



H2020-TWINN-2015. Grant Agreement no 691936	
Project full title:	Remote Sensing Science Center for Cultural Heritage
Project acronym:	ATHENA
Work Package	WP1
Deliverable	D1.5 (15M Interim report)



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Dissemination Level		
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CO	Confidential, only for members of the consortium (including the Agency Services)	

Document Sign-off				
Nature	Name	Role	Partner	Date
DRAFT	Diofantos G. Hadjimitsis Vasiliki Lysandrou Athos Agapiou	Work Package Leader	CUT	14/03/2017
REVIEWED	Rosa Lasaponara - Nicola Masini	Partner 1	CNR	19/03/2017
REVIEWED	Gunter Schreier	Partner 2	DLR	19/03/2017
APPROVED	All partners	All partners	CUT, CNR, DLR	20/04/2017

Work Package: 1 – Project Management Deliverable: D1.5 – 15M Interim report				
Sections to be protected	Description	Owner	Access Rights	
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Summary

The Deliverable 1.5 is the periodic report of the project as defined by the reporting provisions of the Grant Agreement no 691936 related to “ATHENA” project (Article 20). The present document consists the Part B of the periodic technical report of the project and covers the period from 01/12/2015 to 28/02/2017 (M1-M15 of the project).

The report aims to bring out all activities accomplished by the project up to date according their description in the approved and signed version of the project. Financial adequateness of all related actions according the requests for interim payment are not included here, but are to found in a separate annex, while part A is directly uploaded to the portal of the project. The deliverable is mainly focuses to the (1) Explanation of the work carried out by the beneficiaries and Overview of the progress , (2) Objectives achieved so far as these where initially defined by the partners, (3) Explanation of the various tasks and work carried per WP and (4) the impact of the “ATHENA” project both in terms of upgrading the scientific knowledge of the partner from the low-performing country (i.e. CUT) as well as any other impact to the society and economy. It should be finally noticed that details related to the various work and tasks accomplished so far can be found in the Deliverables per se.

1. Introduction

1.1. *What is ATHENA about?*

In periods of economic instability, national considerations are overruling the process of European integration. Cultural Heritage (CH) is an integral element of a European set of values and respect for heritage is vital for developing a common European identity. The CH sector has always been facing a number of challenges that have increased with the financial crisis that has hit Europe. Amongst others, these challenges include the decrease of public budgets, urbanisation, globalisation and technological changes. Within this context, CH professionals are seeking to improve currently used methodologies, in order to better understand, protect and valorise the common European past and common identity. ATHENA project seeks to improve and expand the capabilities of collaboration between low performing and leading institutions, involving professionals dealing with remote sensing technologies for supporting CH sector, as well as experts in the field of remote sensing applications for archaeological and cultural heritage issues.

Although the term “Remote Sensing” (RS) has mostly been used to describe satellite imaging, this project also considers other non-destructive distant techniques, including aerial imaging using planes and Unmanned Aerial Vehicles (UAVs), ground-based reflectance spectroscopy and geophysical surveys. While the use of some of these techniques is well established in archaeology, new technological achievements have been made recently that are not yet fully applied to CH investigations, such as the use of hyperspectral and radar satellite data with high spatial resolution, as well as the motorization of geophysical measurements with multiple instruments. This leads to another important issue addressed by the ATHENA project: all aforementioned techniques have often been used separately, therefore, the benefits of combining them to gain new archaeological insights have seldom been realised. The integration of RS with other information related to archaeological research, historic socio-economic data and landscape information can be performed in geographical information systems, targeting for Cultural Heritage preservation. This is one of the innovative aspects of ATHENA project.

Therefore, the ATHENA project will be devoted to the development and systematic use of advanced remote sensing science and technologies for the multi-temporal analysis and interpretation of archaeological and built cultural heritage, and the distant monitoring of their natural and anthropogenic environment.

ATHENA is further exploiting the current capabilities of Cyprus University of Technology (CUT), both in terms of capacity as well of equipment, performing advance research and support to the CH sector. CUT aims to be in close collaboration with both national and international research institutes and stakeholders, providing integrated remote sensing services and solutions beyond Cyprus, in the area of the Eastern Mediterranean. For this reason two leading institutions of Europe namely the Italian National Research Council (CNR) and the German Aerospace Center (DLR) will assist in this direction.

ATHENA will bring positive effect to endangered European cultural heritage (refer to publications exposing the up to date research achieved) and will assist in the implementation of social initiatives aimed to preserve endangered cultural heritage sites through documentation via remote sensing techniques. Documentation of cultural heritage sites using remote sensing technologies will bring positive effects to the natural, built and social environments. Therefore, the project can assist in supporting missions and initiatives aimed to save cultural heritage sites that have been ravaged by urban sprawl, climate change, earthquakes, floods, war, terrorism, and other threats. Remote sensing techniques are useful methods to document endangered CH sites, in cases where lack of funding prevails and where physical presence is prohibited or difficult. ATHENA is therefore lobbying with the European Copernicus Programme, to have monitoring of endangered CH sites a core application service of Copernicus.

Another important societal benefit of the ATHENA project, is the promotion of multidisciplinary collaboration through a fruitful blending of scientists interested towards remote sensing and cultural heritage. The project focuses on the knowledge related to cultural heritage implementing actions based on multidisciplinary collaborations and closes the gap between cross-disciplinary research and exploitation methods through different scientific domains such as history, archaeology, architecture, urban design, sociology, anthropology, engineering, and computer sciences using remote sensing technologies. Innovation in the ATHENA directly and indirectly benefits the project consortium as well as associated stakeholders. The combination of innovative methodologies to enhance the understanding of European CH by means of RS techniques will bring new knowledge and collaboration across disciplines, while the innovative procedures and applications will enable remote communication and collaboration across the industry, professionals, experts, researchers and academia.

1.2. Summary of the progress report

As defined by the Article 20.1 (Obligation to submit reports) of the signed Grant Agreement of the ATHENA project: “The coordinator must submit to the Agency (see Article 52) the technical and financial reports set out in this Article. These reports include the requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).” Part B Periodic Technical Report is the narrative part that includes explanations of the work carried out by the beneficiaries during the reporting period. The periodic report covers the first 15 months of the all tasks as these where described in the Gantt Chart of the Project:

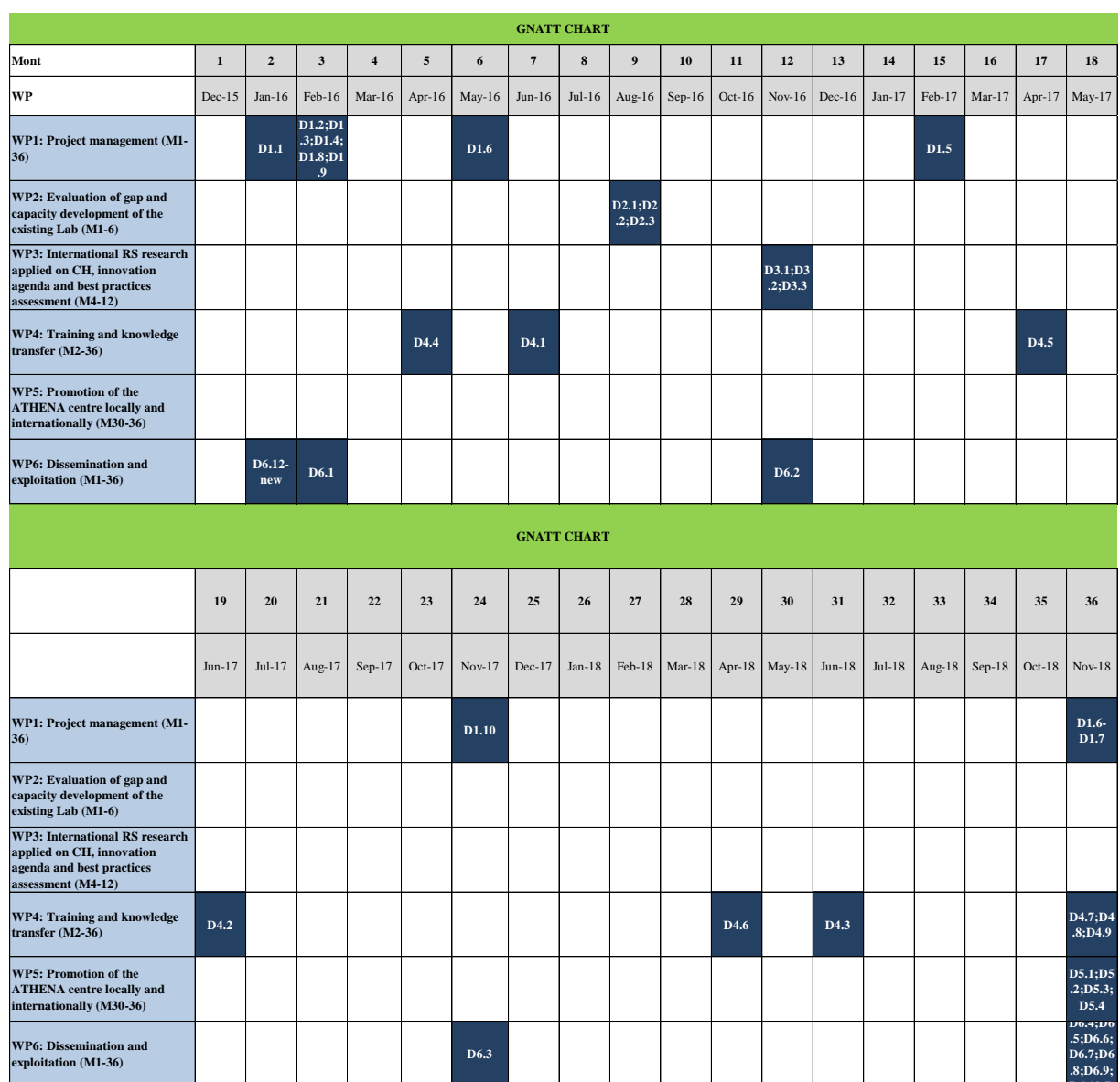


Figure 1: Gantt chart of the ATHENA project. In red color the actions related with the interim report (M1-M15)

Below a full list of the already submitted deliverables of the ATHENA project for the first 15 months (M1-M15). These deliverables can be found in the participant portal of the project as well as in the website.

Deliverable	No	Name	Leader	Type	Public / Confidential	M	Date
D1	D1.1	Work schedule	CUT	R	PU	2	1-Jan
D13	D6.12	Evolution of the publications in high impact journals in the relevant research fields	CUT	R	CO	2	1-Jan
D2	D1.2	Reporting and financial management guidelines	CUT	R	CO	3	1-Feb
D3	D1.3	Project infrastructure and file sharing arrange (clima)	CUT	R	PU	3	1-Feb
D4	D1.4	QA guidelines (clima and anagenisis)	CUT	R	PU	3	1-Feb
D8	D1.8	Risk management and contingency planning	CUT	R	CO	3	1-Feb
D9	D1.9	Exploitation Manager Agreement	CUT	R	CO	3	1-Feb
D30	D6.1	ATHENA's website	CUT	DEC	PU	3	1-Feb
D20	D4.4	Material from 1st workshop	DLR	R	PU	5	1-Apr
D41	D1.10	Data Management Plan	CUT	R	CO	6	1-May
D17	D4.1	Report of the 1st summer school	DLR	R	PU	7	1-Jun
D10	D2.1	RS systems use for application in archaeology research assessment report	CNR	R	PU	9	1-Aug
D11	D2.2	Report of the outcomes with potential partners – Five year roadmap for future research projects	CNR	R	CO	9	1-Aug
D12	D2.3	Five year roadmap for future research projects, based on outcomes from discussions with partners	CNR	R	CO	9	1-Aug
D14	D3.1	Evaluation report including Lab's existing capacities, baseline assessment and roadmap concerning the future planning development of the centre according the needs emerged for the evaluation report	DLR	R	CO	12	1-Nov
D15	D3.2	Report from the meetings with local stakeholders	DLR	R	CO	12	1-Nov
D16	D3.3	Report of the gap analysis	DLR	R	CO	12	1-Nov

D31	D6.2	ATHENA's 1st electronic newsletter	CUT	DEC	PU	12	1-Nov
D5	D1.5	15M Interim report	CUT	R	CO	15	1-Feb

Figure 2: Deliverable list of the ATHENA project during the first 15 months of the project.

The so far achieved milestones are indicated in the following table, while they are further discussed below, under the relative work package.

Milestone number	Milestone title	WP number	Lead beneficiary	Due Date (in months)	Means of verification
MS1	Inaugural meeting	WP1	1 - CUT	1	Inaugural meeting
MS2	Project website launched	WP1	1 - CUT	3	Project website launched
MS3	RS archaeology assessment	WP2	2 - CNR	9	RS archaeology assessment
MS4	GAP analysis	WP3	3 - DLR	12	GAP analysis

Below a calendar of all activities carried out within the first 15 months of the ATHENA in chronological order (newest to oldest).

<p>ATHENA support RSCy 2017 February 17, 2017</p>	
	<p>Organization of Workshop: Remote Sensing for Cultural Heritage Beyond Europe February 12, 2017</p>

ATHENA @ EGU Conference
January 14, 2017



**SPIE
Digital
Library**

SPIDigitalLibrary.org

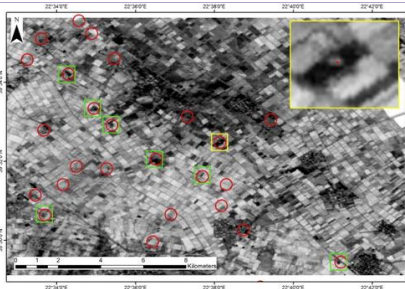
New conference publication release
December 11, 2016

1st e-Newsletter of ATHENA
December 8, 2016



1st e-Newsletter 2016

www.athena2020.eu



New publication release
November 18, 2016

ATHENA participates in the Celebration
of the annual GIS DAY 2016
November 18, 2016



ATHENA briefing
November 17, 2016

Geo-CRADLE project Workshop held in
 CUT premises 16-17/11/2016
November 16, 2016



ATHENA supports EGU Special Session
November 13, 2016

ATHENA at EuroMED 2016 conference
November 9, 2016



ATHENA project first year's annual meeting
November 2, 2016

ATHENA project team members meeting
 with local stakeholders
November 2, 2016



ATHENA-Training "Multi-Temporal Remote
 Sensing Analyses"
October 6, 2016

Educational Activities of Remote Sensing Archaeology Presented at the

SPIE
October 4, 2016



ATHENA...back to school!
September 28, 2016

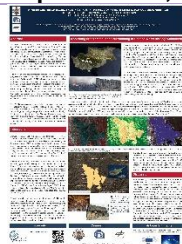
Researchers from the Eratosthenes Lab will meet you in Filoxenia Conference Centre in Nicosia, on Friday 30 September
September 28, 2016



ATHENA project presents to archaeologists

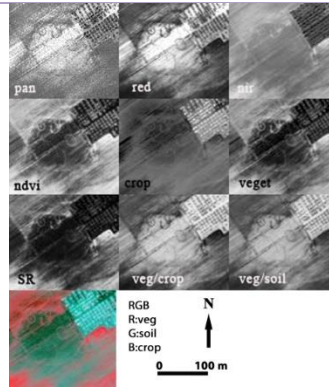
September 18, 2016

6TH GEOBIA – SOLUTIONS & SYNERGIES
September 18, 2016



ESA Briefing 2016
September 8, 2016

Journal Publication release
September 2, 2016



First results from TerraSAR-X processing over
Nea Paphos, Cyprus

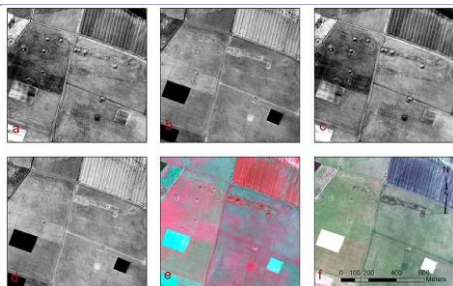
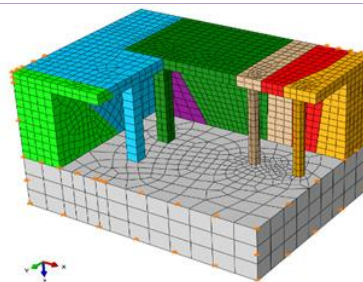
August 22, 2016

Journal Publication release
August 10, 2016



ATHENA project responds to fire emergency
call in Cyprus
July 27, 2016

Journal Publication release
July 15, 2016



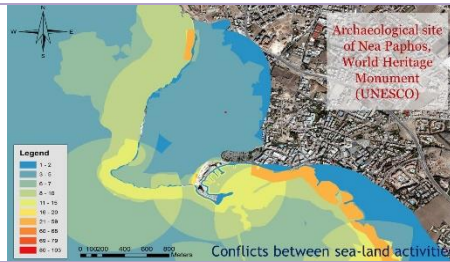
Journal Publication release
July 14, 2016

Surveying Modelling Monitoring
 Management BIM-GIS based: Cultural
 Heritage & Built Environment
July 14, 2016



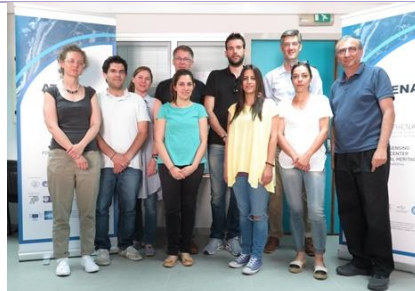
Cyprus became the 11th country to sign the
 European Cooperating State Agreement,
 strengthening its relations with ESA.
July 14, 2016

Satellite Remote Sensing Technology in
 Underwater Archaeology
June 24, 2016



Journal Publication release
June 21, 2016

Summer School 23-25/6/2016
June 08, 2016



ATHENA project presented to undergraduate
 students
June 01, 2016

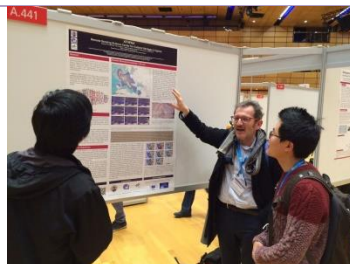
<p>Cyprus Embraces Space 2016 May 19, 2016</p>	
	<p>Photos from Pompeii May 10, 2016</p>
<p>Athena project partners CNR and CUT discussing with Pr. Fulong Chen from HIST (International Centre on Space Technologies for natural and Cultural Heritage under the auspices of UNESCO) supporters of ATHENA projects. May 10, 2016</p>	
	<p>ATHENA – Pompeii, GRSA 2016 co-organized by CNR-IBAM May 10, 2016</p>
<p>Dr Agapiou presented “Ground-truth Spectroradiometric data for archaeological applications” May 09, 2016</p>	
	<p>CUT team participated in the International School of Pompeii May 09, 2016</p>

Main Issues and results from the discussion with the Participants
 ATHENA Copernicus Workshop Paphos, Cyprus, April 7th 2016
 May 02, 2016



Material from Workshop 'Copernicus contribution to Cultural Heritage'
 April 25, 2016

Visit to the Minister of Education and Cultural
 April 21, 2016



European Geosciences Union – EGU
 April 20, 2016

ATHENA travels to POMPEII...
 April 15, 2016



RSCY2016
 April 14, 2016

ATHENA project Partners meeting
April 08, 2016



RSCy2016
April 07, 2016

Copernicus contribution to Cultural
Heritage
April 07, 2016



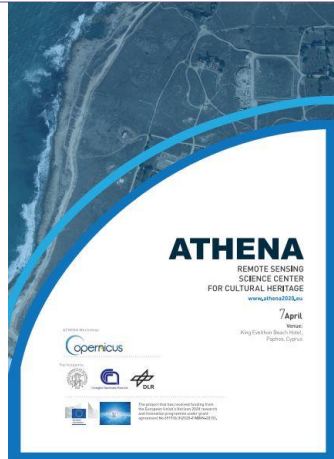
The first official meeting with the ATHENA's
project QA team
March 31, 2016

Prof. Diofantos Hadjimitsis in La Notre
conference
March 28, 2016



Professor D. Hadjimitsis the coordinator of
ATHENA's project met with the rector principles
of Aristotle University of Thessaloniki
March 28, 2016

16th February 2016, 1st Virtual Training
 “Multi temporal RS analysis” from
 Daniele Cerra (DLR)
 March 17, 2016



Workshop (07 April 2016): Copernicus
 contribution to Cultural Heritage
 March 11, 2016

Professor Diofantos Hadjimitsis,
 coordinator of ATHENA’s project visited
 the Balkan Environment Center (i-BEC)
 March 10, 2016



Leaflet No. 1
 January 19, 2016

Kick-off ATHENA project
December 14, 2015



ATHENA Project starting date
December 01, 2015

2. Explanation of the work carried out by the beneficiaries and Overview of the progress

2.1. Objectives

The overall objective of the ATHENA project is to significantly strengthen the scientific excellence and innovation capacity of the Remote Sensing Science and Geo-Environment Research Laboratory, established in Cyprus University of Technology (CUT) and specifically upgrade and improve its Archaeology and Cultural Heritage Section, turning it into a centre of excellence specialised in the field of Remote Sensing for Cultural Heritage applications. This action still in progress is becoming achievable through the creation of unique link between two internationally-leading research institutions: National Research Council of Italy (CNR) and the German Aerospace Centre (DLR). Through ATHENA, CUT's staff research profile and expertise will be raised while at the same time it will enhance the S&T capacity of the linked institutions.

To materialise this overall objective, specific scientific and technological objectives, as well as training and knowledge transfer objectives have been set down. As far as the reporting period of the present report concerns, some of these objectives have been achieved, while others are in the way of achievements, according to the respective work package(s) that each objective is linked to.

Scientific and Technological objectives of ATHENA project - S&T and the related Training and knowledge transfer- T&K objectives

S&T-1: Transformation of the existing CUT's Remote Sensing Laboratory into a Scientific Centre of Excellence providing innovation capacity within a public University. The existing lab

will significantly strengthen in the field of Remote Sensing Archaeology by its twinning to internationally-leading institutions. It will link to initiatives in the European Copernicus programme.

Work carried out: This objective is running throughout the whole project and is to be achieved mainly through WPs 2-6. This is mostly a general objective and the various subtasks of WPs 2 – 6 have their impact to the achievement of the present task, to be fully completed at the end of the project. The existing CUT staff has been involved in special trainings and hands-on experience provided by the internationally leading institutions. Already some of the achievements of the ATHENA project are visible through the scientific publications in high impact factor multi-disciplinary journals, dealing with innovative aspects of remote sensing archaeology. It is also noticeable to stress the involvement into new scientific fields such as radar, ground geophysical prospection, hyperspectral analysis and phenological studies which have been limited studied until now by the CUT group.

ATHENA project has also provided the floor to the researchers involved, to present these innovative aspects in various stakeholders and other experts including researchers and academia. At the same time ATHENA was presented in the wider public, raising the awareness to the local community regarding the innovative aspects of space technologies for cultural heritage. From these events we just highlight the meetings with the Minister of Education and Culture, General Secretary with the Ministry of Communication and Works (responsible for space in Cyprus), Archaeological Research Unit, etc.

It is expected that, until the end of the project, ATHENA will fulfill its objectives, creating a critical mass of researchers involved in these fields, increase the reputation of the Remote Sensing Laboratory and attract funding from various sources. At the same time, it is expected that ATHENA will become a point of reference for any future remote sensing application / project in the field of archaeology and cultural heritage.

S&T-2: Intensive high quality training of the research staff currently working at CUT in new remote sensing technologies, information systems, tools and methods. **Related to T&K-2:** Strengthening a state-of-art ground based remote sensing centre and its transformation to a transnational access point in eastern Mediterranean. Cyprus due to its geographical position has always been the crossroad between three continents: Europe, Africa and Asia, the bridge between east and west. Already, from WP2 potential partner research will be identified. In WP5 through the Centre's promotion internationally, creating collaboration clusters. With the various war conflicts in the Middle East region, remote sensing techniques seem to be the most efficient, time-effective way for monitoring CH or even documenting CH

prior its damage or total destruction,.

Work carried out: This task deals with Training and knowledge transfer and is directly linked to the actions and activities of Work Package 4. Its accomplishment started already from the second month of the project and is continuing through-out the project (M36) since the upgrade of the CUT's existing staff knowledge in the field of Remote Sensing Archaeology. It is one of the major concerns of the project, as well as one of the key factors to achieve its goals. The work carried out up to date for achieving this task are related to the following activities:

Table 1: Meetings and training activity during the first 15 months of the ATHENA project

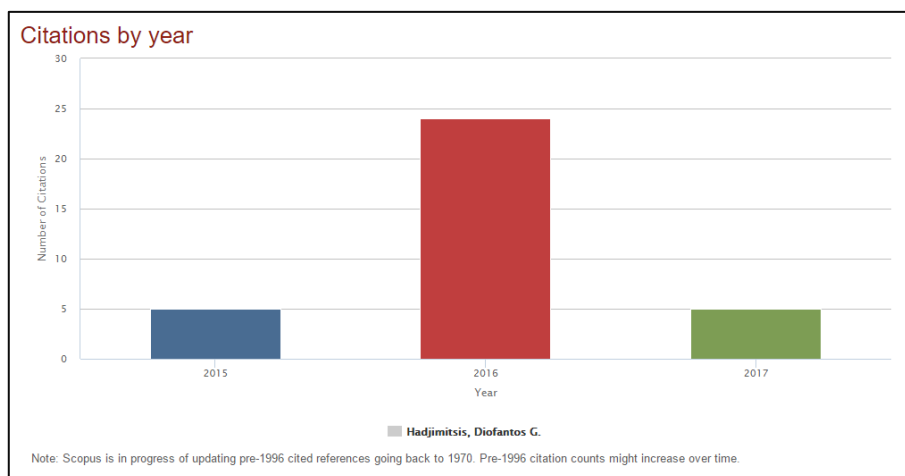
Activity type	Activity No	Activity Topic	Due date (M)	Participant	Hosting Institution	Delivery Date
Meetings (M)	M1	Kick-off meeting	1 (Dec 2015)	All partners	CUT	15 December 2015
Meetings (M)	M2	Annual Meeting	12 (Nov 2016)	All partners	CUT	02 November 2016
Workshops (WS)	WS1	Copernicus contribution to CH	4 (April 2016)	DLR-CUT	CUT	7 April 2016
Short term visits on site (OS)	OS1	Visit to the Archaeological park of Paphos (in parallel with SS1)	6 (May 2016)	DLR-CUT	CUT	23-25 May 2016
Experts visits (EV)	EV1	GAP evaluation (see WP3)	2 (Jan 2016)	All partners	CUT	20-21 January 2016
Short term staff exchanges (SE)	SE1	Active and passive RS data & archaeology	9 (Aug 2016)	CNR-CUT	CNR	09-13 May 2016
Virtual training (VT)	VT1	Hyperspectral processing	2 (Jan 2016)	DLR-CUT	CUT	16 February 2016
	VT2	Multi temporal RS analysis	10 (Sep 2016)	DLR-CUT	CUT	06-07 October 2016
Summer Schools (SS)	SS1	Interferometry/Radar	6 (May 2016)	DLR-CUT	CUT	23-25 May 2016

S&T-3: Raise initiating centre's staff research profiles and establish of researcher's levels in correspondence to academic levels: e.g. research assistant, research associate, research fellow, senior research fellow and research professor. In parallel, upraise all participants

research profiles through common publications and conference attendance etc. ***Related to T&K-4:*** Overwhelming existing gaps in S&T-3: Raised involved institutions staff's research profiles. This step will be achieved mainly through publications in scientific journals, conference attendance participation and networking in a European and International level of all partners' staff.

Work carried out: This task started from the beginning of the project and is still on-going though out the project's duration. This is directly related to Work Package 6 dealing with the Dissemination and Exploitation of the project and more specifically is connected to that part pf WP6 regarding the scientific dissemination of the project. In this perspective, the task has been fulfilled through the scientific publications until now completed and through the presentation to scientific conference of international ranking. For these, refer below to section 1.2.6. where all related outcomes are exposed. So far the CUT's existing staff academic and scientific profile has already been raised through the publication in high impact international scientific journals with measurable upgrade of their ranking. This upgrade is evidenced below according to Scopus Engine, Mendeley and other sources based on authors profiles.

As proven the ATHENA project has significantly strengthen the scientific background of the researchers involved in the project, which has been reflected also to their research profile. For instance, paper citations for three key researchers from the HO, Prof. Diofantos Hadjimitsis (coordinator), Dr. Athos Agapiou and Dr. Vasiliki Lysandrou, during the period 2016 (period fully covered by the ATHENA project) as these were estimated by the Scopus engine are shown below:



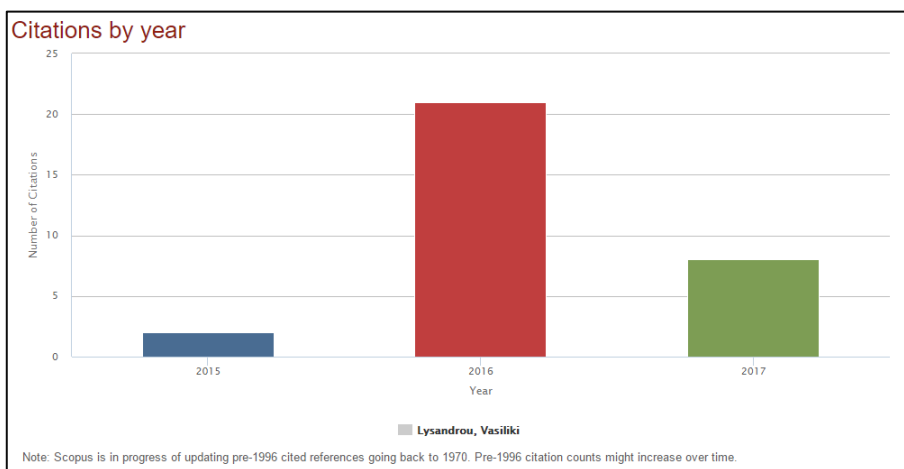
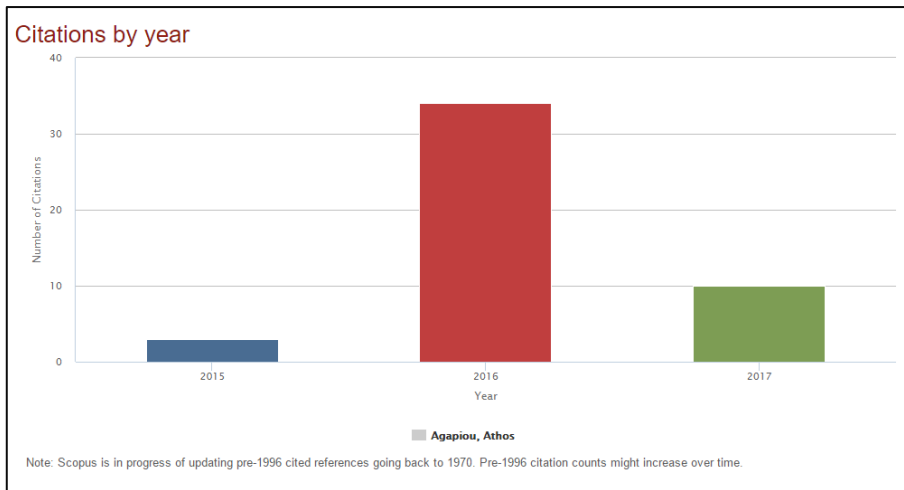


Figure 3: Citations per year for Prof. Diofantos Hadjimitsis (top), Dr. Athos Agapiou (middle) and Dr. Vasiliki Lysandrou (bottom) during 2016 (full year of activities of the ATHENA project, the citations have been increased).

In a similar way, various scores for researchers involved in the ATHENA project have been extracted from the Mendeley statistics and demonstrated below. Please note the increase during the launch of the ATHENA project (end of 2015) while these indicators have been slightly increase in the next year (both in terms of views and citations):

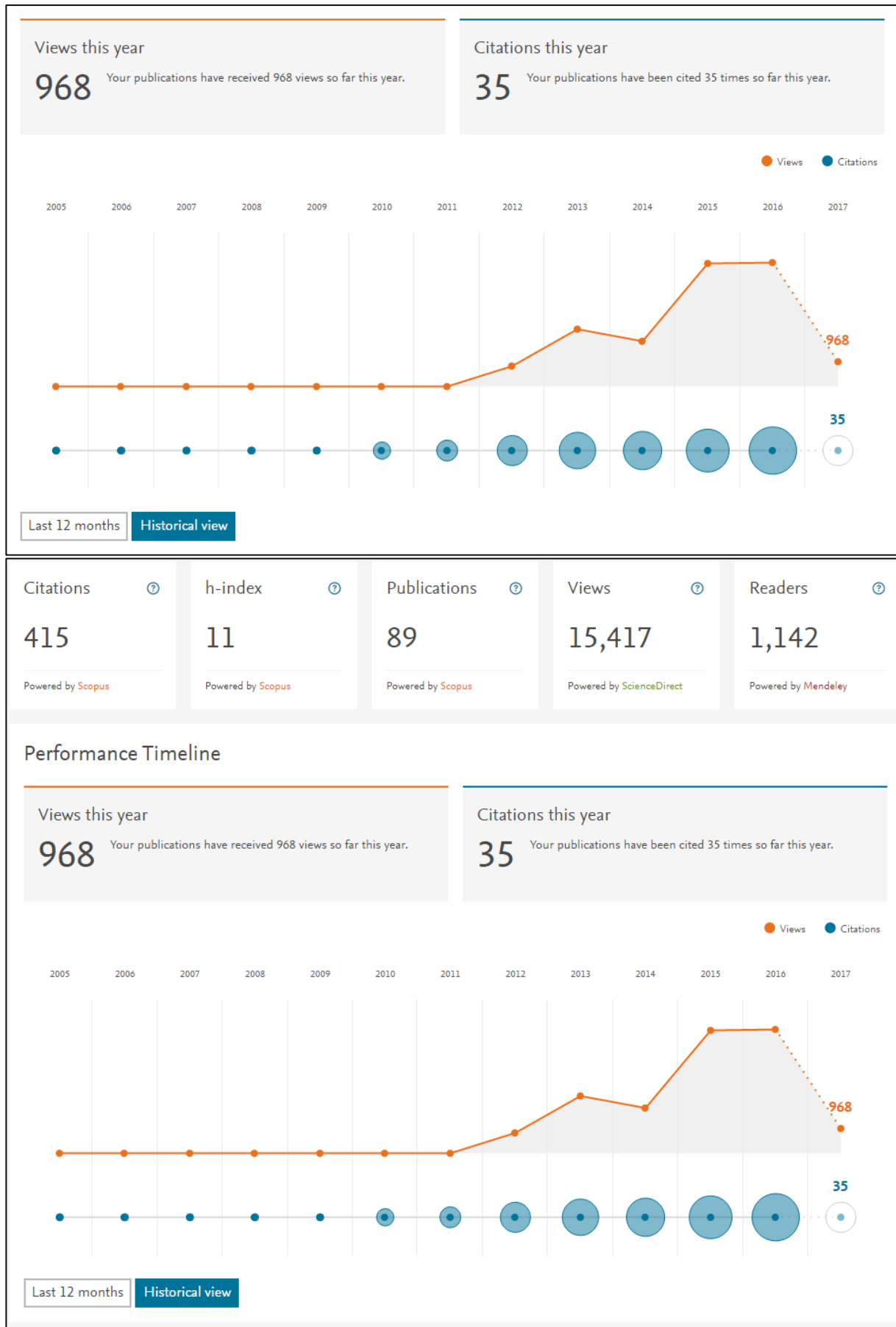


Figure 4: Mendeley statistics for Prof. Diofantos Hadjimitsis (top) and Dr. Athos Agapiou (bottom). Note the increase during the launch of the ATHENA project (end of 2015) both in terms of views as well as in citations.

Papers submitted to high impact factor journals such as those of *Remote Sensing*, *MDPI*, have been already acknowledged by the scientific community. Below some indicators (Articles metric) from the MDPI source are shown for (1) Cerra, D.; Plank, S.; Lysandrou, V.; Tian, J., *Cultural Heritage Sites in Danger—Towards Automatic Damage Detection from Space*. *Remote Sens.* 2016, 8, 781 and (2) Agapiou, A.; Lysandrou, V.; Lasaponara, R.; Masini, N.; Hadjimitsis, D.G., *Study of the Variations of Archaeological Marks at Neolithic Site of Lucera, Italy Using High-Resolution Multispectral Datasets*. *Remote Sens.* **2016**, 8, 723.

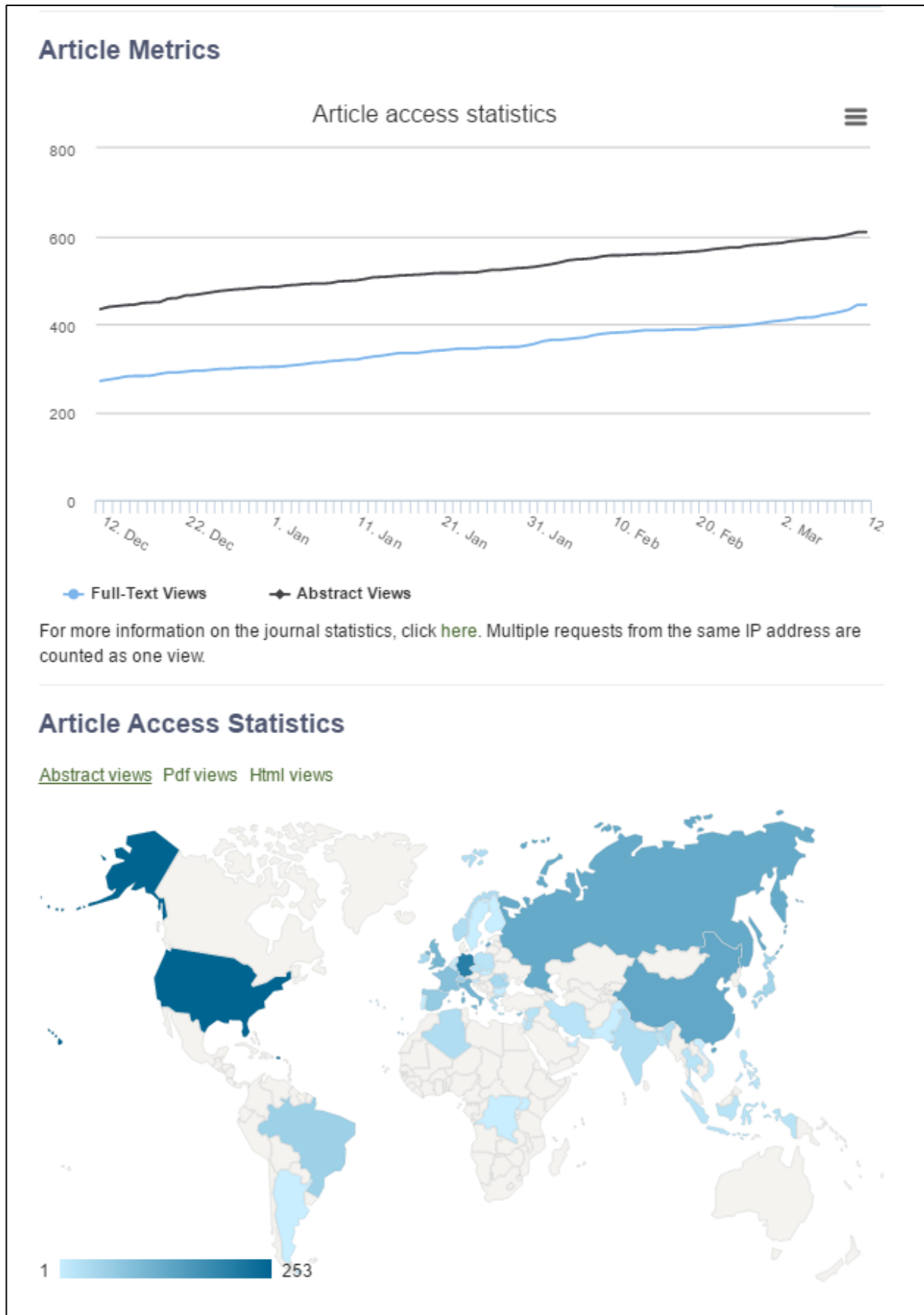


Figure 5: Articles metric of the paper Cerra, D.; Plank, S.; Lysandrou, V.; Tian, J. *Cultural Heritage Sites in Danger—Towards Automatic Damage Detection from Space*. *Remote Sens.* 2016, 8, 781.

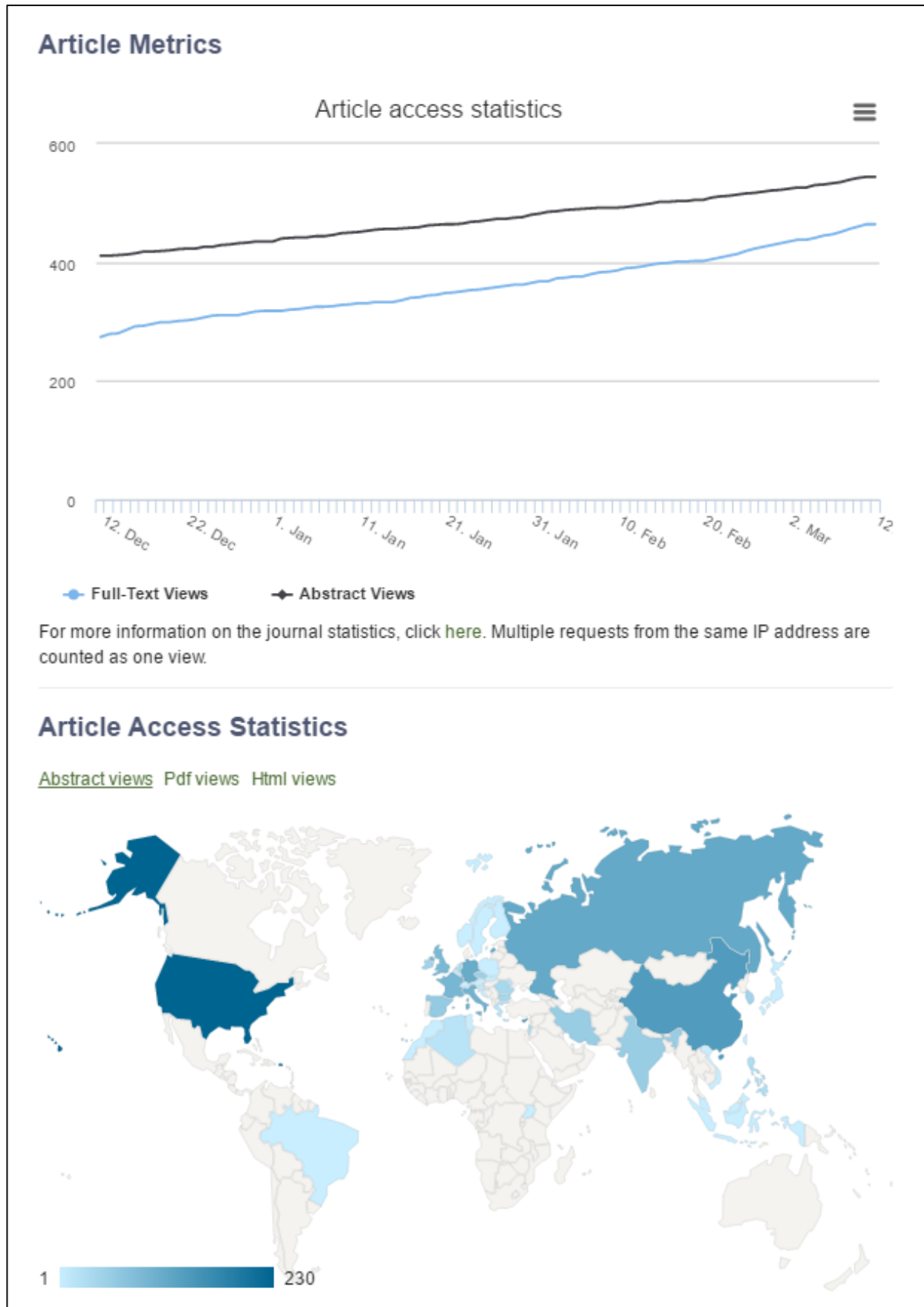
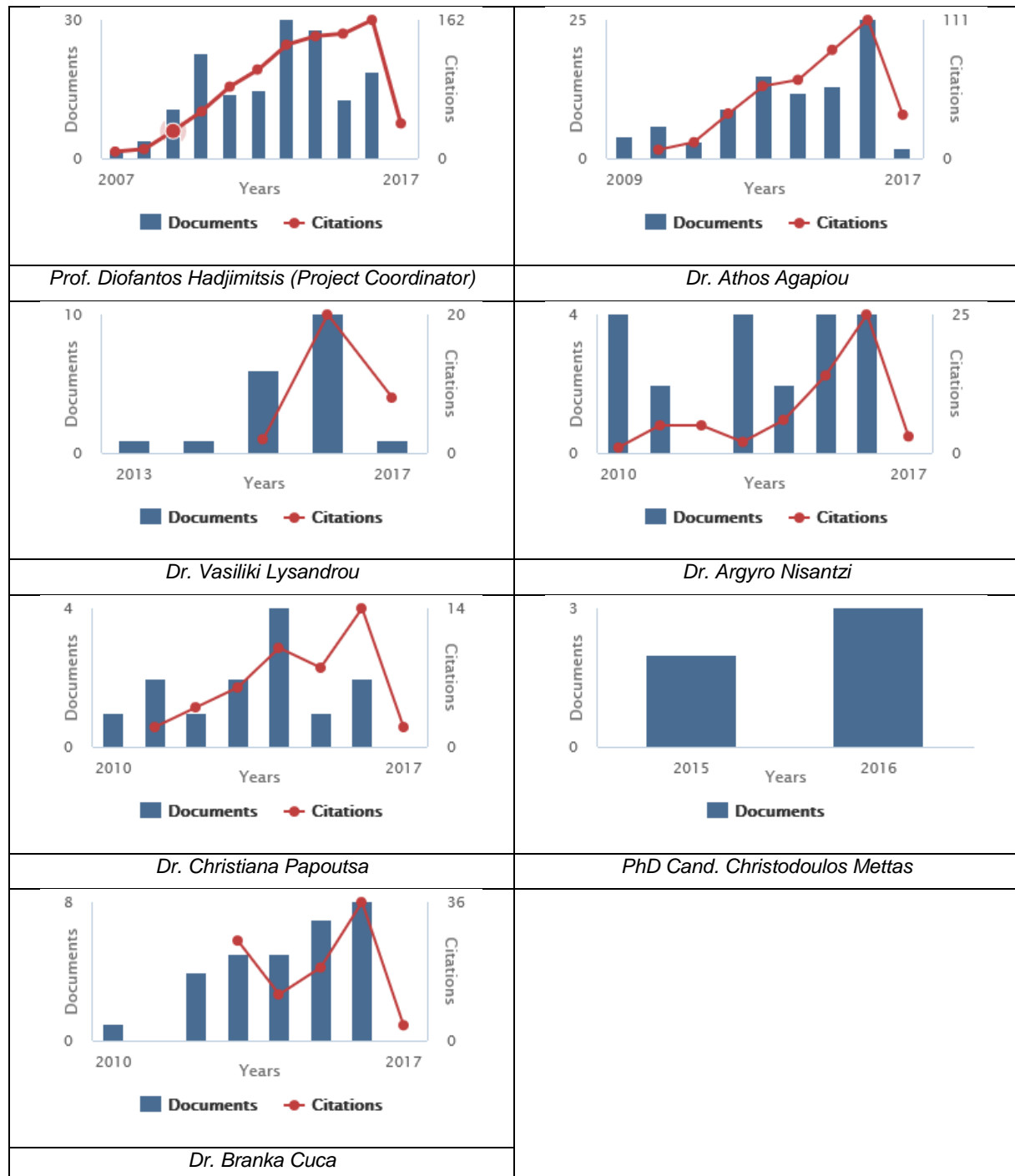


Figure 6: Articles metric of the paper Agapiou, A.; Lysandrou, V.; Lasaponara, R.; Masini, N.; Hadjimitsis, D.G. Study of the Variations of Archaeological Marks at Neolithic Site of Lucera, Italy Using High-Resolution Multispectral Datasets. Remote Sens. 2016, 8, 723.

For some researchers involved in the ATHENA project some indicators have been extracted from the Scopus engine for the year 2016 (below indicated in green rectangle). All publications of this year are connected to the ATHENA project.

Table 2: Scopus documents and citation score for researchers involved in the ATHENA project as provided by the Scopus engine



Furthermore, as concerns the establishment of researcher's levels corresponding to academic ones, this has also been achieved recently by the Cyprus University of Technology, have as actual impulse for its materialisation, the ATHENA project.

S&T-4: Development of multidisciplinary courses harmonized with the purposes of the centre, e.g. Integrate RS techniques for detection of unexcavated archaeological remains; Integrated RS techniques for monitoring CH; Non-destructive remote techniques for environmental control and environment's impact to monuments.

Work carried out: This task has been achieved mainly as an outcome of the exercises related to the various training activities of WP4. The outcomes of the training activities and knowledge transfer are generally reflected in the publications of the ATHENA project participants and are treating subjects of multidisciplinary nature as described in the relevant task and are comprising result of a multidisciplinary team of scientists, including surveyors, archaeologists, engineers, remote sensing experts, experts in environmental studies etc.

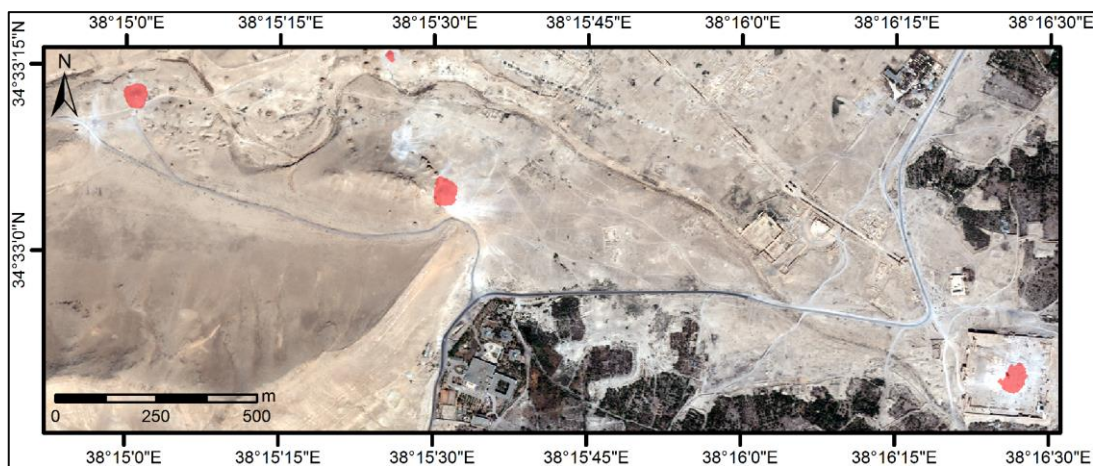


Figure 7: Red: post-processed change map from Figure 7 overlaid on the 2 September 2015 WorldView-2 image reported in the Figure above. All the main damaged areas are correctly identified (European Space Imaging / DigitalGlobe) (Source: Daniele Cerra, Simon Plank, Vasiliki Lysandrou, Jiaojiao Tian, *Cultural Heritage Sites in Danger—Towards Automatic Damage Detection from Space*, *Remote Sens.* 2016, 8, 781; doi:10.3390/rs8090781).

S&T-5: Create close ties between academic research and end users/stakeholders related to archaeology and cultural heritage sectors, including the Department of Antiquities of Cyprus (responsible authority for the island's CH); Cyprus Remote Sensing Society (the only society of its kind operating on the island); Episcopal regions (retaining a vast number of ecclesiastical monuments, but still no means or know-how for their documentation, valorisation, monitoring etc.).

Work carried out: This objective will be achieved through the promotion of the Centre during WP5 (Promotion of the centre locally and internationally) which is foreseen to start at month 30 of the project. Nevertheless, the task has been already partially and through the dissemination of ATHENA project during WP6 with various meetings to stakeholders,

academic and research institutions in Cyprus and abroad. Further related information are exposed below in section 1.2.6.



Figure 8: 1st November 2016: Presenting the ATHENA project to the archaeological community of Cyprus at the Archaeological Research Unit of the University of Cyprus.


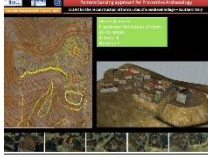


<p style="text-align: center;">  Πανεπιστήμιο Κύπρου University of Cyprus </p> <p style="text-align: center;">Η ΕΡΕΥΝΗΤΙΚΗ ΜΟΝΑΔΑ ΑΡΧΑΙΟΛΟΓΙΑΣ του Πανεπιστημίου Κύπρου και το</p> <p style="text-align: center;">ΕΡΓΑΣΤΗΡΙΟ ΤΗΛΕΠΙΣΚΟΠΗΣΗΣ ΚΑΙ ΓΕΩΠΕΡΙΒΑΛΛΟΝΤΟΣ του Τμήματος Πολιτικών Μηχανικών και Μηχανικών Γεωπληροφορικής, Τεχνολογικό Πανεπιστήμιο Κύπρου</p> <p style="text-align: center;">σας προσκαλούν τη Τρίτη, 1 Νοεμβρίου 2016 και ώρα 19:30 στις διαλέξεις των</p> <p style="text-align: center;">Prof. Rosa Lasaponara IMAA-CNR (Italian Research Council), Institute for Environmental Monitoring) με τίτλο: "Living in the golden age of digital Heritage: from discovery to documentation, management and tourist exploitation"</p> <p style="text-align: center;">και Dr. Gunter Schreier German Aerospace Center Earth Observation Center με τίτλο: "The European Earth Observation Programme COPERNICUS: A contribution to the preservation of Cultural Heritage"</p> <p style="text-align: center;">Οι διαλέξεις είναι ανοικτές για το κοινό και θα δοθούν στο κτήριο της Ερευνητικής Μονάδας Αρχαιολογίας Οδός Γιάδωστνας 12, Λευκωσία</p> <p style="text-align: center;">"Living in the golden age of digital Heritage: from discovery to documentation, management and tourist exploitation" Περίληψη: The field of digital archaeology is stepping in its golden age characterized by an increasing growth of both classical and emerging multidisciplinary methodologies, addressed to the study and conservation of cultural heritage. The availability of the new digital technologies have opened new infinite possibilities, unthinkable only a few years ago for archaeology and cultural landscape that is an integral part of our archaeological heritage being that it preserves the main features that identify the evolutionary history of civilization over time. One of the greatest advantages of digital technologies (available from air, space,</p>	<p>ground) is that they gather an immense amount of information on archaeological remains, even those which are buried, in a non-invasive, non-destructive way. At the same time they also contribute to their protection and preservation.</p> <div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center; font-size: small;">Virtual reconstruction of the medieval village of Yruem from information obtained from satellite and aerial lidar (Left), whereas no evidence is visible in situ as shown in the photograph to the right.</p> <p>"The European Earth Observation Programme COPERNICUS: A contribution to the preservation of Cultural Heritage" (Left): Imaging and remote sensing of physical properties have always been a method for archaeology and the preservation of cultural heritage. Advances in sensing and space technologies now enable even to use measurements from space for this purpose. Now Earth Observation missions and specifically international initiatives, such as the European Copernicus programme, now enable a wider use of space borne Earth Observation data to detect still unknown and monitor known sites. They contribute to the science understanding of the site, or to monitor effects of natural and manmade destruction to these sites. However, monitoring of Cultural Heritage is a fairly new domain in space data application. Historians and space engineers need a common understanding of the technologies, approaches and their expectations, in order to take benefit from this new source of information. The lecture will address these issues.</p> <div style="text-align: center;">  <p style="font-size: x-small;">This image comprises two scans from the Sentinel-2A satellite on the same day: 21 December 2015. Copyright Copernicus Sentinel data (2015)/ESA</p> </div>
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Figure 9: Leaflet disseminating the event of the presentation of the ATHENA project to archaeologists

S&T-6: Build close ties between industries relating to remote sensing techniques (including equipment) and research to optimize scientific instrumentation for future research activities. For instance, through research funded projects SMEs related with non-destructive techniques for documentation, preservation and restoration of CH sites and monuments (to be achieved mainly through WP3; WPs 5-6). **Related to T&K-3:** Provide and support transnational access to the Center infrastructures for RS to CH strengthening high-quality collaboration in and outside the EU and access to high-quality information and services for

the user communities (research, CH protection authorities, etc.), in particular also making benefit of European Copernicus initiatives.

Work carried out: This objective is expected to fulfill mainly through the WP5, while concrete results are expected to be seen towards the end of the project. However, it should be stressed that synergies have been started by the involvement of relevant SMEs into new scientific proposals (i.e. under the H2020 or Research Promotion Foundation of Cyprus calls).

S&T-7: Aligned objectives of ATHENA centre of excellence with Smart Specialisation Strategy for Cyprus and especially towards the development of cultural tourism on of the priorities of Smart Specialisation Strategy for Cyprus, both vertical and horizontal (to be achieved mainly through WP4). **Related to T&K-1:** Enhance training of scientists in the field of RS techniques and technologies, environmental information systems, and best practices in CH management. This will be achieved through WP4 with the accomplishment of various training meetings such as summer schools, workshops, seminars etc.

Work carried out: All outcomes of WP4 so far accomplished are addressing the Smart Specialization Strategy for Cyprus, since the project proposal was from the beginning tailored towards this direction.

2.2. *Explanation of the work carried per WP*

2.2.1. *Work Package 1*

WP title: Project Management

Lead beneficiary: CUT – Project Coordinator

Duration: Month 1 to Month 36

Status: On-going

The main objective of this WP is to Coordinate the whole project execution in terms of legal, contractual, financial, and administrative issues. To ensure the timely delivery of high quality deliverables through the effective coordination of partners, robust technical and financial management, and strict Quality Assurance (QA) for all project activities and associated deliverables. For the reasons above exposed, the duration of this work package extends during the total period of the project (Months: 1-36).

Within the time span of the present periodic report, the following Deliverables related to WP1, have been accomplished:

No	Title	Lead beneficiary	Type	Status	Due months	Due data
D1.1	Work schedule	CUT	R	PU	2	January 2016
D1.2	Reporting and financial management guidelines	CUT	R	CO	3	February 2016
D1.3	Project infrastructure and file sharing arrange	CUT	R	PU	3	February 2016
D1.4	QA guidelines	CUT	R	PU	3	February 2016
D1.8	Risk management and contingency planning	CUT	R	CO	3	February 2016
D1.9	Exploitation Manager Agreement	CUT	R	CO	3	February 2016
D1.10	Data Management Plan	CUT	R	CO	6	May 2016
D1.5	15M Interim report	CUT	R	PU	15	February 2017

The project coordinator (PC), professor at the Department of Civil Engineering and Geomatics Dr. Diofantos Hadjimitsis and Vice Rector of Academic Affairs of the CUT is leading the WP1. To achieve all necessary procedures in order to ensure the success and the smooth running of the project, the following tasks as predetermined in the initial proposal have been fulfilled:

Task 1.1: Framework Partnership Agreement (Lead: CUT)

This task focused on the follow-up of the Consortium Agreement (CA) among all partners. The agreement evidenced the main characteristics of the cooperation of participating parties, including responsibilities, liability towards each other, management structures and procedures, financial provisions and all aspects related to Intellectual Property Rights (IPRs). The CA was signed by all partners before the inauguration of the project.

Task 1.2: Administrative and financial management (Lead: CUT)

The present Task have been assigned by the Project Coordinator to qualified and experienced personnel of the Research, International and Public Relations Department of CUT. These personnel worked and still working under the supervision and coordination of the Quality Assurance Team (Prof. Andreas Anayiotos, Rector; Prof. Diofantos Hadjimitsis, Vice Rector of Academic Affairs; Ass. Prof. Evangelos Akylas, Vice President of the Department of Engineering and Geomatics).



Figure 10: 31 March 2016: First official meeting with the ATHENA's project Quality Assurance team.

Through this task, the following actions have been implemented:

- Preparation of a reporting and financial management guideline (D1.2). This guideline was prepared by the Administrative personnel in cooperation with the QA Team; These guidelines were structure to include the following issues:

General Guidelines

- Obligation to keep records and other supporting documentation
- Records and other supporting documentation on the scientific and technical implementation

Report Guidelines

- Introduction
- Template and Dissemination
- Delivery procedure
- Document Status
- Preconditions

Financial Guidelines

- Periodic Financial Reports
- Financial Reports
- Templates
- Delivery procedure

As well as other information related to the Acknowledgements and the Logos.

The purpose of this deliverable is to establish the necessary procedures for managing, implementing and reporting the ATHENA project. This document is an output of Work

Package (WP) 1 (Project Management), the goal of which is to guarantee effective coordination of the project, to ensure that contractual and reporting obligations are met on time and to maintain effective liaison with the European Commission. Monitoring and assessment of project activities will be based on the procedures, tools, and criteria, developed also in the Consortium Agreement (CA) as well as D1.3 (Project infrastructure and file sharing arrange).

The main objective of WP 1 is to coordinate the whole project execution in terms of legal, contractual, financial, and administrative issues. To ensure the timely delivery of high quality deliverables through the effective coordination of partners, robust technical and financial management, and strict Quality Assurance (QA) for all project activities and associated deliverables. For the reasons above exposed, the duration of this work package will extend during the total period of the project.

- Establishment of project infrastructure and file sharing arrangements (D1.3);
- Coordination and management of administrative activities including the preparation of progress reports;
- Financial management of the project including cost control-monitoring, review of accounting practices of the partners, collation of cost statements, authorization of costs and distribution of funds (D1.2);
- Compilation and submission to the EC of the project reports and deliverables.

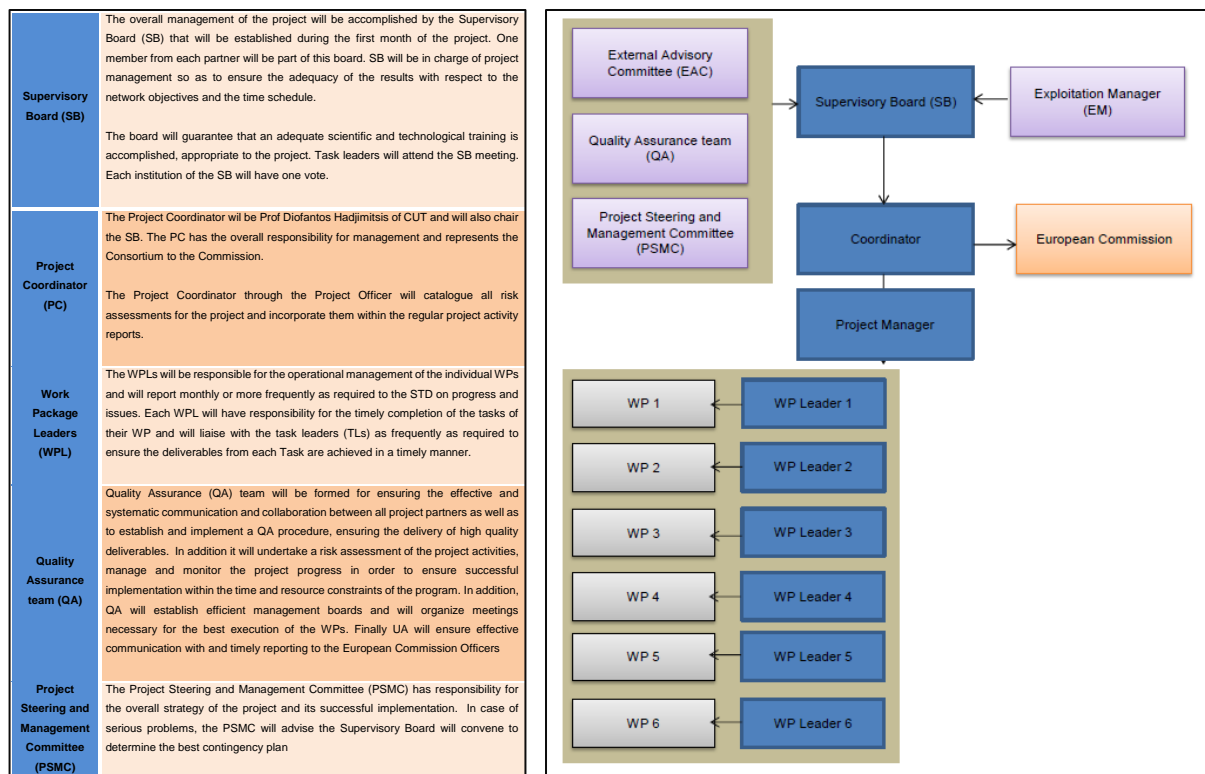


Figure 11: The organizational structure of the ATHENA Consortium bodies (left) and their workflow (right).

The QA guidelines (D1.4) were structured in such a way to cover issues related to the following topics: (a) General QA guidelines; (b) Objectives of the QA guidelines; (c) QA guidelines for reports (deliverables), including Delivery procedure / Document Status / Preconditions and Document Sign-Off; (d) QA guidelines for publications and (e) QA guidelines for training.

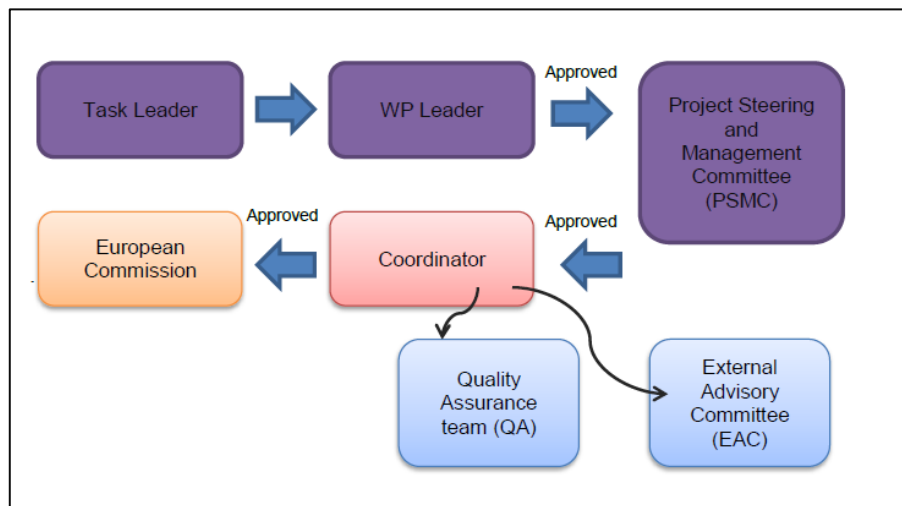


Figure 12: Description of the delivery procedure according to the QA guidelines

Task 1.3: Project management and coordination (Lead: CUT)

This task included general activities carried out and still to be carried out along the project in order to achieve a good management flow among the partners. For this reason, a three-member Supervisory Board (SB – one member from each participating partner: Dr. Diofantos Hadjimitsis (CUT); Dr. Rosa Lasaponara (CNR); Dr. Gunter Schreier (DLR), has been established in the first month of the project (refer to minutes of the Kick-off meeting). This task also includes the consortium meetings, which have been scheduled for each year, plus the initial kick-off meeting.



Figure 13: 14 December 2015: Kick-off ATHENA project Senate Building

Continuity in the meetings is considered necessary for the project, making easier the interchange of views among partners and the effective coordination among activities. Regular web meetings and email exchange amongst the partners have been taken place in ordinary basis to monitor day to day progress and ensure coordination of sub-tasks.

Physical meetings according the project's Gantt's Chart and in relation to the project management WP1 have been up to date accomplished as follows:

- Kick-off meeting: At the start of the project (Month 3), a kick-off meeting at the CUT's premises inaugurated the beginning of the project. At the kick off meeting all project partners attended in order to fine tune the work programme according to the terms, time scale and costs definitely stated in the EC contract, approved the quality assurance plan for project management, and outlined the roadmap and overall methodology for the whole project duration, as well as a detailed work plan for the first six months. Further to the project meeting, in the kick-off meeting local stakeholders from governmental departments related to the project were presented, as well as representative from the Research Promotion Foundation of Cyprus and university (CUT) students.
- The first annual meeting was accomplished on the 2nd November 2016. The meeting took place during the International Conference on digital Heritage (EuroMed 2016) in Nicosia, Cyprus.



Figure 14: 02 November 2016, 1st Annual meeting

During the meeting an overview of the first year's activities has been accomplished. Several issues regarding the future planning of the project have been discussed. An assessment on the internal reporting to control the outcomes and costs incurred by the partners. In addition, technical advances of the different activities have been discussed while forthcoming tasks have been defined in order to better prepare the official reporting, as well as for planning reasons. Furthermore, discussion amongst the consortium members of the consortium covered important issues such as future collaboration in relation to the Centre's future steps.

Task 1.4: Risk assessment and contingency planning

For this important task, two reports have been prepared and submitted already from the third month of the project's beginning. The first report entitled Risk management and contingency planning (D1.8) presented a risk management strategy specifically developed to ensure project risks are minimised. These potential risks were associated with each separate WP and once identified they were used to develop the contingency plan. The identification of the risks has been done by the Project Coordinator (PC) and the SB. As a safety valve, since the beginning of the project it has been decided and agreed by all participating parties that in the event of serious problems, the Project Steering and Management Committee (PSMC) will convene to determine the best contingency plan and the PC will seek the Commission's approval for the proposed solution. Up to date such a need has not been emerged.

Table 3: Proposed risk mitigation measures for the ATHENA project

Description of risk	WP involved	Probability	Impact	Proposed risk-mitigation measures
Difficulty in fixing dates for meetings. One or more members could be absent.	WP1	Medium	Low	Advanced planning to avoid conflicting events. Teleconferencing will be offered as an option to physical presence.
Partnering institution not available for training or visiting Cyprus. Specific exchange of know-how is not realised.	WP4	Low	Medium	CEG/CUT staff will visit the partnering institution. All material will be prepared in advance and provided in digital form. In case of unavailability of the staff to travel, lecturing will be performed in telematic workshops.
Shifting the date of a specific training event	WP4	Medium	Low	As no critical dependencies between most training activities exist, changing and shifting the dates has low impact.
Non availability of training data, instruments training sites	WP4	Low	Low	Trainings, esp. summer schools always work on several data, instruments and sites in order to have an alternative in kind of unavailability.

New RS technologies are applied in CH not included in the proposal	WP4	Low	Medium	Such RS-technologies will be included in the proposal after negotiation between partners. The advancement in RS science will be thoroughly followed during the whole project in order to promptly update all the material regarding the novel technologies.
Poor performance during the training activities	WP4	Low	Medium	The one month period after each training activity can be expanded to cover the specific topic

Task 1.5: Management of research data generated by the project

An Exploitation Agreement was prepared (D1.9) since the beginning of the project (month 3), mainly defining those mechanisms for protecting the Foreground IP, ensuring that protocols and plans for data collection and storage are in line with Data Policy of the European Union (e.g. H2020 Data Management Manual). The Exploitation Agreement was formed by all consortium members, under the guidance of the project's Exploitation Manager (EM). The last one has been unanimously appointed already during the project's kick-off meeting.

In relation to WP1 the scheduled Milestone (MS) was MS1 leaded by CUT and concerned the Inaugural meeting of the project. This, as already abovementioned, was completed successfully on Month 1 of the project, as scheduled.

2.2.2. Work Package 2

WP title: International RS research applied on CH, innovation agenda and best practices assessment

Lead beneficiary: CNR

Duration: Month1 to Month 9

Status: Completed

Primary objective of this WP was to provide the consortium partners with a full understanding of the current and as forthcoming research and innovation agenda within as well beyond Europe in the field of Remote Sensing Archaeology. The actions of the WP2 also aimed to aid the options and alternatives of the Centre of Excellence to be created, based on international established best practices. Within the time span of the present periodic report, all Deliverables related to WP2, have been accomplished as follow:

No	Title	Lead beneficiary	Type	Status	Due month	Due date
D2.1	RS systems use for application in archaeology research assessment report	CNR	R	PU	9	August 2016
D2.2	Database of the outcomes with potential partners	CNR	R	CO	9	August 2016
D2.3	Five year roadmap for future research projects	CNR	R	CO	9	August 2016

The present WP has been led by the CNR with close collaboration and active involvement from all consortium partners. A special contribution has been achieved by the CNR, regarding best practices in Remote Sensing archaeology and architectural cultural heritage, while CUT's staff covered the research part according their profile needs, guided and finally evaluated by the other partners. DLR also contributed in the research part mainly in regards to the Remote Sensing technologies, data processing, as well as information systems.

Main tasks that have been followed for the accomplishment of the WP objectives comprised the following key actions:

Task 2.1: Remote sensing archaeology research assessment (Lead: CNR)

For this task, consortium members conducted a state of the art review in the field of RS for Archaeology, in order to define the European and international context for the ATHENA centre of excellence, including the nature and scale of demand for remote sensing archaeology research and innovation (D2.1). An evaluation of the existing space and ground remote sensing technologies currently used for CH has been done. This review provided useful information on the available RS technologies more suitable for applications to fit the various needs of CH, from preventive archaeology to heritage monitoring and risk assessment.

As the assessment report delineates in the last fifteen years, the application of Earth Observation (EO) techniques has exhibited great potential for archaeological investigations, so that it has accounted for a number of important archaeological discoveries and has provided manifold capabilities from the detection of cultural remains to the documentation,

monitoring and preservation. The significant increase of Remote Sensing in Archaeology is confirmed by the scientific interest in terms of publications between 1999 and 2015 as showed by Agapiou and Lysandrou (2015):

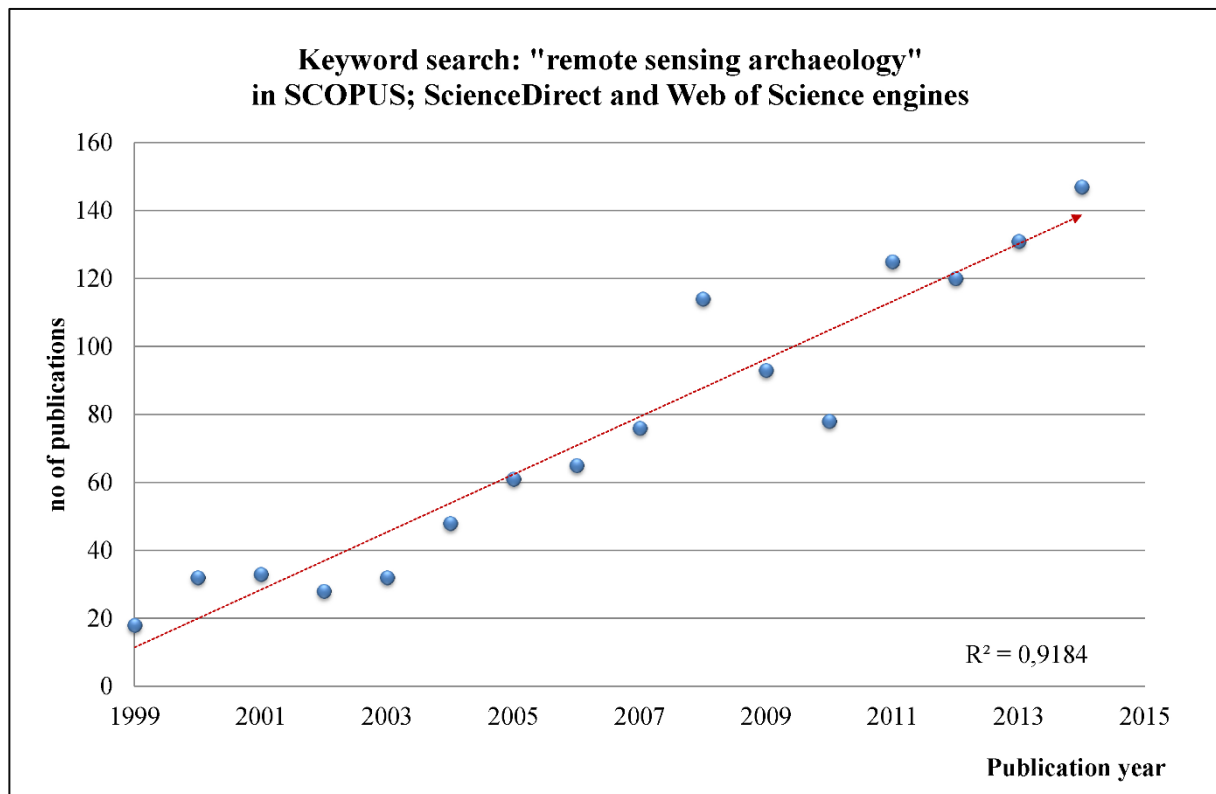


Figure 15: Trend of publications from 1999 to 2015 from the Scopus; ScienceDirect and WoS engines, considering as keyword search "remote sensing archaeology" (drawn by Agapiou & Lysandrou 2015).

One of the main advantages of remote sensing techniques is their capability to provide a huge amount of information in a non-invasive way. The remote sensing tools today available for archaeological application enable us to get extremely precise results speeding up the work during the diverse phases of archaeological heritage management ranging from survey, mapping, excavation, documentation, monitoring at diverse scales of interest, moving from small artifacts to architectural structures and landscape reconstruction. Data acquired by active and passive satellite, aerial and ground sensors and tools such as GIS, virtual and augmented reality have opened new possibilities, unthinkable only a few years ago. As an example, it is possible to integrate satellite and aerial data with archaeological and historical information for a virtual reconstruction of ancient landscape.

One of the most important points is that all these technologies are available at different costs for different purposes and needs, even with a small budget it is possible to implement a very effective solution. Moreover, we already live in an age of a growing availability of free data and open access software tools that can also enhance a powerful link between in situ investigations and computer-based analysis thus offering a new opportunity for the

operational exploitation of archaeological results.

Technologies that have been studied more in detail for the present needs are related to airborne remote sensing (including UAVs and Lidar), Passive Satellite Remote Sensing, SAR and Geophysics.

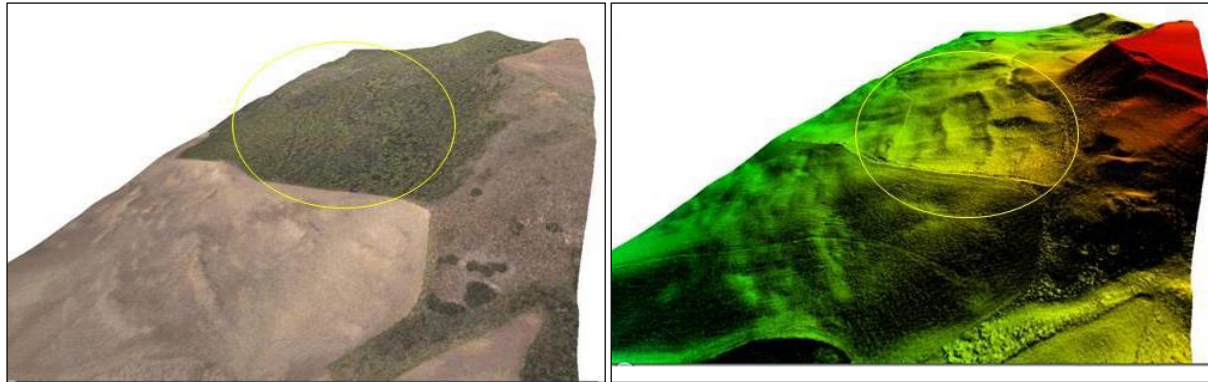


Figure 16: Airborne laser scanning survey aerial photo (left) and DTM (right) obtained after the removal of vegetation cover

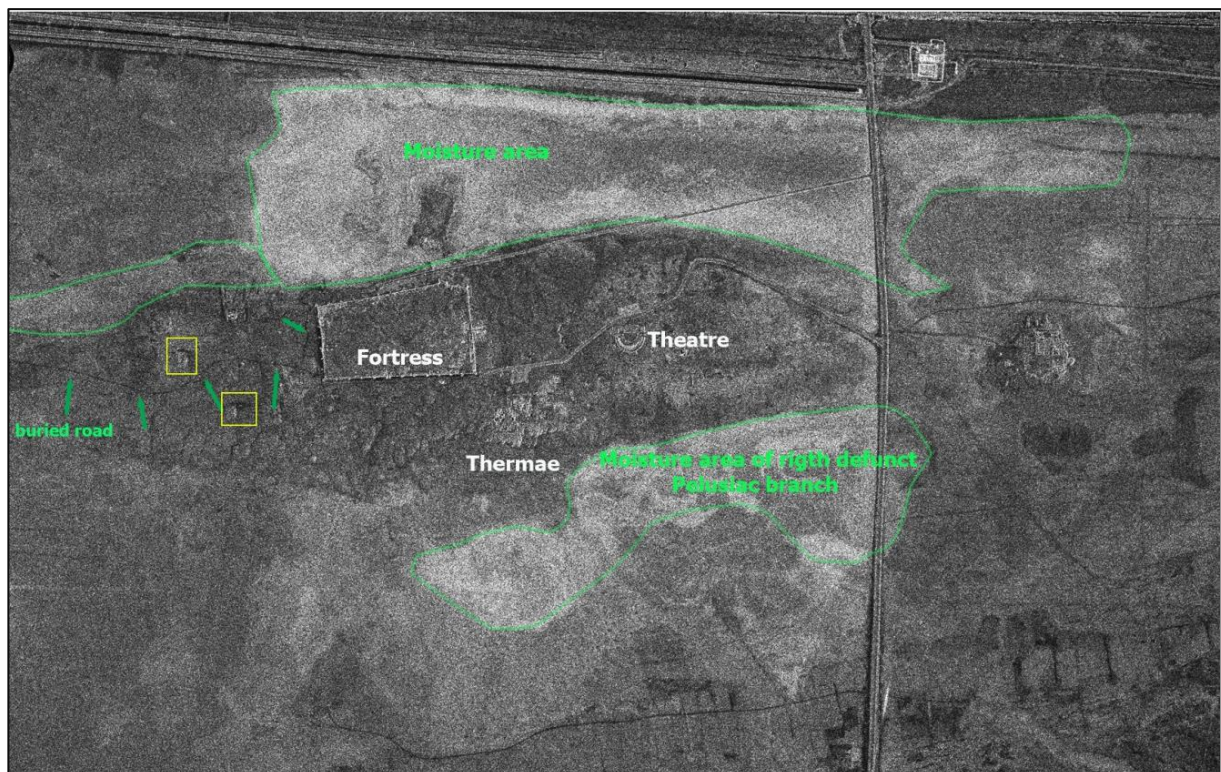


Figure 17: Pelusium (Egypt): new information provided by processing x-band Cosmo SkyMed data (Satellite SAR technology) (Lasaponara & Masini 2015)



Figure 18: Lidar based virtual reconstruction of an abandoned medieval village near Matera. On the basis of the virtual reconstruction a serious game has been developed (Gabellone et al. - *Journal of Cultural Heritage*, 2016)

An extremely important aspect for a rigorous exploitation of RS capabilities stands in the **integration** of: i) data provided by diverse sensors (from aerial, space and ground acquisition), ii) 3D models, acquired from airborne and terrestrial laser scans, iii) GIS and software technologies. This approach provides effective solutions for the management, integration, elaboration, and publication of heterogeneous data sources, including excavation reports, historical photographs and cartography, etc..

GIS or web-based GIS environment tools allow a new and more effective way to conduct archaeological research, storing handling and sharing geospatial data from heterogeneous sources in a collaborative way, including citizen science. The huge amount of data (big data), the increasing needs of data integration, archiving and processing along with the necessity to make cost effective and easier available technologies require new approaches and concepts in the development of infrastructures. These issues can be reliably and effectively addressed by a WebGIS platform, based on and built using open source components, i. e. open standards, metadata and open source (OSS) architectures.

A webGIS architecture provides flexible tools for the diverse needs, applications and “usage phases” ranging from data collection phase to the system fruition. In fact, in recent years the development of open webGIS source tools has played an important role with regard to different aims as, for example, (i) publication of the results of an excavation, (ii) placement of archaeological evidence in the territory, (iii) inclusion of archaeological data in broader

58	Macquarie University	University	Australia	http://www.mq.edu.au	23.78	151.12	Quashif Wooley	Michael Egan	michael.egan@mq.edu.au
59	University of Leeds	University	United Kingdom of Great Britain and Northern Ireland	http://www.leeds.ac.uk	53.81	-1.36	Quashif Wooley	Quashif Wooley	quashif.wooley@leeds.ac.uk
61	Leiden University	University	Netherlands	http://www.leidenuniv.nl	52.98	4.7	Quashif Wooley	Quashif Wooley	quashif.wooley@leidenuniv.nl
62	U2 Amsterdam		Netherlands	http://www.u2.nl	52.33	4.86	U2	U2	u2@u2.nl
63	Museum of Modern Art	Museum	Dominican Republic	http://www.museumofmodernart.com	18.28	79.22	Jan Stenly Mader	Jan Stenly Mader	jan.stenly.mader@museumofmodernart.com
64	The Getty Research Institute	Research Institute	USA	http://www.getty.edu/research	34.05	121.35	Quashif Wooley	Quashif Wooley	quashif.wooley@getty.edu
65	The Landscape Research Centre	Research Institute	United Kingdom of Great Britain and Northern Ireland	http://www.landscape-research.com	54.2	-0.84	Dominic Prosser	Dominic Prosser	dprosser@landscape-research.com
66	Politecnico Institute of Torino University	University	Italy	http://www.polito.it	45.76	7.66	Eugenio Alleva	Eugenio Alleva	eugenio.alleva@polito.it
67	University College Dublin	University	Ireland	http://www.ucd.ie	53.34	-6.22	Andrew Deane	Andrew Deane	andrew.deane@ucd.ie
68	Centre National de la Recherche Scientifique	Research Organization	France	http://www.cnrs.fr	48.85	2.28	Alma Peyroteo	Alma Peyroteo	alma.peyroteo@cnrs.fr
69	University of Cyprus	University	Cyprus	http://www.ucy.ac.cy	35.18	33.38	Quashif Wooley	Quashif Wooley	quashif.wooley@ucy.ac.cy
70	The Cyprus Institute	Research Organization	Cyprus	http://www.cyi.ac.cy	35.14	33.37	Quashif Wooley	Quashif Wooley	quashif.wooley@cyi.ac.cy
71	EMBL CNR IFR49	Laboratory	Italy	http://www.embl.it	43.34	10.13	Francesco Giacomini	Francesco Giacomini	giacomini@embl.it
72	MAA CNR IFR49/01	Laboratory	Italy	http://www.maa.it	43.6	13.72	Rosa Lapomarda	Rosa Lapomarda	lapomarda@maa.it
73	IFAC CNR IFR49/01	Laboratory	Italy	http://www.ifac.it	43.11	12.83	Salvatore Piro	Salvatore Piro	piro@ifac.it
74	Academy of Athens ICR	Academy	Greece	http://www.athens.ac.gr	37.98	23.73	Georgios Mavroudis	Georgios Mavroudis	mavroudis@athens.ac.gr
75	Department of Agriculture DA	Public Authority	Cyprus	http://www.daf.gov.cy	35.17	33.55	Maria Christodouidou	Maria Christodouidou	christodouidou@daf.gov.cy
76	Centre for Mining Research in Cyprus CMRC	Research Institute	Cyprus	http://www.cmrc.gov.cy	35.17	33.55	Quashif Wooley	Quashif Wooley	quashif.wooley@cmrc.gov.cy
77	Research Institute for Cultural Heritage	Research Institute	Italy	http://www.ricoh.it	45.14	11.98	Angela Pignatelli	Angela Pignatelli	angela.pignatelli@ricoh.it
78	Institute for Oceanographic Knowledge IOK	Research Institute	Spain	http://www.ioh.es	40.29	16.30	Quashif Wooley	Quashif Wooley	quashif.wooley@ioh.es
79	International Centre on Space Technology for Natural and Cultural Heritage	Research Institute	China	http://www.icst-hat.org.cn	40.07	116.28	Tianhua Hong	Tianhua Hong	hong@icst-hat.org.cn
80	ISAC	Research Institute	Italy	http://www.isac.it	40.8	14.72	Antonio Ciampaglia	Antonio Ciampaglia	ciampaglia@isac.it
81	ISAC	Research Institute	Italy	http://www.isac.it	40.07	14.28	Feng Chen	Feng Chen	chen@isac.it
82	CNR - Consiglio Nazionale delle Ricerche	Research Organization	Italy	http://www.cnr.it	41.9	12.81	Giuseppe Casella	Giuseppe Casella	casella@isac.it
83	CNR - Consiglio Nazionale delle Ricerche	Research Organization	Italy	http://www.cnr.it	44.48	11.33	Giuseppe Di Stefano	Giuseppe Di Stefano	di.stefano@isac.it
84	CNR - Consiglio Nazionale delle Ricerche	Research Organization	Italy	http://www.cnr.it	46.12	11.68	Francesco De Vivo	Francesco De Vivo	de.vivo@isac.it
85	University of Venice, Faculty of Regional Planning	University	Italy	http://www.unive.it	45.44	12.31	Giuliana Billa	Giuliana Billa	billa@unive.it
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Figure 19: Screen shots from the database with potential partners

Thanks to the coordinates' queries, it is possible to Export the tables or geolocalize each research group and display all the information on a webgis platform

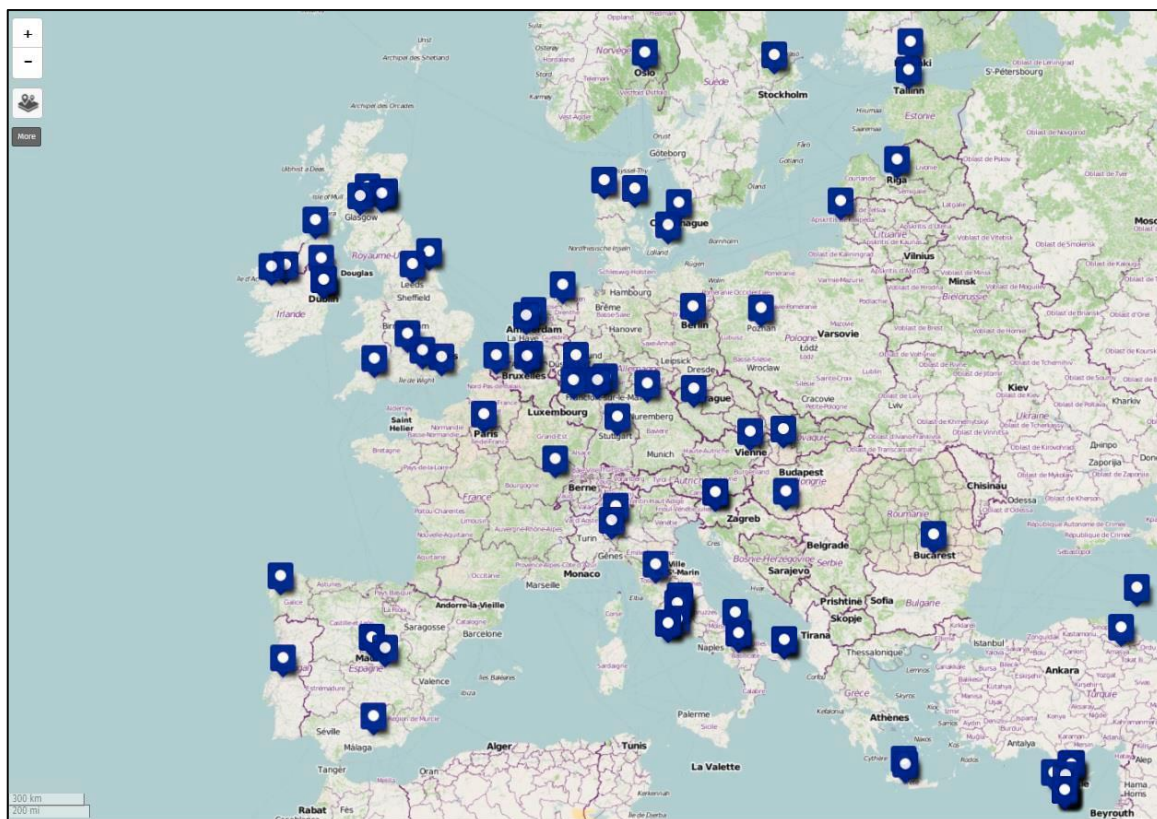


Figure 20: Geographical distribution of the potential Partners

2.2.3. Work Package 3

WP title: Evaluation of gap and capacity development

Lead beneficiary: DLR

Duration: Month 4 to Month 12

Status: Completed

The primary objective of this WP was to assess and fully understand the gaps of the existing Remote Sensing and Geo-Environment Research Laboratory of the CUT and its personnel and roadmap their capacity development. An effort was put in the understanding the context of the ATHENA Centre of Excellence in relation to the local capacity, skills and infrastructure. Within the time span of the present periodic report, all Deliverables related to WP3, have been accomplished as follow:

No	Title	Lead beneficiary	Type	Status	Due month	Due date
D3.1	Evaluation report including Lab's existing capacities, baseline assessment and roadmap concerning the future planning development of the centre according the needs emerged for	DLR	R	CO	12	November 2016

	the evaluation report					
D3.2	Report from the meetings with local stakeholders	DLR	R	CO	12	November 2016
D3.3	Report of the gap analysis	DLR	R	CO	12	November 2016

WP3 was led by DLR with significant contribution from all partners. Scope was to provide a very detailed catalogue of the needs of the existing lab and subsequently to define its scientific upgrade.

Task 3.1: Cyprus baseline and opportunity assessment (Lead: CUT)

During the first task of WP3 desk-based research was conducted, profiling existing RS research and innovation capacity, institutions, infrastructure and resources within Cyprus, as well as mapping the context for the new Centre of Excellence, including the national Smart Specialisation Strategy and local socio-economic structures, resources and priorities. The data gathered facilitate the formation of D3.1, while offered important information for the other deliverables of the present WP.

The identification and engagement with local stakeholders was an interesting action accomplished partially for the needs of the present WP (D3.2). This action offered indeed a clearer view on the research and innovation priorities, and evidenced to the project's consortium the local dynamics in the field and the potential partnership and investment opportunities.

Task 3.2: Gap Analysis (Lead: DLR)

The second task of WP3 is considered of major importance since will significantly contribute to the primary objectives of the whole project, namely understand the current status of the Project coordinator and the goals to be achieved through the project by its twinning to the consortium partners. A first GAP Analysis has been achieved (D3.3) concerning a comparison between the current position of CUT's research lab and the targeted position, as well as the determination of the 'distance' between the two positions. This was based on quantifiable indicators and on the basis of the current status of CUT staff members profile, know-how and infrastructure. To avoid premature recommendations, mainly in relation to the time span of the project and D3.3 due time (end of the project's 1st year, for a 3 years' project), it was decided amongst partners another report to be followed integrating the one already submitted.

The GAP analysis fulfilled up to now considered also the short-, mid- and long term vision of the ATHENA Center, while the Gap analysis consisted mainly of listing of characteristic

factors (such as personnel, performance levels, building infrastructure) of the present situation and factors needed to be achieved as future objectives.

The milestone for WP4 was the report of the GAP analysis (MS4), submitted as scheduled on the 12th month of the project.

2.2.4. Work Package 4

WP title: Training and knowledge transfer

Lead beneficiary: DLR

Duration: Month 2 to Month 36

Status: On-going

WP4 is one of the most important and substantial WPs of the project since it deals with the training and knowledge transfer amongst the leading institutions and the low performing countries, in response to the specific call demands. WP4, as of course with the rest of the WPs is interconnected with other activities of the project, offering thus an added value to the various outcomes.

Specific objectives include amongst other the transfer of technological knowledge, exchange knowledge and experience, training of the CUT's personnel on state-of-the-art methodologies in Remote Sensing and Earth Observation Sciences applied in Archaeology and Cultural Heritage, enhancement of the research potential of CUT, increase CUT's potential in participating in existing European networking activities, etc. The up to date accomplished deliverables for the present WP are as follows:

No	Title	Lead beneficiary	Type	Status	Due month	Due date
D4.4	Material from 1st workshop	DLR	R	PU	5	April 2016
D4.1	Report of the 1st summer school	DLR	R	PU	7	June 2016

To address the objectives of the ATHENA project (Enhance the S&T capacity Objectives and Training and knowledge transfer Objectives) a rigorous training strategy has been applied including training actions of various types. The present WP is led by DLR, with equal contribution of all consortium partners for the fulfillment of the training and meeting activities. The following training activities and meetings for the needs of the present WP4 have been carried out successfully, with great participation amongst the CUT's members and interested scholars/students of the University, according to the type of training and topic:

Table 4: Various activities of the ATHENA project

Activity type	Activity No	Activity Topic	Due date (M)	Participant	Hosting Institution	Delivery Date
Meetings (M)	M1	Kick-off meeting	1 (Dec 2015)	All partners	CUT	15 December 2015
Workshops (WS)	WS1	Copernicus contribution to CH	4 (April 2016)	DLR-CUT	CUT	7 April 2016
Short term visits on site (OS)	OS1	Visit to the Archaeological park of Paphos (in parallel with SS1)	6 (May 2016)	DLR-CUT	CUT	23-25 May 2016
Experts visits (EV)	EV1	GAP evaluation (see WP3)	2 (Jan 2016)	All partners	CUT	20-21 January 2016
Short term staff exchanges (SE)	SE1	Active and passive RS data & archaeology	9 (Aug 2016)	CNR-CUT	CNR	09-13 May 2016
Virtual training (VT)	VT1	Hyperspectral processing	2 (Jan 2016)	DLR-CUT	CUT	16 February 2016
	VT2	Multi temporal RS analysis	10 (Sep 2016)	DLR-CUT	CUT	06-07 October 2016
Summer Schools (SS)	SS1	Interferometry/Radar	6 (May 2016)	DLR-CUT	CUT	23-25 May 2016

Primary training activities and knowledge transfer from the experts (DLR & CNR) to the Host Organisation (CUT) of the low performing country (Cyprus):

Activity type	Topic	Date	Participants	Hosting institution
Summer School	Interferometry/Radar	23-25 May 2016	DLR-CUT	CUT

The ATHENA SAR Summer School took place on CUT premises in Limassol from the 23rd to 25th of May. Visiting SAR scientists from the SAR Signal Processing Department of DLR (department head Prof Dr Michael Eineder and research scientist Dr Ramon Brcic) met with members of the Remote Sensing and Geo-Environment Research Lab to introduce them to the concepts of SAR including how to access and process such data but also to visit the UNESCO World Heritage archaeological site of Nea Paphos and thereby gain an understanding of the problems facing those working to preserve sites of cultural heritage.

On first day the fundamentals of both SAR and interferometric SAR were covered. This included numerous examples of their application in practice. The summer school began with a brief introduction to the Remote Sensing Technology Institute of DLR by Prof Michael Eineder. The topic then turned to SAR fundamentals where the concepts of SAR imaging, geometry and focusing were explained. Following this, SAR image characteristics were described. Here, one is essentially concerned with what can be seen in SAR images and

how to interpret this. Concepts covered included speckle, radar cross-section, SAR polarimetry, penetration characteristics at different carrier frequencies and the unique radar geometry which leads to layover and shadow. To round-up the morning, many examples of the uses of SAR in practice were given. These ranged over diverse applications such as oceanography, maritime security and ship detection, the use of SAR in crisis situations after earthquakes, volcanic eruptions and flooding, and in glaciology, geodesy, urbanisation, agriculture and traffic monitoring. Finally, some information on further educational resources was given including the ESPACE master's program at TUM (Technische Universität München), the one week SAR Principles and Application course offered by the CCG (Carl-Cranz Gesellschaft) and the freely offered SAREDU course which is jointly coordinated by the Friedrich-Schiller University Jena and DLR with support from BMWi (German Federal Ministry for Economic Affairs and Technology).

Building on this, the topic turned to interferometry where 2 or more SAR images are combined to extract information about, among others, changes on the earth's surface. Although there are a myriad of applications, the first and perhaps the most well-known is the generation of highly accurate topographic maps. For instance, the TanDEM-X mission will produce a homogeneous world-wide DEM with unprecedented absolute vertical accuracy better than 10 metres and a horizontal resolution of 12 metres. Another important application is the ability to monitor surface deformation with millimetre accuracy. Indeed, monitoring deformation over tectonic regions world-wide is one of the main tasks of ESA's Sentinel-1 mission consisting of 2 SAR satellites, the second of which was launched in April 2016. The information gleaned from this mission is expected to revolutionise our understanding of the earth's tectonics and aid in the monitoring of earthquakes and volcanism. Other applications include landslide monitoring and velocity estimation of glacier flows, vehicles travelling on highways and tidal currents. Analysis of an interferometrically compatible stack of 20 or more SAR images can provide estimates of surface deformation with a precision on the order of 1 mm/year. Such techniques can provide important information about the long-term stability of archaeological sites. Aside from the plethora of practical applications, the basics of interferometry were also elaborated, starting from how such images are acquired through to the typical processing steps of coregistration and phase unwrapping including the noise sources that arise and their characteristics. Finally, an overview of current SAR missions was given with respect to their use for interferometry.

Two main objectives for the future were defined. The first concerned data acquisition and included the planning of further TerraSAR-X datatakes over Nea Paphos, access to TanDEM-X CoSSCs and DEMs, and the download of actual Sentinel-1 data over Cyprus and historical data from the ERS and ENVISAT missions. The second concerned processing this

data where the aim is to enable CUT to process and interpret the data themselves. This includes deciding what type of processing is useful, which will become clearer after a detailed examination of the data, and which software packages can be most effectively leveraged to carry this out.



Figure 21: Summer School 23-25/6/2016: 1st ATHENA Summer School, held in the premises of CUT's Remote Sensing and Geo-environment Lab. Prof. M. Eineder from DLR/TUM presented the Synthetic Aperture Radar (SAR) Principles and Applications while Dr. R. Brcic presented Terra SAR-X Data, SAR Sentinel-1 Data, ERS-ENVISAT-Data and SAR data availability for Paphos Test site as well SAR Data Evaluation.

Activity type	Topic	Date	Participants	Hosting institution
Workshop	Copernicus contribution to Cultural Heritage	7 April 2016	DLR-CUT	CUT

The ATHENA Workshop was a one day general introduction to the European Copernicus Earth observation program, putting specific focus on the topics of the H2020 ATHENA project, such as: (a) Preservation and monitoring of Cultural Heritage; (b) Archaeological research; (c) Protection from archaeological looting and (d) Eastern Mediterranean region

The German Aerospace Center (DLR) - ATHENA twinning partner - alongside guest speakers from European Space Agency (ESA) and the European Commission (EC) have presented aspects of Copernicus programme, such as:

- Sentinel space segment

- Contributing missions and access to the Copernicus data
- Core and collaborative ground segment
- Data policy and access to the data
- Core Services with focus on those of relevance for ATHENA

The following issues have been discussed at the end of the workshop, during a one hour discussion with the participants

General Issues on Copernicus: Amongst others, the following general issues have been raised during the discussion: (a) Access to Copernicus Data: The access to Sentinel data will be improved on a European scale by the new initiative of the European Commission to better coordinate and merge core and collaborative data access points; (b) Access to Contributing mission data: this data is purchased by the Commission/ESA with a certain license to be used for the Copernicus Core Services. Under certain restrictions the data can be used by H2020 projects and governmental agencies

European representation of World Heritage Sites and Archaeological issues: The areas and services in Copernicus are represented by European Agencies (not necessarily Agencies of the Commission) and European Interest groups. For them and based on a legal procedure, the Commission has entrusted the resources to conduct parts of the Copernicus programme, including the Copernicus Core Services. For instance, the civil security services have been delegated to FRONTEX, EMSA and SatCen (from mid of 2016 onwards). At the present moment, it seems that there is no single body (e.g. a European wide agency) dealing with cultural heritage and specifically with World Heritage Sites in Europe. Participants noted that on the international scale there are several interest groups such as CIPA and ICOMOS are indeed active and have European members. But no organization, specifically dealing with European interests in this matter was known to the participants at the time of the discussion.

Arguments for including World Heritage Monitoring in Copernicus: Several arguments to promote the inclusion of WH Monitoring into Copernicus have been discussed. In the end, these arguments need to be tangible in terms of bringing a socio-economic benefit. These arguments include:

- Tourism: There are Pro's and Con's for encouraging tourism to preserve WHS;
- Cultural heritage: in times, when the European Society raises the "European Identity" and "European Culture", relevant cultural sites in Europe (including WHS) should be monitored for their better preservation, preventive maintenance and thus management;
- Security: Looting and illegal trading of archaeological artefacts is a serious source of finance for crime and terrorism;

- Holistic approach: cultural heritage, especially archaeological sites, interest larger portions of territory. They should be observed on a larger geographical scale in order to consider all possible threats and to provide a more complete monitoring based on a holistic approach.

Interest of the European Commission to include World Heritage Monitoring in the Copernicus Core Services: The European Commission representative (who unfortunately couldn't make it in person to the workshop due to the closure of the Brussels airport), issued a written statement:

- 1) There has been a growing interest in the use of satellite observation for monitoring cultural heritage, in particular seen the conflicts in the middle East and the difficulty in assessing damage in-situ.
- 2) Monitoring of Cultural Heritage - particularly related to damage assessment in conflict zones - will be one of the services accessible through SEA (Support to EU External Actions) as from mid-2016.
- 3) Until then, in specific cases it could be possible to use the Copernicus Emergency Management Service, to provide reference material also in support to the EU External Action Service and Regional desk officers.
- 4) We are keen in developing further contacts with the R&D community to explore how satellite observations, merged with other sources of information, may help us to increase awareness and contribute to the preservation of our World cultural heritage.

This statement was the basis for further discussion on how World Heritage Monitoring (WHM for short) could be embedded in the Copernicus Core Services and which of the current services would be best to implement WHM.

It needs to be noted that the European Agencies, executing the Core Services, are also contracting the generation of the maps and products to industrial consortia by an open tender procedure. Academia might be involved in definition of the products, in validating the results and supporting European geo-information industry.

Meanwhile, the European Commission is calling for a workshop in support for cultural heritage, April 24th in Brussels. The workshop intends to assess the potential of Copernicus in support of Cultural Heritage preservation and management, and to provide inputs for further research and/or operational implementation.

The objectives of the workshop are:

- To identify intermediate and end-users' needs in the Cultural Heritage domain, and assess and characterise space-based applications in support of Cultural Heritage at EU and global level

- To assess capabilities and outline requirements for Copernicus-based products/services in support of Cultural Heritage
- To propose and assess implementation scenarios for a structured Copernicus-based approach for Cultural Heritage support

The workshop will aim at identifying the main user requirements for space-based applications associated to the preservation and management of cultural heritage assets in Europe and Worldwide. Opportunities for standardisation shall be analysed taking into account what is already done in some European Countries, with risk assessments associated to each Cultural asset subject to environmental risks. The main focus will however be on the characterisation and mapping of Copernicus capabilities and existing solutions over the identified user needs, and the identification of potential evolutions to effectively support cultural heritage needs.

Different scenarios should be assessed:

- 1) A new Cultural Heritage Copernicus Service
- 2) Cultural heritage as part of an existing Copernicus Service
- 3) The structured use of a Combination of Copernicus Services for cultural heritage
- 4) A follow-up of Copernicus Products tailored for cultural heritage. Out of those, a preferred option will later be identified.

Time	Topic	Speaker
9:30	Welcome and Introduction to the Workshop	Gunter Schreier, DLR
9:45	Overview of Copernicus Framework, policy and strategy	Saelliaris HOURDAS, EC
10:15	The Copernicus Space Component Sentinel and Core Ground Segment	Simon Jutz, ESA
10:45	A Copernicus Ground Segment - Example of DLR Core and collaborative ground segment	Gunter Schreier, DLR
11:00	Coffee Break (available for registered participants)	
11:30	Overview of European Earth Observation missions	Gunter Schreier, DLR
12:15	Access to Copernicus Data and Contributing Missions	Simon Jutz, ESA
12:45	First Q & A session	
13:00	Lunch (available for registered participants)	
14:30	German EO mission contributions to Copernicus and DLR Copernicus projects	Gunter Schreier, DLR
15:00	Overview of the Copernicus Security Service	Raj MENESES, EC
15:30	Summary and potential contributions of Copernicus to preserve the world cultural heritage	Gunter Schreier, DLR
16:00	Coffee Break (available for registered participants)	
16:30	Round Table Discussion, Q&A from the participants	All speakers, moderator: Gunter Schreier
17:30	End of Workshop	

Figure 22: Program of the 1st Workshop “Copernicus contribution to CH” Trainer: DLR During RSCy2016, Paphos – Cyprus



Figure 23: Group picture at the end of the ATHENA Workshop on Copernicus. The introduction to the European Copernicus Earth observation program was afterwards focusing on the topics related to the H2020 ATHENA project, such as preservation and monitoring of Cultural Heritage, archaeological research, protection from archaeological looting.

Activity type	Topic	Date	Participants	Hosting institution
Virtual training	Hyperspectral processing	16 February 2016	DLR-CUT	CUT

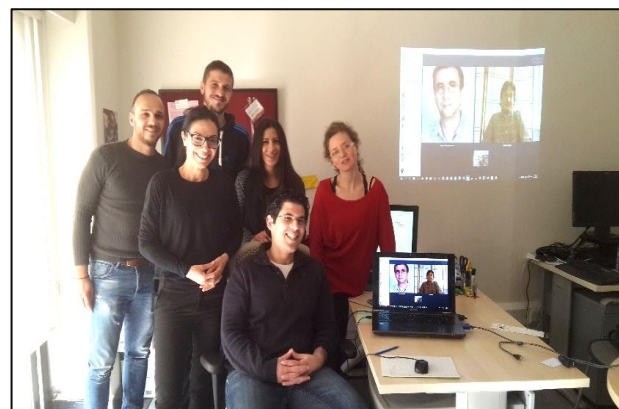


Figure 24: Slide from the virtual training (left) and photo from of the virtual training at the premises of the Cyprus University of Technology, Limassol – Cyprus (right) (Trainer: Dr. Daniele Cerra – DLR)

Activity type	Topic	Date	Participants	Hosting institution
Training	Multi temporal RS analysis	6-7 October 2016	DLR-CUT	CUT

Agenda of the training:

Thursday, October 6	
12:30-13:30 Lunch	
13:30-14:30	- Time series in earth observation: <ul style="list-style-type: none"> o Suitable sensors and missions o Types of EO time series o Data access
14:30-15:30	- Theoretical background on time series processing:

	<ul style="list-style-type: none"> ○ Time series components and characteristics ○ Preprocessing of EO time series (handling of outliers, quality information, smoothing methods etc.) ○ Data fusion for EO time series
15:30-16:30	<ul style="list-style-type: none"> - Methods for EO time series analysis I: <ul style="list-style-type: none"> ○ Variability, seasonality, trend, correlation analyses etc. ○ Phenological analyses

Friday, October 7	
9:30-10:30	<ul style="list-style-type: none"> - Methods for EO time series analysis II: Complex developments (abrupt changes, multi-directional changes, etc.)
10:30-12:30	<ul style="list-style-type: none"> - Examples for EO applications based on time series (examples from DLR research and activities)
12:30-13:30 Lunch	
13:30-14:30	<ul style="list-style-type: none"> - Use Cases: <ul style="list-style-type: none"> ○ Land surface phenology: theoretical background and practical exercise with optical data ○ Inundation/flood dynamics: theoretical background and practical exercise with SAR data
14:30-16:30	<ul style="list-style-type: none"> - Discussion of presented aspects - Identification of interesting aspects for joint studies - Ideas for joint journal paper /conference presentation



Figure 25: ATHENA “Multi-Temporal Remote Sensing Analyses” training from DLR, held in the premises of CUT in the Remote Sensing and Geoenvironment Lab of “Eratosthenes (Trainer: Dr. Ursula Gessner – DLR)

Activity type	Topic	Date	Participants	Hosting institution
Short term staff exchange	Active and passive RS data & archaeology	9-13 May 2016	CNR-CUT	CNR

The Short term staff exchange was taken place during the International School "Geophysics and remote sensing for archaeology", held at Pompei, 9-13 May 2016. The School aimed at giving the opportunity to researchers and specialists in Geophysics, Remote Sensing and Archaeology to deepen their knowledge and expertise with geophysical and remote sensing techniques for archaeology and cultural heritage documentation and management.

The school consisted of lectures and practical work in laboratory and on-field at the prestigious site of Pompei. The course provided the basics about data collection, processing and interpretation for geophysical techniques (GPR, magnetic, ERT), passive and active

remote sensing and low-cost approaches based on the use of UAV. The school was organized by two Institutes of the Consiglio Nazionale delle Ricerche, i.e., CNR-IBAM and CNR-IREA, and Soprintendenza Speciale Beni Archeologici Pompei, Ercolano e Stabia. The programme is indicated below:

- Monday, 9/5: Lectures: Introduction and description of the course; Remote sensing and UAV for archaeology; Magnetic and Electrical Resistivity Tomography for Archaeology
- Tuesday, 10/5: Lectures: Ground Penetrating Radar for archaeology; Non-invasive diagnostics of monuments and artifacts; Integrated approaches and strategies for archaeology and cultural heritage
- Wednesday, 11/5: Data acquisition in a test site at the archaeological area of Pompeii (UAV, magnetic, seismic, ERT and GPR), for both archaeological and conservation purposes
- Thursday, 12/5: Tutorial regarding the processing and integration of the collected data (UAV, magnetic, ERT and GPR)
- Friday, 13/5 (only the morning): Presentation of the data processing results (in charge of the students), Wrap-up and conclusions



Figure 26: Top: Short term staff exchange: Research staff from the ATHENA Coordinator (CUT) hosted by CNR during the summer school dedicated in Geophysics and Remote Sensing for archaeology, held in Pompeii. Bottom: Program of the summer school (left) and in situ lecturing (right).



Figure 27: Dr. Agapiou (CUT) lecturing on the spectroradiometers (left) and ATHENA-CUT researchers and representatives from the UNESCO-HIST of Beijing (right)

Activity type	Topic	Date	Participants	Hosting institution
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Short term visits on site	Visits to CH sites for testing/evaluation/discussion (in parallel with SS1)	23-25 May 2016	DLR-CUT	CUT
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The summer school visited Nea Paphos, the designated testsite for evaluating the use of high-resolution SAR based techniques in archaeology. Visual inspection of the site itself aids in the understanding and interpretation of SAR images which possess a different geometry and characteristics compared to optical images.

The visit set the stage for Wednesday where the theme was SAR data including how to obtain it, process it, what exists over Cyprus and the Nea Paphos testsite and a first look at SAR images and interferograms over the testsite. The focus was on high-resolution staring spotlight mode data from the TerraSAR-X mission especially acquired for ATHENA through a TerraSAR-X science proposal. The process of proposal submission and how to order data was also described. The same was done for the Sentinel-1 mission where free access is provided via the sentinel science hub. The large amount of data already available was acquired from various sensors in different modes and geometries, and was processed to provide several products, each bringing out different features in the data. Although only a cursory examination was possible during the summer school, this already showed the potential of SAR in highlighting features that are less visible with other techniques. A thorough joint evaluation of this data by SAR experts from DLR and archaeological experts from CUT is the next step.





Figure 28: CUT and DLR consortium members visiting the archaeological site of Nea Paphos. They have talked with local stakeholders - archaeological officers discussing issues of the site and the potential use of remote sensing to aid some problems.

Activity type	Topic	Date	Participants	Hosting institution
Experts visits	GAP evaluation	20-21 January 2016	All partners	CUT

All forthcoming activities according to the project's strategy, are already planned by the partners. The up to date fulfilled Milestone of WP4 is MS5 and deals with the 1st year accomplished training activities. All the 1st year expected training activities have been completed indeed successfully and on time.

2.2.5. Work Package 5

WP title: Promotion of the centre locally and internationally

Lead beneficiary: CUT

Duration: Month 30 to Month 36

Status: Not started

2.2.6. Work Package 6

WP title: Dissemination and exploitation

Lead beneficiary: CUT

Duration: Month 1 to Month 36

Status: On-going

WP6 is led by CUT, with equal contribution of all partners in the various dissemination and exploitation actions. WP6 is dedicated to the dissemination of the project itself, its various and variable activities, results, as well as to the exploitation of project's outcomes. The dissemination activities are targeting variable audience (scholars, researchers and

scientific community, stakeholders, elementary and higher education institutions and students, wider public) in an effort for the maximum impact of the project's substance in different layers of the society to familiarise most possible people towards protection of Cultural Heritage and the potential of Remote Sensing and Earth Observation technologies. According to the time schedule, all predefined deliverables have been timely accomplished, as follows:

No	Title	Lead beneficiary	Type	Status	Due month	Due date
D6.12	Evolution of the publications in high impact journals in the relevant research fields	CUT	R	CO	2	January 2016
D6.1	ATHENA's website	CUT	DEC	PU	3	February 2016
D6.2	ATHENA's 1st electronic newsletter	CUT	DEC	PU	12	November 2016

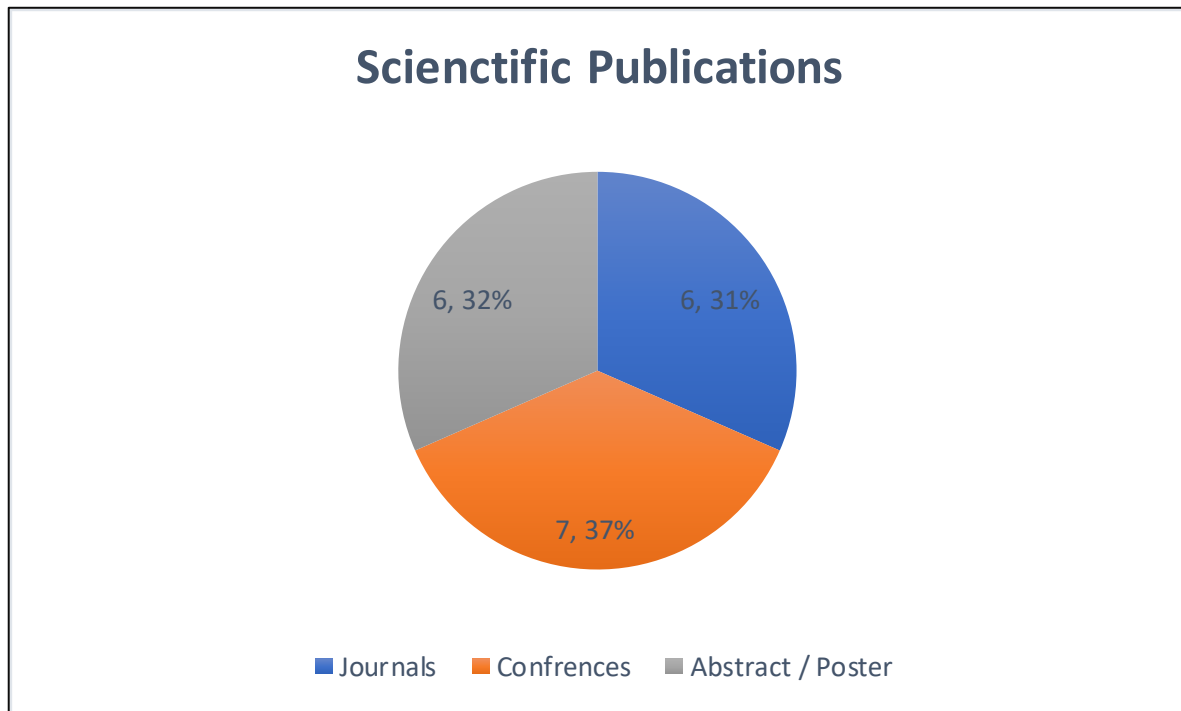
An accumulative record of the up to date various types of dissemination activities carried out between the first fifteen months (M1-M15) presented in the following table evidencing the intensity of a variety of events undertaken for each dissemination activity type:

Type of activity						
Journal publication	Conference participation	Press Release	Stakeholders meeting	Educational activities	Leaflets	Public awareness
6 published + 2 submitted	13	21	9 meetings	More than 500 students	3	3 events
International Journal of Digital Earth / Remote Sensing / Journal of Archaeological Science: Reports	Computer Applications and Quantitative Methods in Archaeology (CAA GR) 2016, Athens, Greece 20-21 December 2016 6th International Euro-Mediterranean Conference (EuroMed 2016), 31 Oct. – 05 November 2016, Nicosia, Cyprus Fourth International Conference on	07/10/2016 Paideia News 6/10/2016 Cyprus University of Technology 22/07/2016 Simerini 15/03/2016 Alitheia 11/03/2016 Cyprus News 22/01/2016 Taxidromotis Pafou 21/01/2016 Phileleftheros	17/11/2016 Prof. D. Hadjimitsis, coordinator of the ATHENA project briefs Prof. Gerasimos Pavlogeorgatos, University of Aegean 02/11//2016 ATHENA presented to the Ministry of Communications and Works 01/11/2016 ATHENA project presents to Archaeologists – Archaeological Research Unit,	Research week-lectures in schools all districts of Cyprus - Research Promotion Foundation, Cyprus	ATHENA promotion banner during the RSCy2016 conference ATHENA project leaflet ATHENA project electronic newsletter	Researchers day and night event – Research Promotion Foundation, Cyprus Celebration of the annual GIS DAY 2016 - Cyprus Geographical Association & Cyprus Geography Teachers Association Festival of Environment and Culture

	Remote Sensing and Geoinformation of the Environment (RSCy2016), 4-8 April, 2016, Cyprus	17/01/2016 Reporter	University of Cyprus			
		17/01/2016 Politis	07/09/2016 ESA Briefing			
		17/01/2016 Machi	24/06/016 ATHENA project presented at the Hellenic Maritime Museum, Greece in the framework of the FP7 ITACA Final Conference			
	XXIII ISPRS Congress 2016, 12-19 July, 2016, Prague	15/01/2016 Simerini				
		15/01/2016 Lemosos				
	Aerial Archaeology Research Group (AARG) annual meeting, Pilsen, Czech Republic, 7-9, September, 2016	13/01/2016 Politis				
		13/01/2016 Phileleftheros	01/06/2016 ATHENA project presented to undergraduate students of the Department of Civil Engineering and Geomatics (Cyprus University of Technology)			
	6th GEOBIA 2016, 14-16 September, 2016 / Enschede, The Netherlands	13/01/2016 Charavgi				
		13/01/2016 Alitheia				
		12/01/2016 Phileleftheros				
		12/01/2016 Paideia News	19/04/2016 Meeting with the Minister of Education and Culture			
	European Geosciences Union – EGU, General Assembly 2016, 17 – 22 April 2016, Vienna, Austria	12/01/2016 i-eidisi				
		12/01/2016 H Phoni tis Lemosou	28/03/2016 Prof. D. Hadjimitsis (PC and Vice Rector for Academic Affairs of CUT) met with the rector principles of Aristotle University of Thessaloniki			
	Earth Resources and Environmental Remote Sensing/GIS Applications VII, 100050L (December 9, 2016)	20/11/2015 Phileleftheros	10/03/2016 Prof. D. Hadjimitsis (PC and Vice Rector for Academic Affairs of CUT) visited the Balkan Environment Center (i-BEC) and met with the Scientific Coordinator of the Centre Prof. George Zalidis			

Journal Publications

Scientific dissemination of the project as well as from the results of research produced until now mainly based on the outcomes of the various training activities, lists an interesting record. The figure below presents the balance between the journal publications, papers to international conferences as well as poster – abstract presentations:



These references are hereunder exposed:

1. Agapiou A., 2016, Remote Sensing Heritage in a petabyte-scale: Satellite Data and Heritage Earth Engine© applications, International Journal of Digital Earth, 10.1080/17538947.2016.1250829.



Abstract: This paper aims to demonstrate results and considerations regarding the use of remote sensing big data for archaeological and Cultural Heritage management large scale applications. For this purpose, the Earth Engine© developed by Google© was exploited. Earth Engine© provides a robust and expandable cloud platform where several freely distributed remote sensing big data, such as Landsat, can be accessed, analysed and visualized. Two different applications are presented here as follows: the first one is based on the evaluation of multi-temporal Landsat series datasets for the detection of buried Neolithic tells ('magoules') in the area of Thessaly, in Greece using linear orthogonal equations. The second case exploits European scale multi-temporal DMSP-OLS Night-time Lights Time

Series to visualize the impact of urban sprawl in the vicinity of UNESCO World Heritage sites and monuments. Both applications highlight the considerable opportunities that big data can offer to the fields of archaeology and Cultural Heritage, while the studies also demonstrate the great challenges that still are needed to be overcome in order to make the exploitation of big data process manageable and fruitful for future applications

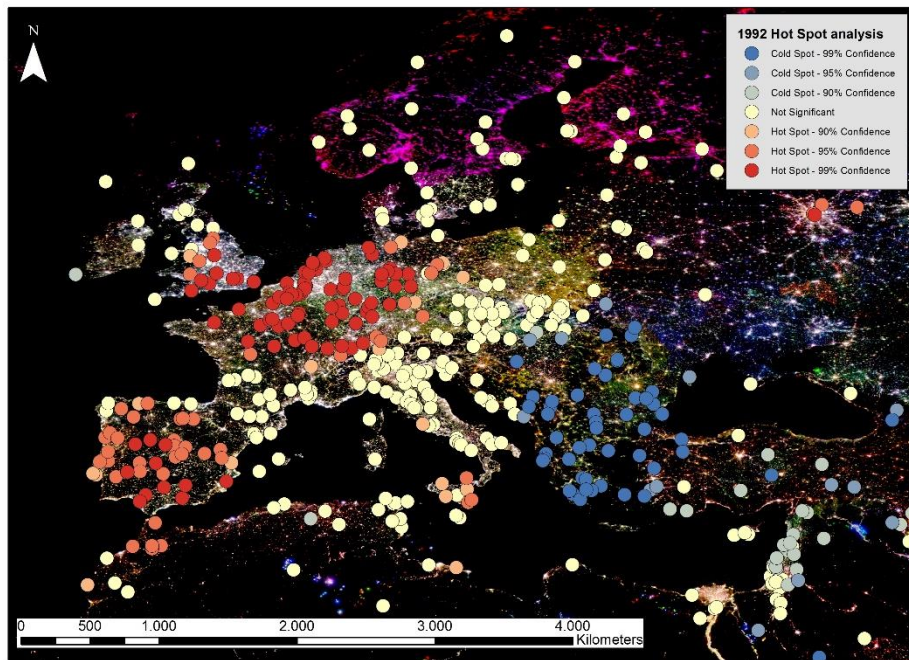


Figure 29: Figure from the above-mentioned paper

2. Agapiou A., Lysandrou V., Lasaponara R., Masini N., Hadjimitsis D. G., 2016, Study of the variations of archaeological marks at Neolithic site of Lucera, Italy using multispectral high resolution datasets, *Remote Sensing*, 8(9), 723; doi:10.3390/rs8090723.



remote sensing

Abstract: Satellite images have been systematically explored by archaeologists to detect crop marks, which are considered as a proxy for the identification of buried archaeological remains. Even though several existing algorithms are frequently applied, such as histogram enhancements and vegetation indices, the detection of crop marks still remains a difficult task, while the final interpretation results can be very poor. This paper aims to present some of the current difficulties of “remote sensing archaeology” in terms of detection and interpretation of crop marks due to the crops’ phenological variations. At the same time, the presented work seeks to evaluate the recently proposed linear equations for the enhancement of crop marks, initially developed for the eastern Mediterranean region. These linear equations re-project the initial n-space spectral into a new 3D orthogonal space determined by three components: a crop mark component, a vegetation component, and a

soil component. For the aims of this study, the Lucera archaeological site (southern Italy), where several Neolithic trenches have been identified, was selected. QuickBird and GeoEye high-resolution satellite images were analysed, indicating that vegetation indices may mismatch some crop marks depending on the phenological stage of the vegetation cultivated in the area of the archaeological site. On the contrary, ratios from linear equations were able to spot these crop marks even in shadow areas, indicating that improvements and developments of novel methodologies and equations based on remote sensing datasets can further assist archaeological research.

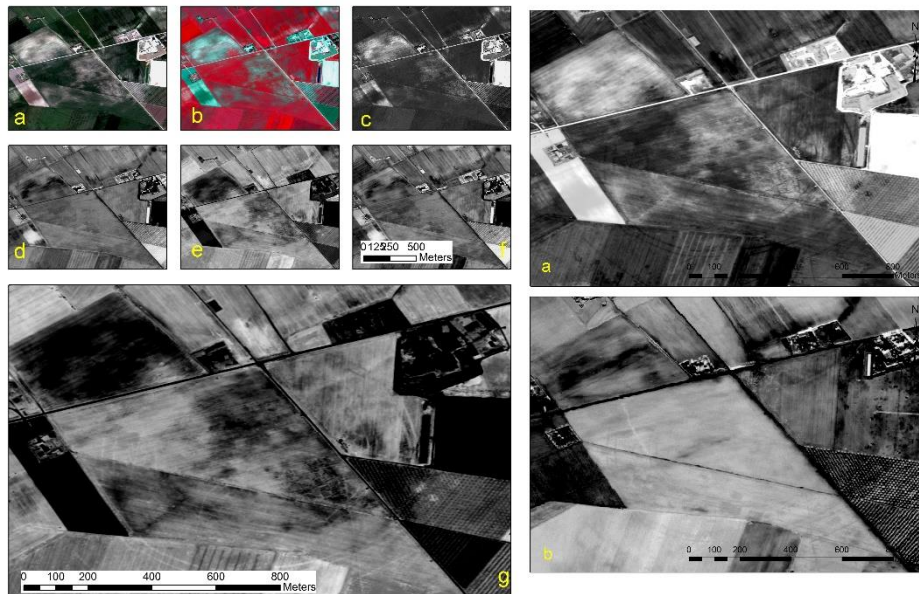


Figure 30: Figure from the above-mentioned paper

3. Lysandrou V., Cerra D., Agapiou A., Charalambous E., Hadjimitsis D. G., 2016, Towards a spectral library of Roman to Early Christian Cypriot floor mosaics, *Journal of Archaeological Science: Reports*, <http://dx.doi.org/10.1016/j.jasrep.2016.06.029>



Abstract: Floor mosaics are of great interest for archaeologists and art historians. While in the last decade other scientific sectors supported their study mainly from a technical point of view, through traditional archaeometric analysis, this paper suggests an innovative methodological approach and presents some preliminary results aiming to a non-destructive investigation based on the spectroradiometric analysis of stones used for manufacturing the ancient floor mosaics of Cyprus. This method evaluates the results of spectroradiometric analysis in relation to reliable destructive analysis completed in the past on the hereunder examined samples. In addition, the results of the proposed approach foresee to contribute to the expansion of the existing Cypriot database of floor mosaics, improving their characterization by collecting their

spectral signatures in the range of 350–2500 nm. The proposed methodology has been applied to a number of stone samples directly linked to pavement floor mosaic tesserae from Cyprus. The results have shown that spectroradiometers may be used in order to identify mineralogical compositions of the stones with an accuracy of nearly 90%. To the best of our knowledge, this is the first time that a comprehensive spectral library related to Cyprus floor mosaics is derived.

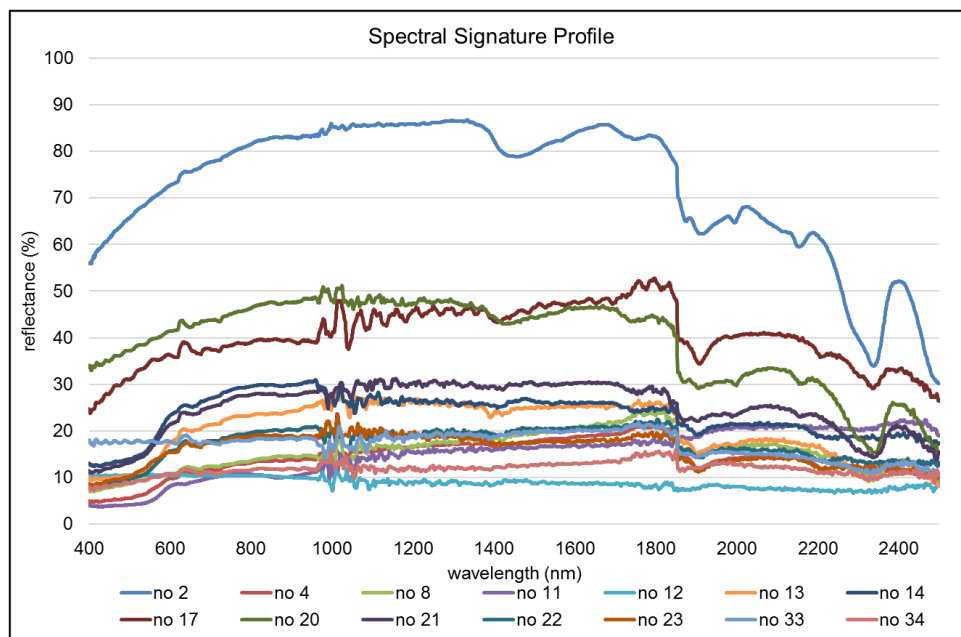


Figure 31: Figure from the above-mentioned paper

4. Agapiou A., 2016, Orthogonal equations for the detection of archaeological traces demystified, *Journal of Archaeological Science: Reports*, 10.1016/j.jasrep.2016.07.004



Abstract: Spectral variations of vegetation, known as crop marks, have been widely used for archaeological research as a proxy to detect buried archaeological remains. Such marks can be recognized using space-borne data and image analysis techniques supported by the existing archaeological knowledge of the area under study. Orthogonal equations for the enhancement and detection of crop marks using multispectral satellite images have been recently proposed in the literature. The proposed equations are linear transformations of the initial spectral bands of multispectral datasets aiming to the improvement of the satellite images. For the calculation of the n-space coefficients of this linear transformation a four-step methodology was followed, separately for each sensor. This paper aims to provide the fundamental concept of the development of these equations as well as some aspects related with the application and accuracy assessment. Spectral characteristics of the sensor, atmospheric effects, and spectral

calibration of the datasets as well as the selection of the appropriate period for applying these equations for the enhancements of crop marks are also discussed. Such orthogonal equations may be further developed and applied for any kind of sensor either hyperspectral or multispectral for the detection of buried archaeological remains. An example of the applicability of the orthogonal equations at Stonehenge archaeological site is also demonstrated.

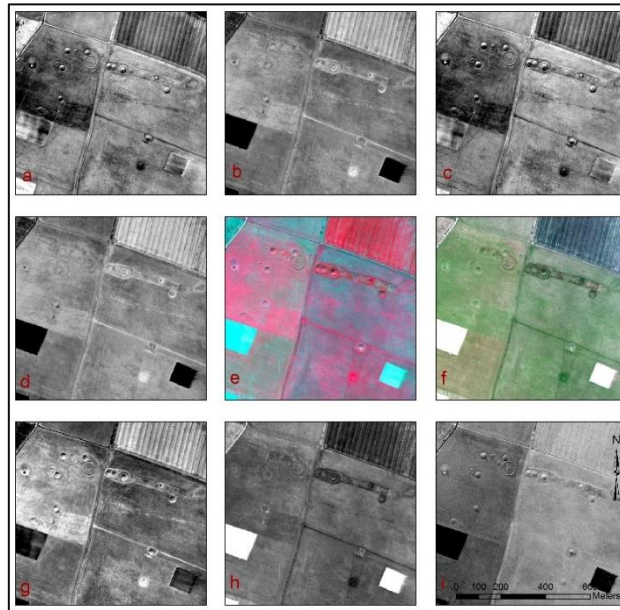


Figure 32: Figure from the above-mentioned paper

5. Cerra, D.; Plank, S.; Lysandrou, V.; Tian, J. Cultural Heritage Sites in Danger—Towards Automatic Damage Detection from Space. *Remote Sens.* 2016, 8, 781.



remote sensing

Abstract: The intentional damage to local Cultural Heritage sites carried out in recent months by the Islamic State have received wide coverage from the media worldwide. Earth Observation data provide important information to assess this damage in such non-accessible areas, and automated image processing techniques will be needed to speed up the analysis if a fast response is desired. This paper shows the first results of applying fast and robust change detection techniques to sensitive areas, based on the extraction of textural information and robust differences of brightness values related to pre- and post-disaster satellite images. A map highlighting potentially damaged buildings is derived, which could help experts at timely assessing the damages to the Cultural Heritage sites of interest. Encouraging results are obtained for two archaeological sites in Syria and Iraq.



Figure 33: Figure from the above-mentioned paper

6. Kyriakides N., Lysandrou V., Agapiou A., Illampas P., Charalambous E., 2016, Correlating damage condition with historical seismic activity in underground sepulchral monuments of Cyprus, *Journal of Archaeological Science: Reports*, doi:10.1016/j.jasrep.2016.07.007.



Abstract: Severe and repeated earthquakes devastated Cyprus in antiquity, causing in many cases the abandonment of entire settlement sites. Yet, information regarding the level of seismic activity of historical seismicity in Cyprus is very limited and does not provide the evidence to arrive at reliable conclusions relative to hazard damage parameters such as the severity or occurrence frequency of a seismic event. Thereafter, the level of risk in which these monuments are exposed is unclear

leading to an increased uncertainty regarding their safeguarding from future events. The paper aims at investigating the correlation between damage observed in underground ancient tombs and the historical seismic activity at the area based on in situ observations and expert opinion analysis. In addition, the paper aims to simulate the current state of the tomb's structure, and predict, through a seismic scenario, the propagation of damage from future large earthquake events. Underground monuments are chosen since, due to the nature of the seismic force, they are further "protected" and capable of surviving strong ground motions as they follow the displacement of the soil surrounding them. Typical examples of such structures in Cyprus are the hypogea in the necropolis of the "Tombs of the Kings", located in Paphos area. Some of these monuments exhibit severe cracking of the rock-cut stone walls and evidence of collapse of vertical resisting members of skeleton structure. Paphos area is the most active seismic region in Cyprus based on the historical catalogue of events with evidence of a number of destructive earthquakes. The framework presented herein utilizes information regarding the current geometry of these structures as documented from topographical surveys, their depth, area of opening, size of resisting members along with

information regarding the geotechnical conditions at the site to arrive at estimates of the displacement demand under various seismic scenarios. The predicted shear strain levels on the walls are compared with the strain capacity under tension of the soil material to identify the possibility of propagation of cracking of the walls based on a specific seismic scenario.

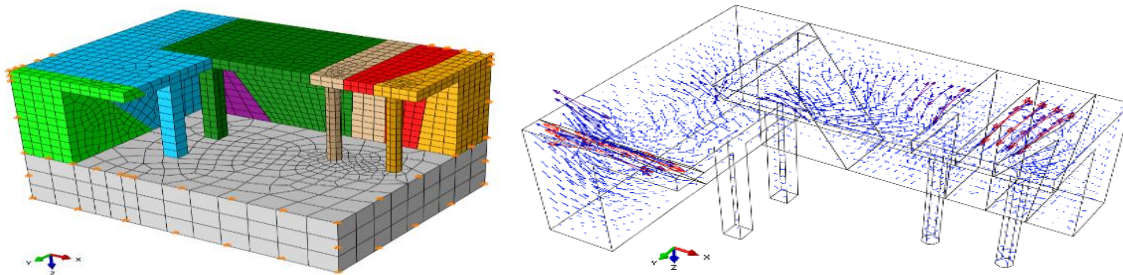


Figure 34: Figure from the above-mentioned paper

7. Agapiou A., Lysandrou V., Sarris A., Papadopoulos N., Hadjimitsis D. G., Pseudo penetration of optical remote sensing images: Application for the detection buried archaeological remains in the area of Vészto-Mágor Tell, Hungary, Remote Sensing, (*under review*).

8. Cerra D., Agapiou A., Sarris A., Hadjimitsis D. G. 2016, Assessment of Hyperspectral Indicators for the Detection of Buried Archaeological Remains, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, (*under review*).

Conference Participation

Full papers

1. Agapiou A., Lysandrou V., Satellite based investigation for detection of ancient tombs' looting in Cyprus, 2nd Computer Applications and Quantitative Methods in Archaeology (CAA GR) 2016, Athens, Greece 20-21 December 2016.

2. Hadjimitsis D., Agapiou A., Lysandrou V., Themistocleous K., Lasaponara R., Masini N., Krauss T., Cerra D., Gessner U., Schreier G., Establishing a remote sensing science center in Cyprus: first year of activities of ATHENA project, 6th International Euro-Mediterranean Conference (EuroMed 2016), 31 Oct. – 05 November 2016, Nicosia, Cyprus.

3. Cuca B., Agapiou A., Hadjimitsis D.G., Observing the changes in landscape around the historical capital of Nicosia using multi-spectral multi-temporal datasets, 6th International Euro-Mediterranean Conference (EuroMed 2016), 31 Oct. – 05 November 2016, Nicosia, Cyprus.

4. Agapiou A., Orthogonal equations for the detection of archaeological traces de-

mystified, Fourth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2016), 4-8 April, 2016, Cyprus.

5. Agapiou A., V. Lysandrou, K. Themistocleous, B. Cuca, R. Lasaponara, N. Masini, T. Krauss, D. Cerra, U. Gessner, G. Schreier, D. Hadjimitsis, Searching data for supporting archaeolandscape in Cyprus: an overview of aerial, satellite and cartographic datasets of the island, Fourth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2016), 4-8 April, 2016, Cyprus.

6. Kyriakides N., Lysandrou V., Agapiou A., Illampas R., Correlating damage condition with historical seismic activity in underground sepulchral monuments of Cyprus, Fourth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2016), 4-8 April, 2016, Cyprus.

7. Cerra D., Tian J., Lysandrou V., Plank S., Automatic damage detection for sensitive cultural heritage sites, XXIII ISPRS Congress 2016, 12-19 July, 2016, Prague.

Posters -Abstracts

1. Lysandrou V., Agapiou A., Elaborating latent and apparent knowledge configurations in Hellenistic-and Roman landscape of Cyprus, 2nd Computer Applications and Quantitative Methods in Archaeology (CAA GR) 2016, Athens, Greece 20-21 December 2016.

2. Cuca B., Agapiou A., Hadjimitsis D. G., Urban landscapes: temporal changes around the historical capital of Nicosia, Aerial Archaeology Research Group (AARG) annual meeting, Pilsen, Czech Republic, 7-9, September, 2016.

3. Hadjimitsis D. G., Agapiou A., Lysandrou V., Branka C., Themistocleous K., Nisantzi A., Lasaponara R., Masini N., Krauss T., Cerra D., Gessner U., Schreier G., ATHENA: Center of Excellence in Cyprus in the Field of Remote Sensing for Cultural Heritage in the Areas of Archaeology and Cultural Heritage, 6th GEOBIA 2016, 14-16 September, 2016 / Enschede, The Netherlands.

4. Hadjimitsis D. G., Agapiou A., Lysandrou V., Branka C., Themistocleous K., Lasaponara R., Masini N., Krauss T., Cerra D., Gessner U., Schreier G., ATHENA: Remote Sensing Science Center for Cultural Heritage in Cyprus. European Geosciences Union – EGU, General Assembly 2016, 17 – 22 April 2016, Vienna, Austria.

5. Hadjimitsis D. G., Agapiou A., Lysandrou V., Branka C., Themistocleous K., Nisantzi A., Lasaponara R., Masini N., Krauss T., Cerra D., Gessner U., Schreier G., Establishment of a center of excellence in the field of remote sensing for cultural heritage at the Cyprus

university of technology: the 'ATHENA' Horizon 2020 Twinning project, Fourth International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2016), 4-8 April, 2016, Cyprus.

6. Hadjimitsis D. G., Agapiou A., Lysandrou V., Themistocleous K., Branka C., Nisantzi A., Lasaponara R., Masini N., Krauss T., Cerra D., Gessner U., Schreier G., Educational activities of remote sensing archaeology (Conference Presentation), Proc. SPIE 10005, Earth Resources and Environmental Remote Sensing/GIS Applications VII, 100050L (December 9, 2016); doi:10.1117/12.2242109.

ELABORATING LATENT AND APPARENT KNOWLEDGE CONFIGURATIONS IN HELLENISTIC-AND ROMAN LANDSCAPE OF CYPRUS

V. Lysandrou* and A. Agapiou*

Abstract: The current paper presents the latent and apparent configurations of the Hellenistic and Roman landscape of Cyprus, based on a multi-scale analysis of the landscape. The analysis is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape. The analysis is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Innovation: The innovation of the research lies in the fact that the research is based on a multi-scale analysis of the landscape, which is then used to elaborate the configurations of the landscape. The analysis is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Preliminary results: The preliminary results of the research are based on a multi-scale analysis of the landscape, which is then used to elaborate the configurations of the landscape. The analysis is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

General objectives: The general objectives of the research are based on a multi-scale analysis of the landscape, which is then used to elaborate the configurations of the landscape. The analysis is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Keywords: Hellenistic, Roman, Cyprus, landscape, configurations, multi-scale analysis.

URBAN LANDSCAPES: TEMPORAL CHANGES AROUND THE HISTORICAL CAPITAL OF NICOSIA

Cucur B. Agapiou, A. Hajiminas D.G.

Abstract: Historic center of Nicosia is characterized by quite compacted fortifications known as Venetian walls. In 1887, due to a threat from the Ottoman Empire, Venetian authorities that were ruling the island of Cyprus at the time, has decided to fortify the city. The shape of a star with seven bastions is still visible in Nicosia's urban fabric today. This poster illustrates a methodology using multi-scale analysis of satellite imagery to observe the most recent modifications of the urban landscape around Nicosia's historic center. Freely accessible Landsat satellite data was used in three pairs of images regarding years 1987, 2003 and 2018. The changes that have occurred over the last 30 years were highlighted using a Principal Component Analysis (PCA). For a significant qualitative gradient of changes, a parameter of 6 elements was used, with 1 referring to the most and 5 referring to least significant change. Such images appear in false colour meaning that RGB channels are attributed to original elements of the PCA. Hence, the colours seen in the image do not have an absolute value but are an indication of change in the cover of the land. A closer look on the walled city of Nicosia and its southern area within the PCA image 1987-2018 show significant changes around the city walls, just out of the walls and along the main transport arteries of the city (road network). However, such observations require further qualitative and quantitative interpretation. As such, the need to be further assessed using ground truth data, city masterplans and technical maps. It should be noticed though that observations of different types and densities of urban development could be a very valuable contribution to the planning process of possible future urban development, in particular in proximity of historic centers.

Fig. 1. Walled city of Nicosia by Giacomo Franco, 1567 (source: Wikimedia).

Venetian walls in Julio Savignani, an architect and engineer, has designed new fortifications for the city according to contemporary defense methods in the shape of a star with seven bastions. This feature is still visible in the urban fabric of Nicosia today.

Fig. 2. Nicosia's urban fabric as seen from space.

Fig. 3. Principal Component Analysis for images taken in 1987-2003, 2003-2018 (middle) and 1987-2018 (right). Buffer zone is shown as highlighted area.

Fig. 4. PCA of the image pair 1987-2018, a close-up of southern Nicosia.

ATHENA: CENTER OF EXCELLENCE IN CYPRUS IN THE FIELD OF REMOTE SENSING FOR CULTURAL HERITAGE IN THE AREAS OF ARCHAEOLOGY AND CULTURAL HERITAGE

Abstract: The project aims to create a center of excellence in the field of remote sensing for cultural heritage in the areas of archaeology and cultural heritage. The project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Monitoring fire threats in the surrounding of Unesco World Heritage Monuments: The project aims to monitor fire threats in the surrounding of Unesco World Heritage Monuments. The project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Introduction: The introduction of the project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Consortium: The consortium of the project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Acknowledgments: The acknowledgments of the project are based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

ATHENA Remote Sensing Science Center for Cultural Heritage in Cyprus

Abstract: The project aims to create a center of excellence in the field of remote sensing for cultural heritage in the areas of archaeology and cultural heritage. The project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Remote Sensing Archaeology in Europe: The project aims to create a center of excellence in the field of remote sensing for cultural heritage in the areas of archaeology and cultural heritage. The project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

ATHENA Center: The ATHENA center is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

ATHENA's objectives: The objectives of the ATHENA center are based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Consortium: The consortium of the project is based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

Acknowledgments: The acknowledgments of the project are based on the identification of the latent and apparent configurations of the landscape, which are then used to elaborate the configurations of the landscape.

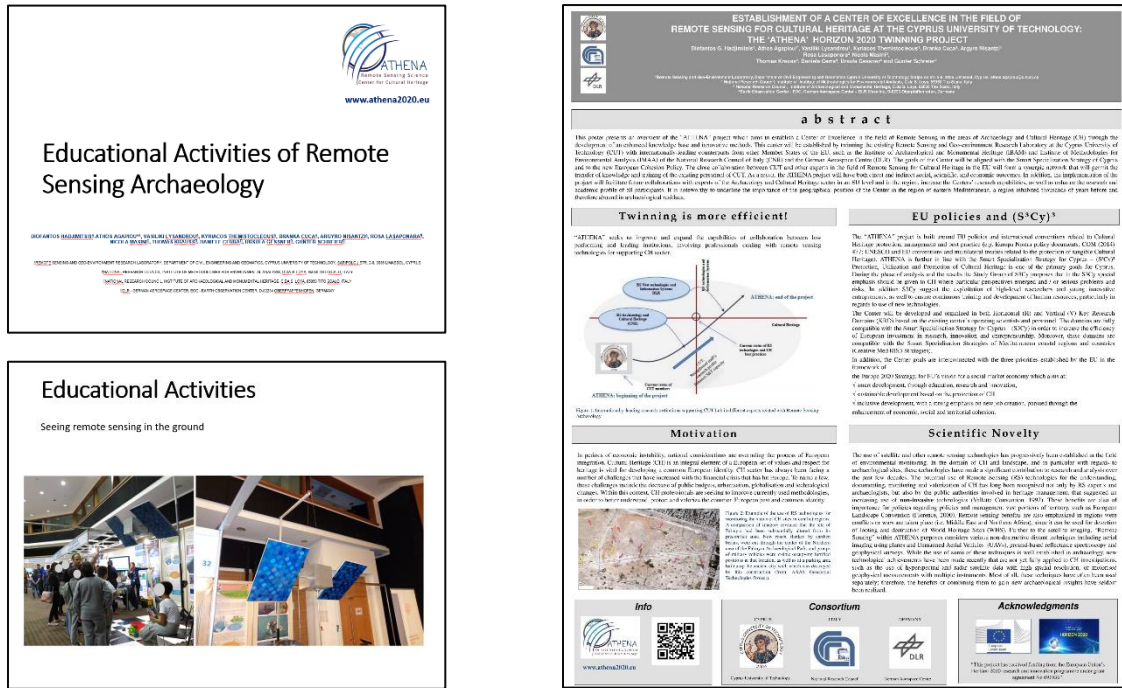


Figure 35: Posters and presentation prepared from the above-mentioned announcements

Website of the Project

Trademark of the project is the ATHENA's website launched since the beginning of the project and continually updated. The website (www.athena2020.eu) is considered the most important and efficient dissemination tool of the project. It has been designed in such a way to be simple, functional and intuitive both for the project partners and the different types of interested audience.

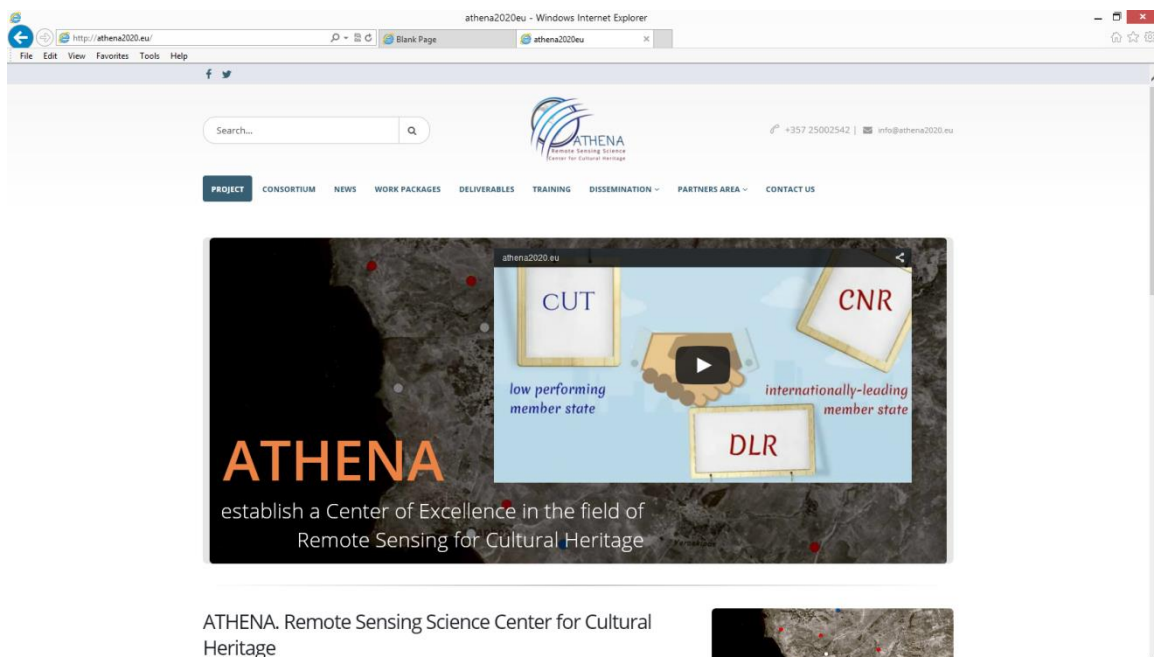


Figure 36: ATHENA's website home page

The website is structured in nine thematic categories covering all needs emerging from the project. These categories are as follows:

-
- **Project:** In this section general information regarding the ATHENA project is provided to the readers. This site will be the front page of the project.
 - **Consortium:** Information about the partners involved in the project is presented here. For further info the individual link for every participant organisation is given.
 - **News:** This page is systematically updated so as to include all news of the project, actions undertaken, uploads related to the project and other. The news is exposed under a chronological order before or after their event.
 - **Work Packages:** A short description of the scientific methodology followed within the ATHNEA project is given here, to familiarise the readers to the several work packages.
 - **Deliverables:** A complete list of the deliverables as these have been approved and finalized by the European Commission is presented. The type of the deliverable is also indicated as well as the expected date of their submission. Public (PU) deliverables are regularly uploaded in this link in order to maximize the dissemination impact of the project.
 - **Training:** Training is considered as the key element of the ATHENA project. In this link the major training events are placed both for dissemination reasons and concrete knowledge transfer transparency.
 - **Dissemination:** This page includes all dissemination actions taken by the partners within the project duration. These actions, being of various types, have been categorized under the main thematic areas of: Publications; Conferences; Press release; Videos and Leaflets.
 - **Partners Area:** This link is the intranet of the project. In this area only registered users (i.e. partners of the project) have access. The partners' area includes mainly three different types of actions: Forum; Files and Webmail. The intranet section is considered an important strategic tool for the management of the project and for preparation actions needed to be taken during the ATHENA project.
 - **Contact us:** Lastly, a friendly site for communication between the viewers and the ATHENA members has been included at this field of the website.

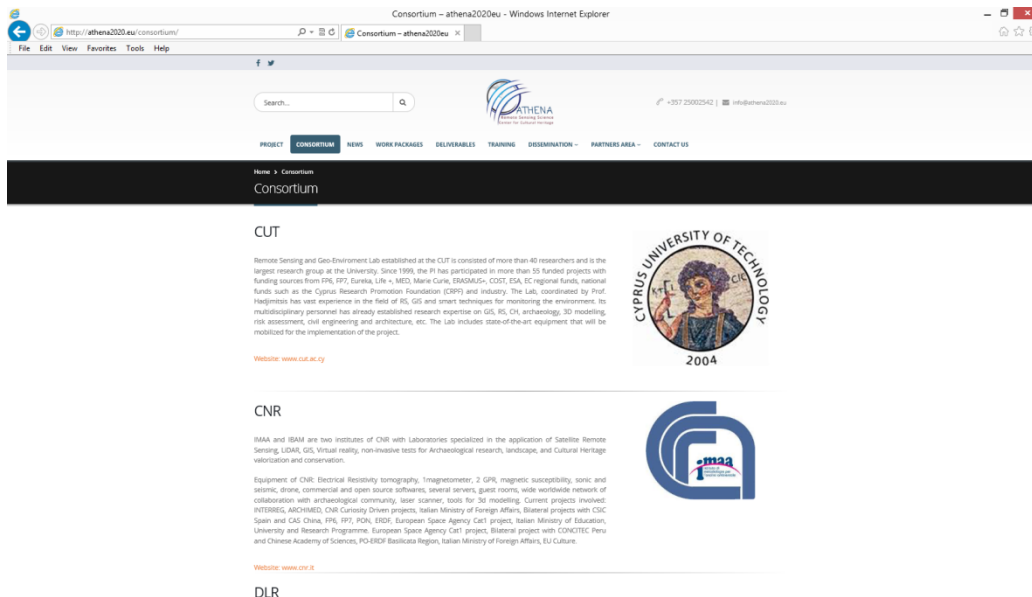


Figure 37: ATHENA's website consortium description

Based on statistics, the website has reached more than 5000 different hits over the last 15 months (i.e. M1-M15, December 2015-February 2017):

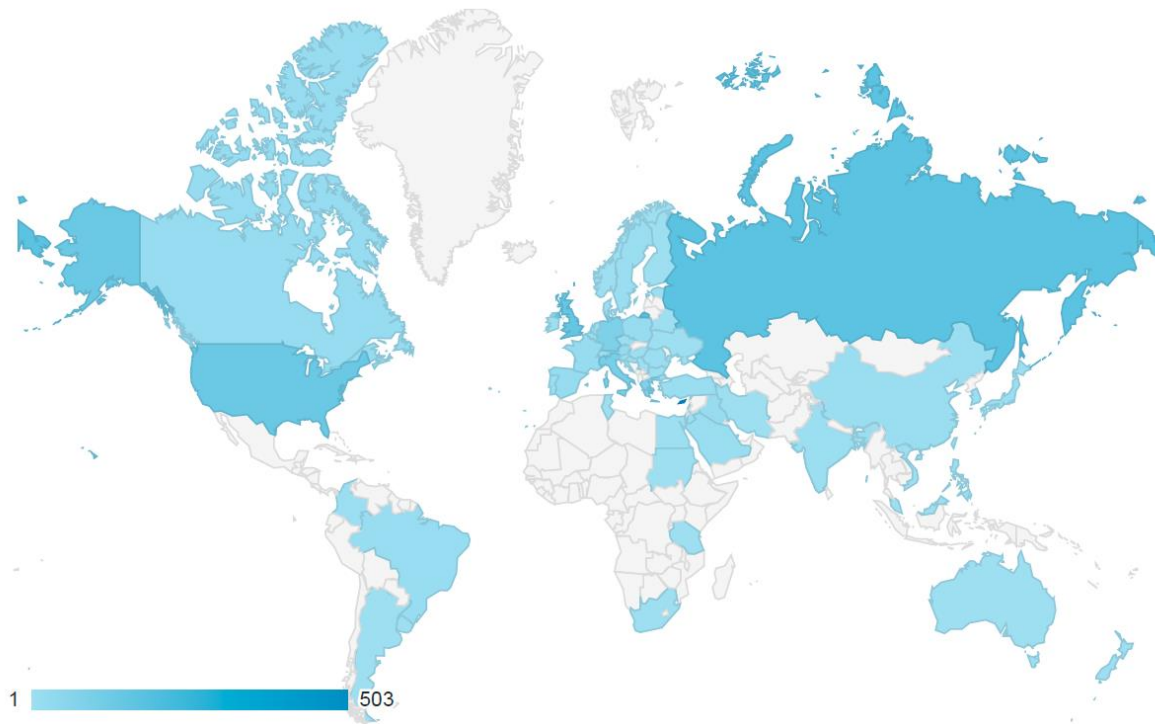


Figure 38: Countries entered the website of the project during the first 15 months (M1-M15) (from statistics of the website)

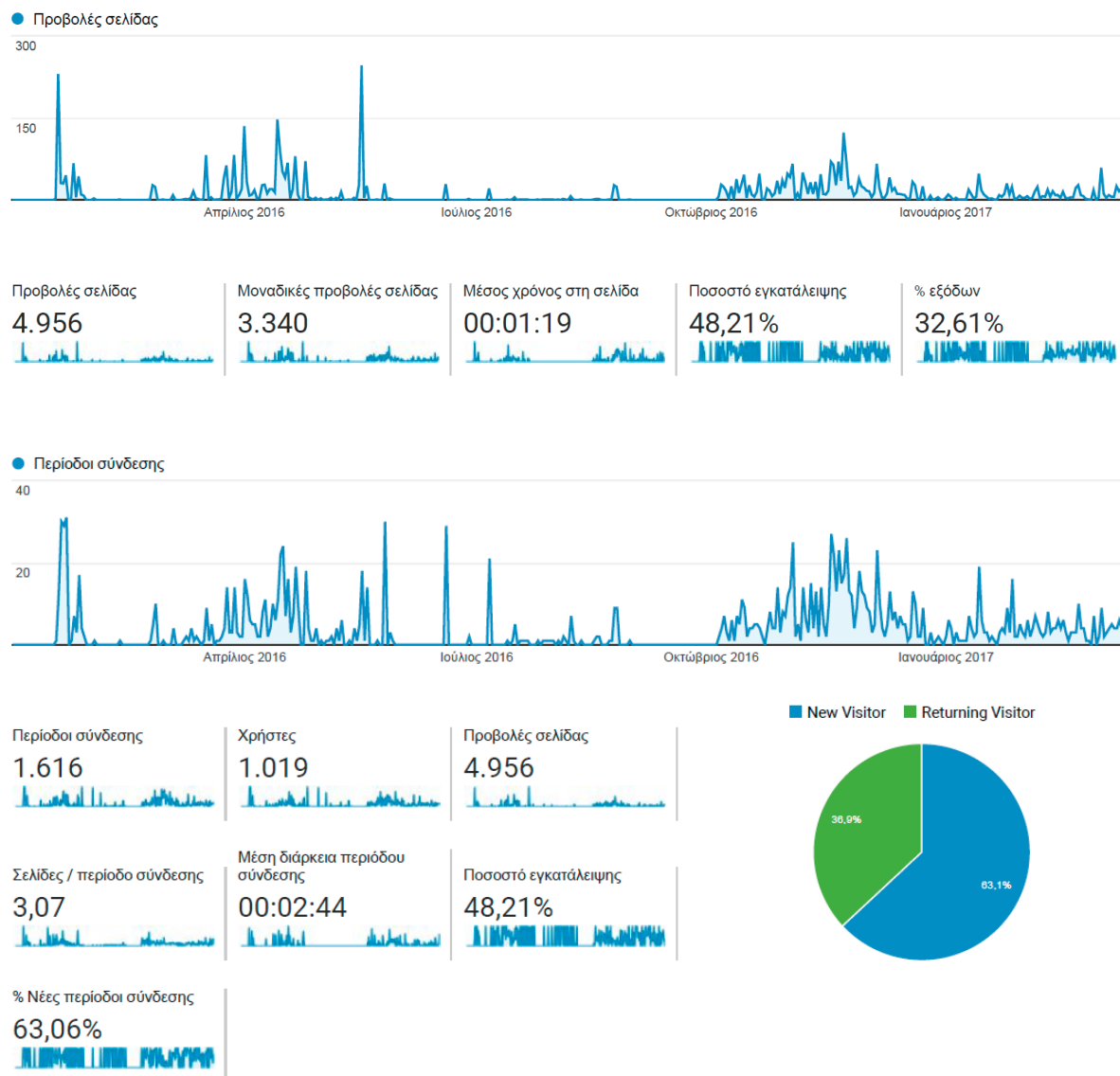


Figure 39: Statistics regarding the view of the website of the ATHENA project

Press releases

In total 22 press releases, have been announced from the beginning of the project in various portals, including local newspapers, blogs, educational institutions websites etc. Below a detail list of these releases are shown (can be found also in the website of the project).

◆	Date	◆	Press / Website	◆
1	30/10/2016		Association of Cypriot Archaeologists	
2	07/10/2016		Paideia News	
3	6/10/2016		Cyprus University of Technology	
4	22/07/2016		Simerini	
5	15/03/2016		Alitheia	
6	11/03/2016		Cyprus News	
7	22/01/2016		Taxidromos tis Pafou	
8	21/01/2016		Phileleftheros	
9	17/01/2016		Reporter	
10	17/01/2016		Politis	
11	17/01/2016		Machi	
12	15/01/2016		Simerini	
13	15/01/2016		Lemesos	
14	13/01/2016		Politis	
15	13/01/2016		Phileleftheros	
16	13/01/2016		Charavgi	
17	13/01/2016		Alitheia	
18	12/01/2016		Phileleftheros	
19	12/01/2016		Paideia News	
20	12/01/2016		i-eidisi	
21	12/01/2016		H Phoni tis Lemesou	
22	20/11/2015		Phileleftheros	

Showing 1 to 22 of 22 entries

Figure 40: Press release related to the project.

Examples from these releases are shown in the following figure:

has indeed been commercialized in some areas, but it needs still European (i.e. Copernicus) and regional motivation, support and moreover, governmental users. Likewise, managing historical monuments and sites, is depending on public support (though the proper management attracts tourism).

The aim of the discussions with regional stakeholders was to bring these facts to the attention of specifically public stakeholders (i.e. Ministries and offices in Cyprus) and to make them aware of the possibilities Earth observation has for their public services and regulations.

The meetings and discussions so far have embraced on one end the Ministry of Transportation, Communication and Works (also in charge for Space Technologies and the European programs) and on the other end academic institutions such as the Archaeological Research Unit of the University of Cyprus.

In all meetings, it was evident that the possibilities and opportunities for a new technology approach to preserve the cultural heritage was recognized and welcomed. But as with all new technologies, there was the need for more practical test cases and a better understanding on how these technologies could be embedded in the traditional workflow (or how the workflow should be changed). Although, the discussions with stakeholders are formally finalized with this deliverable, ATHENA will continue and intensify the dialogue with the current contacts and will continue to get more stakeholders (including from private partners/ i.e. business) involved. The approach to discuss with stakeholders outside Cyprus (i.e. the Eastern Mediterranean and Europe) will also be continued.

Below some details with these meetings, as described in Deliverable 3.2 are given:

Inaugural meeting- ATHENA project aims and objectives

On the 14th December 2015 the kick off meeting of the ATHENA project took place at the Senate of the Cyprus University of Technology in Limassol, Cyprus. During the meeting the project had been presented in an open to the public session. Apart from the consortium partners and the academia, representatives from local stakeholders such as the Department of Antiquities, the Association of Cypriot Archaeologists, the Department of Electronic Communications and the Research Promotion Foundation have been presented.

Ministry of Education and Culture

Organisation profile: The Ministry of Education and Culture is responsible of all aspects of the educational system in Cyprus, including Primary Education, Secondary General Education, Secondary Technical and Vocational Education, Higher Education, Special Education, Private Education, State Institutes of Further Education, Adult Education Centres.

Within the various thematic Services of the Ministry it is included the Department of Cultural Services exclusively responsible for Culture, created in 1965. The Cultural Services are the main exponent of the cultural policy of the state as regards contemporary culture. By being responsible for the development of the Letters and the Arts in Cyprus, informing the public about cultural events and their participation in them, and promoting the achievements of our cultural activities abroad, the Department plays a vital role in shaping the cultural image of the country.

Meeting outcomes: On the 19th April 2016 a meeting with the Minister of Education and Culture of Cyprus, Mr. C. Kades and the Director of the Cultural Services of the Ministry, Mr. P. Paraskevas, was carried out. During the meeting members of the Remote Sensing and Geo-environment Research Lab (Department of Civil Engineering and Geomatics-CUT) lead by the ATHENA project coordinator prof. D. Hadjimitsis (CUT) presented the ATHENA project, accomplished training, dissemination and exploitation activities, as well as future plans. The presentation followed a fruitful discussion regarding the possible engagement of the Ministry in specific activities related to the ATHENA project and education (elementary and secondary general education), as well as training and familiarization both of secondary school teachers, and students on issues related to remote sensing and geoinformatics for the management and protection of Cultural Heritage. Furthermore, possible collaboration with the Department of Cultural Services of the Ministry has been discussed.

The meeting ended with the bilateral agreement of signing a memorandum of understanding between CUT and the Ministry. Through this, a flowchart of common activities and other are foreseen. The Memorandum has been prepared and will be signed within the next days.



Figure 42: Photo taken after the meeting with the Minister of Education and Culture.

Committee on Missing Persons in Cyprus (CMP)

Organisation profile: The primary objective of the CMP is to return the remains of missing persons to their families in order to arrange for a proper burial and close a long period of anguish and uncertainty. Most Cypriot families have been directly or indirectly affected and it is hoped that the healing of old wounds will in turn favour the overall process of reconciliation between both communities. To this end, the project is of a bi-communal nature with teams of Greek Cypriot and Turkish Cypriot scientists involved at every stage of the exhumation and identification processes.

Meeting outcomes: On the 4th of October 2016 a meeting with the Greek Cypriot Member of the CMP, Mr. N. Nestoros took place in their offices in Nicosia, Cyprus. ATHENA project was presented by the project Coordinator Prof. D. Hadjimitsis and other team members (Dr. A. Agapiou and Dr. V. Lysandrou) from the Cyprus University of Technology.

Possible collaboration and future research funding calls were discussed and agreed to be explored. Additionally, the potentialities of satellite, close range and terrestrial remote sensing technologies in the field of forensic archaeology have been discussed. The meeting ended with the bilateral agreement of signing a memorandum of understanding between CUT and the Greek Cypriot Member of the CMP (expected to be signed in the forthcoming weeks).

Archaeological Research Unit of the University of Cyprus

Organisation profile: The Archaeological Research Unit (ARU) of the University of Cyprus, the first research unit of this academic institution, was founded in 1991 by decree of the Government of the Republic of Cyprus, following the issuing of the relative legislation by the House of Representatives. Its primary aims were to conduct active research and to teach the

ancient culture of Cyprus and neighbouring civilisations in the Mediterranean. The decision to establish the ARU was based on the recommendation of the Interim Steering Committee of the University of Cyprus, which stated the following:

(a) Cyprus is offered for primary research in the field of archaeology thanks to its distinctive cultural signature and history, as well as due to the fact that Cypriot archaeology and archaeological research on the island already has a distinguished tradition and international reputation.

(b) The subsequent international recognition of the importance of archaeological research in Cyprus should comprise one of the first incentives for choosing the University of Cyprus as a centre for postgraduate studies, and will pave the way for the exchange of students and academics between the University of Cyprus and academic institutions overseas.

Meeting outcomes: On the 1st of November 2016, a lecture was given at the Archaeological Research Unit (ARU) of the University of Cyprus (UCY), within the ATHENA project framework. Guest speakers were Prof. Rosa Lasaponara from the CNR and Mr Gunter Schreier from the DLR and they presented the topics “Living in the golden age of digital Heritage: from discovery to documentation, management and tourist exploitation” and “The European Earth Observation Programme COPERNICUS: A contribution to the preservation of Cultural Heritage” respectively. During the discussion followed the presentations, the potential collaboration between the ARU-UCY and the ATHENA project, has been mentioned in order to be further investigated.



Figure 43: Photos from the lectures given by the ATHENA project consortium partners at the Archaeological Research Unit of the University of Cyprus.

Ministry of Transportation, Communications and Works

Organisation profile: The Ministry of Transport, Communications and Works responsibilities include the creation and implementation of government policy in the sectors of transport,

communications, public works and antiquities. Its mission is the design and implementation of policies for the continuous improvement of transport (air, maritime and land) and of communications, as well as the continuous upgrading of the quality of projects implemented by the Ministry. In addition, the better promotion and exploitation of the archaeological wealth as well as other resources of the country is pursued. Amongst the Ministry's various sectorial Departments, the following two related to the ATHENA project are briefly described

- ***Department of Antiquities***

The Department of Antiquities was established in 1935 as a result of the enactment of the Antiquities Law. The Department of Antiquities has under its jurisdiction the management of the archaeological heritage of Cyprus. Its main responsibilities include the conducting of excavations and archaeological surveys, the operation, organization and foundation of archaeological museums, as well as the conservation, rehabilitation, protection and promotion of the ancient monuments, archaeological sites and monuments of traditional architecture.

The aims of the Department of Antiquities also include the use of ancient monuments and archaeological museums for educational and cultural purposes and for the development of cultural tourism. Conferences, lectures and exhibitions, both in Cyprus and abroad, are organized towards these goals. The activities of the Department of Antiquities are published in its two annual editions: the Report of the Department of Antiquities Cyprus and the Annual Report of the Department of Antiquities Cyprus.

- ***Department of Electronic Communications***

The Department of Electronic Communications is the responsible Authority, in the Republic of Cyprus, for the spectrum management and the implementation of the framework of electronic signatures. The Radiocommunication Law assigns to DEC executive power and responsibilities for the management of the radio spectrum, including satellite communications. In addition, DEC conducts the market surveillance for the radioequipment and develops and maintains the National Frequency Plan. Within that framework, DEC advises the Minister of Communications and Works on all electronic communications matters and represents Cyprus in international organizations and European Union committees. Since 2009, DEC is the executive arm of the Minister of Communications and Works with duty to formulate and implement a comprehensive national strategy on Information Society.

Moreover, DEC is the coordinator in the Republic for Cyprus in the areas of European Space Policy, including the programs GALILEO/EGNOS and GMES (Global Monitoring for the Environment and Security), and for the relations with the European Space Agency.

Meeting outcomes: On the 1st of November 2016 a meeting to local stakeholders at the Ministry of Transportation, Communications and Works in Cyprus has been carried out. The Ministry was represented by its General Director Mr. Alekos Michaelides, as well as other officers (Mrs Aphrodite Kofterou, Mrs Melitsa Kastellani and others). A representative from the **Department of Antiquities** (Dr. Anthi Kaldeli) attended the meeting. The **Department of Electronic Communications** was represented by its Director Mr G. Komodromos and the officer Mr. Anastasios Elia.

ATHENA team members from CUT (Prof. Diofantos Hadjimitsis, Dr. Athos Agapiou and Dr. Vasiliki Lysandrou), together with Mr. Gunter Schreier DLR-Germany and Prof. Rosa Lasaponara CNR-Italy, presented the ATHENA project.

The presentation proceeded as follows: (a) Overview of the Twinning 2015 call; (b) Presentation of the EU funded ATHENA project; (c) Presentation of ATHENA project Consortium and Supporters; (d) Actions accomplished; (e) Vision of ATHENA within the Cyprus society and (f) Presentation of opportunities of ATHENA and Cyprus with Copernicus

The presentation followed by 30 minutes discussion.

The General remarks from the Ministry and the two Departments representatives are summarised in their great interest towards the use of earth observation, satellite and close range remote sensing techniques for the protection, monitoring and understanding of Cultural Heritage. They all emphasized the urgency of using such techniques to solve practical problems of the public authorities in regards to the protection of antiquities from looting, to efficiently and quickly observe large areas in the case of modern development on potentially archaeological landscape, to efficiently and constantly observe archaeological sites and monuments in an effort of a long term monitoring from environmental and anthropogenic parameters. The event concluded with a fruitful discussion regarding the exploitation of the ATHENA project capabilities for both Cyprus and the Eastern Mediterranean area.



Figure 44: Photo taken after the meeting with the General Director of Communications and Works

Educational activities – Wider Public Activities

The ATHENA project provided to the HO to perform various educational activities related with the topics and the objectives of the project. It is estimated that more than 500 students (elementary and high schools) and more than 100 (undergraduate and post-graduate students) have been informed for the use of remote sensing for cultural heritage. In addition, ATHENA researchers, have participated at “Researchers’ Night” event organized at the end of 2016.





Figure 45: Photos taken during the various educational activities of the ATHENA projects at elementary and high schools



Figure 46: ATHENA project presented to undergraduate students of the Department of Civil Engineering and Geomatics (Cyprus University of Technology) during the summer courses (1/6/2016).



Figure 47: Photos taken during the various educational activities of the ATHENA project.

Leaflet material

Below the material from other dissemination activities such as leaflets and newsletters (e.g. Deliverable 6.2) prepared during the first 15 months of the project are shown:



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CONSORTIUM



"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691936".



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Training Activities	_____	6
Outreach Activities	_____	10
Journal Publications	_____	18



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INTRODUCTION

ATHENA is a funded project under the H2020–TWINN–2015

Specific challenge: The specific challenge seeks to address networking gaps and deficiencies between the research institutions of the low performing Member States and regions and internationally-leading counterparts at EU level.

Scope: Twinning aims at significantly strengthening a defined field of research in a particular knowledge institution (a research active university or a public research organisation or a private non-profit research organisation) by creating a link between this institution and at least two internationally-leading research institutions in other Member States.

Twinning will:

1. Enhance the capacity of the linked institutions.
2. Help raise staff's research profile as well as the one of the institutions involved.

Remote Sensing Science Center for Cultural Heritage–ATHENA

The Idea:

Cultural Heritage sector has always been facing a number of challenge which have increased by the European financial crisis (e.g. decrease of public budgets, urbanisation, technological changes).

Within this context, Cultural Heritage professionals are seeking to improve currently used methodologies, in order to better understand, protect and valorise the common European past and common identity.

"ATHENA aims to improve and expand the capabilities of collaboration between low-performing and leading institutions, involving professionals dealing with remote sensing technologies for supporting Cultural Heritage sector".



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ATHENA Centre:

The ATHENA Centre is devoted to the **development, introduction and systematic use of advanced remote sensing science and technologies in the field of archaeology and Cultural Heritage.**

ATHENA is exploiting the **current capabilities of the Cyprus University of Technology (CUT)**, both in terms of capacity as well as of equipment, performing advance research and support to the Cultural Heritage sector.

The Centre **aims to be in close collaboration with both national as well international research institutes and stakeholders**, providing integrated remote sensing services and solutions in the area of the Eastern Mediterranean.

The new perspectives on archaeological and cultural heritage in the region will position ATHENA as a centre of knowledge and a standard lab in the field of Remote Sensing Archaeology.

Consortium:

Cyprus University of Technology (CUT)



Remote Sensing and Geo-Environment Lab established at the CUT is consisted of more than 40 researchers and is the largest research group at the University. Its multidisciplinary personnel has already established research expertise on GIS, RS, CH, archaeology, 3D modelling, risk assessment, civil engineering and architecture, etc. The Lab includes state-of-the-art equipment that will be mobilized for the implementation of the project.



www.cut.ac.cy



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National Research Council (CNR)



IMAA and IBAM are two institutes of CNR with Laboratories specialized in the application of Satellite Remote Sensing, LiDAR, GIS, Virtual reality, non-invasive tests for Archaeological research, landscape, and Cultural Heritage valorization and conservation.



German Aerospace Center (DLR)



DLR, the German Aerospace Center, is Germany's national research centre for aeronautics, space, energy, transport, defence and security. The Earth Observation Center (EOC) of DLR with the German Remote Sensing Data Center (DFD) and the Remote Sensing Technology Institute (IMF) supports science and industry as well as the general public.





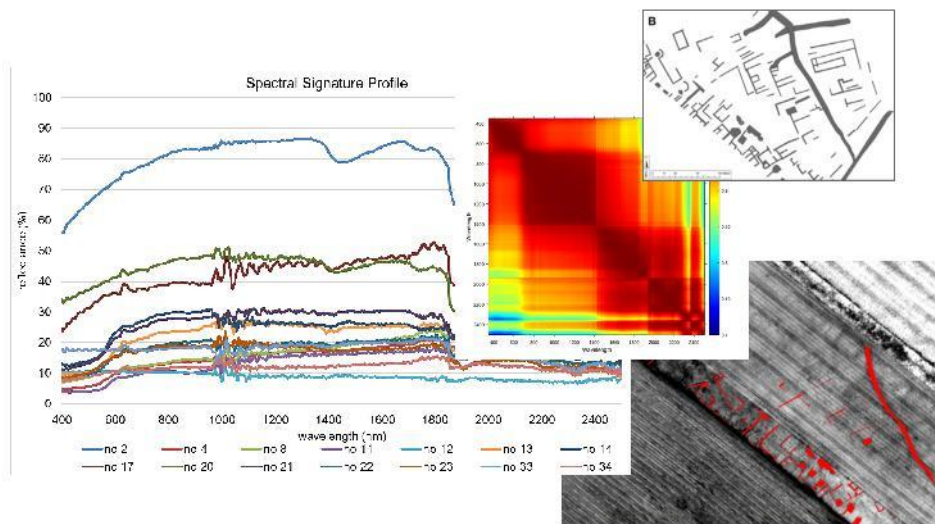
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TRAINING ACTIVITIES

ATHENA project includes an intense training program targeting the knowledge transfer amongst the participating partners of the project and beyond, depending on the nature of each activity. The up to date accomplished training activities are hereunder briefly described.

1st Virtual Training: Hyperspectral data and algorithms

The virtual training focused on hyperspectral data and algorithms was delivered by DLR using ordinary telecommunication platforms. The one-day training included an introduction to hyperspectral remote sensing followed by a seminar for band selection in hyperspectral datasets. As hyperspectral sensors measure the reflected solar radiation in up to hundreds different spectral bands, in practical applications it is usually desired to reduce the number of dimensions to speed up computations and increase the accuracy of the results. Examples from archaeological applications have been exposed and discussed.



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ATHENA

Workshop: Copernicus contribution to Cultural Heritage

The workshop took place during the Fourth International Conference of Remote Sensing and Geoinformation of Environment-RSCY 2016 in Paphos, Cyprus. Main objective was the introduction to the European Copernicus Earth Observation program with specific focus on the topics of the ATHENA project, such as preservation and monitoring of Cultural Heritage, innovative archaeological research, protection from archaeological looting in the eastern Mediterranean region.

The workshop was led by the German Aerospace Center (www.dlr.de) which is the national aeronautics and space center of the Federal Republic of Germany. The main speakers of the event were delegates of the German Center for Aerospace (DLR), the European Commission (EC) and the European Space Agency (ESA), who presented and discussed issues related to technology and space developments, multiple contributions space missions, policy and data access issues, as well as services related to the objectives of the ATHENA project.

The workshop concluded with a discussion on the use of the new space technology and remote sensing for protecting, monitoring and mapping of monuments and cultural heritage sites in a systematic way in Europe.

The project that has received funding from the European Union's Horizon 2020 research and



Supporters





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Staff exchanges: Geophysics and Ground technologies

During the first year of the ATHENA project, CUT and CNR members had the opportunity to join, as part of staff exchange activity, a summer school organized by CNR (IBAM and IREA), held in Pompeii. The summer school included lectures, practical field applications at the archaeological site of Pompeii and processing. The course, provided a unique opportunity for researchers to be familiarized with the basics of data collection, processing and interpretation of geophysical techniques such as Ground Penetrating Radar (GPR), magnetic and Electrical Resistivity Tomography (ERT), as well as other passive and active remote sensing techniques, applied both for detecting buried remains and also for investigating masonry structures and wall paintings.





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Summer school: Synthetic Aperture Radar Principles and Applications

The first ATHENA Summer School was held in the premises of Cyprus University of Technology in the Remote Sensing and Geoenvironment Lab of "Eratosthenes". Prof. Dr. Michael Eineder from DLR/TUM presented the Synthetic Aperture Radar (SAR) Principles and applications while Dr. Ramon Brdic presented TerraSAR-X Data, SAR Sentinel-1 Data, ERS-ENVISAT-Data and SAR data availability for Paphos Test site as well SAR Data Evaluation.

2nd virtual training: Multi-Temporal Remote Sensing Analyses

The second virtual training from DLR was held in the premises of Cyprus University of Technology in the Remote Sensing and Geoenvironment Lab of "Eratosthenes". Dr. Ursula Gessner from DLR/ Earth Observation Center presented the "Multi-Temporal Remote Sensing Analyses" training event demonstrating the potential use of optical datasets for large scale applications and phenological studies.





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OUTREACH ACTIVITIES

ATHENA project has been presented in various international conferences either in terms of dissemination of the project itself or as scientific outcomes from the project.

Agapiou, A., Lysandrou, V., Themistocleous, K., Cuca, B., Lasaponara, R., Masini, N., Krauss, T., Cerra, D., Gessner, U., Schreier, G., & Hadjimitsis, D. (2016). *Searching data for supporting archaeolandscape in Cyprus: An overview of aerial, satellite and cartographic datasets of the island*. Paper presented at the 4th International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2016), Paphos, Cyprus.

Agapiou, A., & Lysandrou, V. (2016). *Satellite based investigation for detection of ancient tombs' looting in Cyprus*. Paper presented at the 2nd Computer Applications and Quantitative Methods in Archaeology (CAA GR), Athens, Greece.

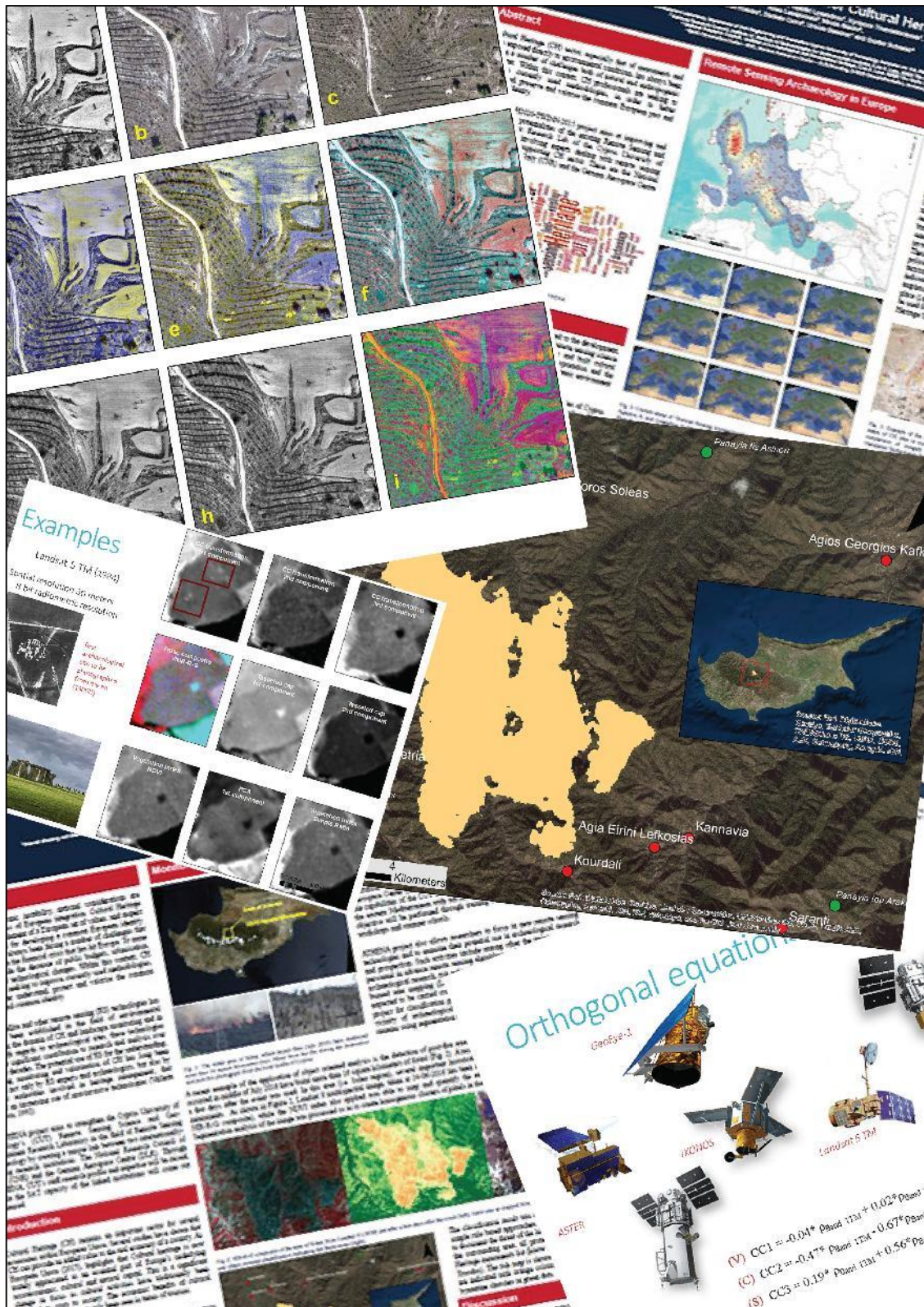
Agapiou, A. (2016). *Orthogonal equations for the detection of archaeological traces de-mystified*. Paper presented at the 4th International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2016), Paphos, Cyprus.

Cerra, D., Tian, J., Lysandrou, V., & Plank, S. (2016). *Automatic damage detection for sensitive cultural heritage sites*. Paper presented at the XXIII ISPRS Congress 2016, Prague, Czech Republic.

Cuca, B., Agapiou, A., & Hadjimitsis, D.G. (2016). *Observing the changes in landscape around the historical capital of Nicosia using multi-spectral multi-temporal datasets*. Paper presented at the 6th International Euro-Mediterranean Conference (EuroMed 2016), Nicosia, Cyprus.

Hadjimitsis, D., Agapiou, A., Lysandrou, V., Themistocleous, K., Lasaponara, R., Masini, N., Krauss, T., Cerra, D., Gessner, U., & Schreier, G. (2016). *Establishing a remote sensing science center in Cyprus: First year of activities of ATHENA project*. Paper presented at the 6th International Euro-Mediterranean Conference (EuroMed 2016), Nicosia, Cyprus.

Hadjimitsis, D. G., Agapiou, A., Lysandrou, V., Branka, C., Themistocleous, K., Nisantzi, A., Lasaponara, R., Masini, N., Krauss, T., Cerra, D., Gessner, U., & Schreier, G. (2016). *ATHENA: Center of excellence in Cyprus in the field of remote sensing for cultural heritage in the areas of archaeology and cultural heritage*. Paper presented at the 6th GEOBIA 2016, Enschede, The Netherlands.





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Hadjimitsis, D. G., Agapiou, A., Lysandrou, V., Branka, C., Themistocleous, K., Lasaponara, R., Masini, N., Krauss, T., Cerra, D., Gessner, U., & Schreier, G. (2016). *ATHENA: Remote sensing science center for cultural heritage in Cyprus*. Paper presented at the European Geosciences Union–EGU, General Assembly 2016, Vienna, Austria.

Hadjimitsis, D. G., Agapiou, A., Lysandrou, V., Branka, C., Themistocleous, K., Nisantzi, A., Lasaponara, R., Masini, N., Krauss, T., Cerra, D., Gessner, U., & Schreier, G. (2016). *Establishment of a center of excellence in the field of remote sensing for cultural heritage at the Cyprus university of technology. The 'ATHENA' Horizon 2020 Twinning project*. Paper presented at the 4th International Conference on Remote Sensing and Geo-information of the Environment (RSCy2016), Paphos, Cyprus.

Hadjimitsis, D. G., Agapiou, A., Lysandrou, V., Themistocleous, K., Cuca, B., Nisantzi, A., Lasaponara, R., Masini, N., Krauss, T., Cerra, D., Gessner, U., & Schreier, G. (2016). *Educational activities of remote sensing archaeology*. Paper presented at the SPIE–Remote Sensing, Earth Resources and Environmental Remote Sensing/GIS Applications Conference, Edinburgh, Scotland.

Kyriakides, N., Lysandrou, V., Agapiou, A., & Illampas, R. (2016). *Correlating damage condition with historical seismic activity in underground sepulchral monuments of Cyprus*. Paper presented at the 4th International Conference on Remote Sensing and Geo-information of the Environment (RSCy2016), Paphos, Cyprus.



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Press & Media

1. 7/10/2016 *Paideia News* (online source)
2. 6/10/2016 *Cyprus University of Technology*
3. 22/07/2016 *Simerini* (local newspaper)
4. 15/03/2016 *Alitheia* (local newspaper)
5. 11/03/2016 *Cyprus News*
6. 22/01/2016 *Taxidromos tis Pafou* (local newspaper)
7. 21/01/2016 *Phileleftheros* (local newspaper)
8. 17/01/2016 *Reporter*
9. 17/01/2016 *Politis* (local newspaper)
10. 17/01/2016 *Machi* (local newspaper)
11. 15/01/2016 *Simerini* (local newspaper)
12. 15/01/2016 *Lemesos* (local newspaper)
13. 13/01/2016 *Politis* (local newspaper)
14. 13/01/2016 *Phileleftheros* (local newspaper)
15. 13/01/2016 *Charavgi* (local newspaper)
16. 13/01/2016 *Alitheia* (local newspaper)
17. 12/01/2016 *Phileleftheros* (local newspaper)
18. 12/01/2016 *Paideia News* (online source)
19. 12/01/2016 *i-eidisi*
20. 12/01/2016 *H Phoni tis Lemesou* (local newspaper)





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Public events

Environmental and culture festival 2016 under the slogan "think future generations" as the central theme of the festival, CUT distributed material and information on several research programs related to environment and culture. In the public awareness raised within the "Scientific technical Sensing Centre of Excellence for Cultural Heritage-ATHENS".

During **Researcher Week** organized by the Researcher Promotion Foundation ATHENA researchers visited elementary and high schools promoting the benefits of Earth Observation for Cultural Heritage.

During **Researcher night 2016** Athena researchers participated in the research night 2016 with the main goal to promote "Cyprus from above: History and Heritage".





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Meetings with stakeholders



ATHENA project was presented to the Minister of Education and Culture and to the Director of Cultural Services of the Ministry. The meeting concluded with the unanimous agreement to proceed with the sign of a memorandum of understanding between the two parts after which common activities will be scheduled for the forthcoming years (19/4/2016).

ATHENA members participating at the "ESA Briefing 2016" workshop organised by the Department of Electronic Communications. During the workshop end-users, stakeholders, academia and others, were informed on the framework and procedures regarding the submission of Proposals for funding under the agreement signed on July 6, 2016 between the ESA and the Republic of Cyprus.



ATHENA presented to the Ministry of Communications and Works



ATHENA mission and objectives have been presented to the General Director of the Ministry of Communications and Works Mr. Alecos Michaelides. The Ministry is responsible for Space Strategy in Cyprus and Cultural Heritage. In the meeting Dr. Anthi Kaldeli from the Department of Antiquities of Cyprus as well as the Director of the Department of Electronic Communications, Mr. George Komodromos have participated along with and the Officer



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Mr. Anastasios Elia from the Department of Electronic Communications.

The meeting included amongst others the presentation of twinning calls, the ATHENA project aims and the first years activities and scientific outcomes. The event concluded with a fruitful discussion regarding the exploitation of the ATHENA project capabilities for both Cyprus and the Eastern Mediterranean area.



Vince Ambrosia, Senior Researcher Scientist from NASA informed about ATHENA project during the RSCY2016 conference (April 2016).



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Education–Invited lectures



"Ground-truth Spectroradiometric data for archaeological applications" was presented at the archaeological site of Pompeii, Italy during the International School "Geophysics and Remote Sensing for Archaeology" (9-13 May 2016).



"Coastal heritage landscapes under Marine Spatial Planning policy: a "forgotten layer" was presented at the Hellenic Maritime Museum, Piraeus, Greece organized in the framework of the FP7 ITACA Final Conference (24/6/2016).



ATHENA project presented to undergraduate students of the Department of Civil Engineering and Geomatics (Cyprus University of Technology) (1/6/2016).



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JOURNAL PUBLICATIONS

Agapiou, A. (2016). Remote sensing heritage in a petabyte-scale: Satellite data and heritage Earth Engine© applications. *International Journal of Digital Earth*, 1-18. doi: 10.1080/17538947.2016.1250829

Agapiou, A., Lysandrou, V., Lasaponara, R., Masini, N., & Hadjimitsis, D. G. (2016). Study of the variations of archaeological marks at Neolithic site of Lucera, Italy using multispectral high resolution datasets. *Remote Sensing*, 8(9), 1-14. doi:10.3390/rs8090723

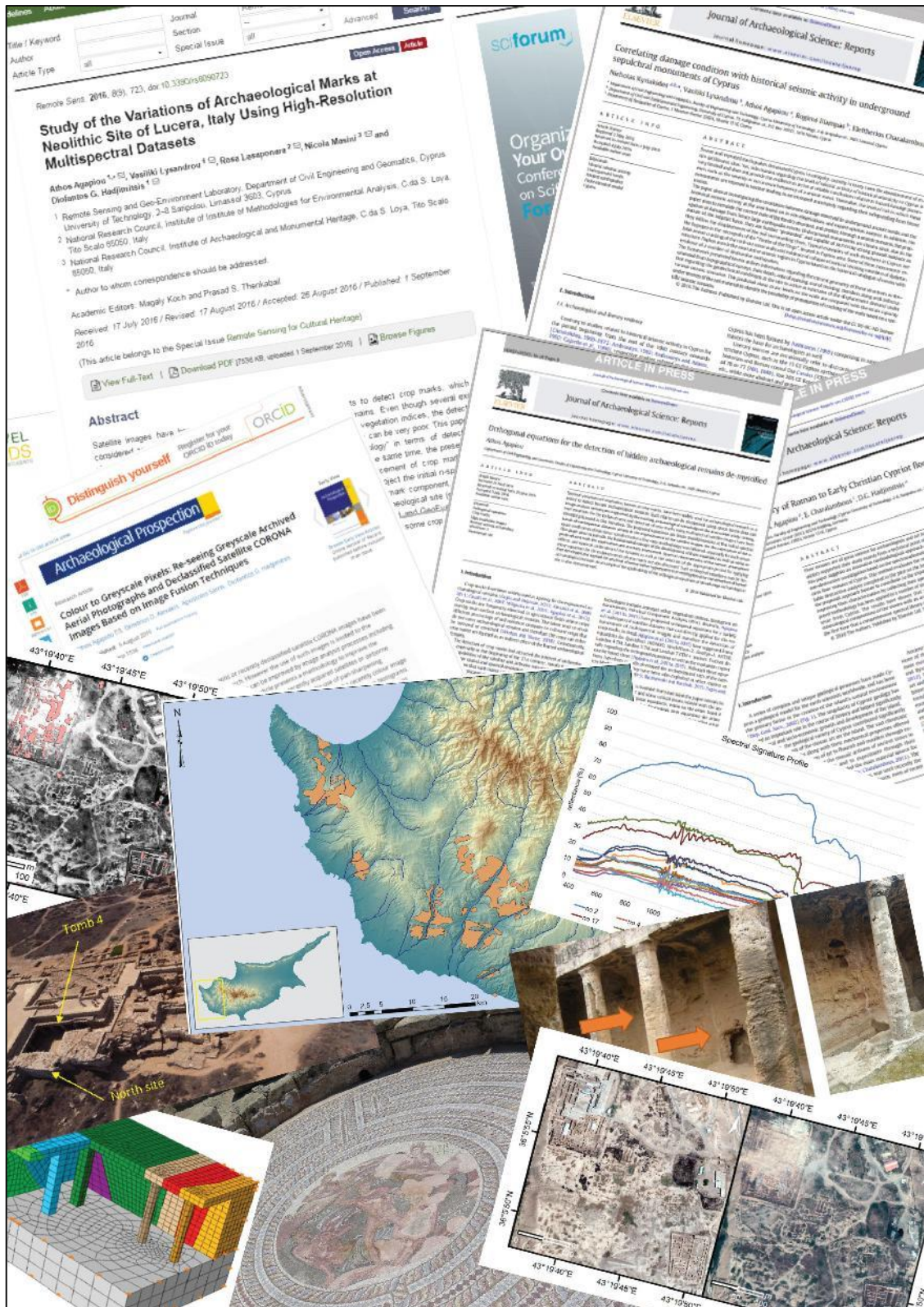
Lysandrou, V., Cerra, D., Agapiou, A., Charalambous, E., & Hadjimitsis, D. G. (2016). Towards a spectral library of Roman to Early Christian Cypriot floor mosaics. *Journal of Archaeological Science: Reports*, 1-10. Retrieved from <http://dx.doi.org/10.1016/j.jasrep.2016.06.029>

Agapiou, A. (2016). Orthogonal equations for the detection of archaeological traces de-mystified. *Journal of Archaeological Science: Reports*, 1-8. Retrieved from <http://dx.doi.org/10.1016/j.jasrep.2016.07.004>

Cerra, D., Plank, S., Lysandrou, V., & Tian, J. (2016). Cultural Heritage Sites in Danger: Towards automatic damage detection from space. *Remote Sensing*, 8, 1-15. doi: 10.3390/rs8090781

Kyriakides, N., Lysandrou, V., Agapiou, A., Illampas, P., & Charalambous, E. (2016). Correlating damage condition with historical seismic activity in underground sepulchral monuments of Cyprus. *Journal of Archaeological Science: Reports*, 1-8. doi:10.1016/j.jasrep.2016.07.007

Journal publications in scientific peer reviewed international journals. For further dissemination of the research outcomes of the projects, these articles have been published under an open access status.





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**ATHENA**
Remote Sensing Science
Center for Cultural Heritage

SUPPORTERS






Figure 48: ATHENA project leaflet



Image from: Agapiou et al. (2015), Colour to grayscale pixels: Re-seeing grayscale archived aerial photographs and declassified satellite CORONA images based on image fusion techniques, Archaeological Prospection (under publication)

ATHENA



Remote Sensing Science Center for Cultural Heritage



“This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 691936”.

ATHENA: Remote Sensing Science Center for Cultural Heritage

Leaflet No. 01
Dec. 2015

“In periods of economic instability, national considerations are overruling the process of European integration. Cultural Heritage (CH) is an integral element of a European set of values and respect for heritage is vital for developing a common European identity. CH sector has always been facing a number of challenges that have increased with the financial crisis that has hit Europe. To name a few, these challenges include the decrease of public budgets, urbanisation, globalisation and technological changes. Within this context, CH professionals are seeking to improve currently used methodologies, in order to better understand, protect and valorise the common European past and common identity”

Image from: Agapiou et al. (2015), Impact of Urban Sprawl to archaeological research: the case study of Paphos area in Cyprus, *Journal of Cultural Heritage*, 16(5).

“The “ATHENA” proposal aims to establish a **Center of Excellence in the field of Remote Sensing for Cultural Heritage**. This center will be established by twinning the existing Remote Sensing and Geo-environment Research Laboratory at the Cyprus University of Technology (CUT) with internationally-leading counterparts from other Member States of the EU, such as the National Research Council of Italy (CNR) and the German Aerospace Agency (DLR).

The close collaboration between CUT and other experts in the field of Remote Sensing for Cultural Heritage in the EU will form a synergic network that will permit networking, transfer of knowledge and training of the existing personnel of CUT.”

Image from: Agapiou et al. (2013), Orthogonal re-projection of spectral bands using medium and high resolution satellite images for the detection of archaeological crop marks. *Remote Sensing*, 5(12)

Consortium:

- Cyprus University of Technology (CY)
- National Research Council (IT)
- German Aerospace Centre (DE)

Figure 49:ATHENA project leaflet

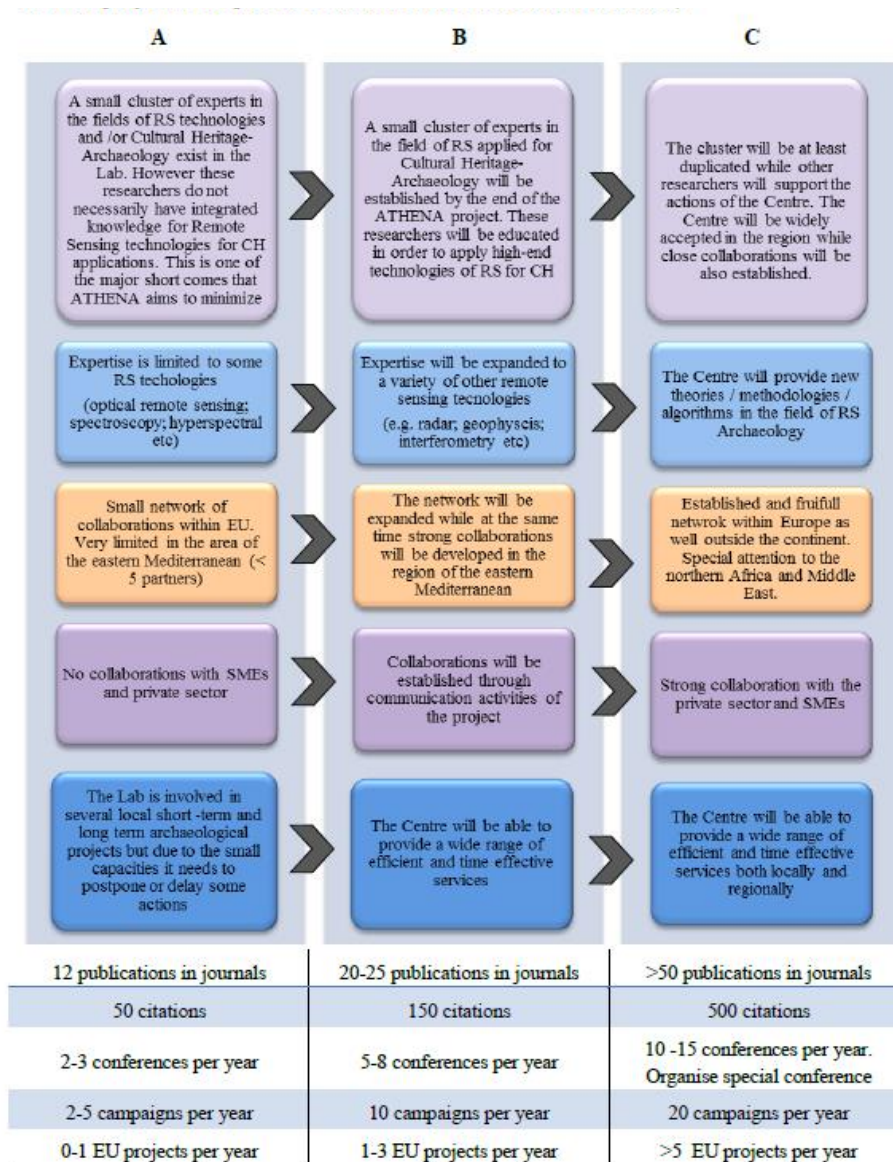
2.3. *Impact*

The information provided on section 2.1 of the DoA in relation to the Expected impacts, is still relevant. Through the various dissemination actions that have been accomplished until the present report, the goals set out in the expected impact of the proposal have been rigorously achieved. More specifically, it is wished to become evidenced by the Coordinator of the project, as well as by the rest of the consortium partners, that through the ATHENA project and the establishment of the Center of Excellence in Cyprus (at CUT), the Remote Sensing research activity in Cyprus for Archaeology and Cultural Heritage fields has been increased. At the same time, the twinning to institutions from high performing member states, operating in the field (CNR and DLR) aided towards the creation of a favourable environment for collaborative activities, while it helped for boosting innovation performance in Cyprus. Furthermore, this twinning action has significantly supported the networking of the low performing country (Cyprus through the CUT) with European and International institutions and other organisations employing Remote Sensing techniques for Cultural Heritage issues. This has been achieved in various ways, as for example through the combination of the training activities and/or meetings of the ATHENA project during well-known scientific conferences.

An impact in local level, deals with the presentation of the project to stakeholders related both to Remote Sensing and Cultural Heritage. The project has been exposed to the Ministry of Education and Culture of Cyprus and to the Department of Cultural Services. As an outcome of the meeting, a memorandum of understanding will be signed, through which future common activities will be discussed and materialized. Towards this direction, the meeting with the Ministry of Transport and representatives from the Department of Antiquities (responsible authority for the antiquities and Cultural Heritage) and the Department of Telecommunications (responsible for earth observation and remote sensing) had great success since the participating governmental bodies demonstrated great interest towards the potentialities of Remote Sensing for archaeological needs and highlighted emerging needs of their departments which could be treated using remote sensing.

Up to date project's impact in a society level, has been extremely important since researchers from the Project Coordinator (Cyprus University of Technology) have presented their work related to ATHENA, to students and teachers from elementary and higher school level, laying thus the groundwork for future growth. A great response has been obtained from the part of the aforementioned target group, asking to repeat this type of activity to be further infiltrate in schools of Cyprus.

Regarding specific indicators as those have been laid out in the Expected impact field of the proposal (refer to image below), the Current Status (A) has been outlined through the deliverables of WP3, while the road for the status upon completion of the project (B) has been paved.



2.4. Access provisions to Research Infrastructures

Not applicable.

3. Update of the plan for exploitation and dissemination of result (if applicable)

Not applicable.

4. Update of the data management plan (if applicable)

Not applicable.

5. Follow-up of recommendations and comments from previous review(s) (if applicable)

Not applicable.

6. Deviations from Annex 1 and Annex 2 (if applicable)***For CUT (Coordinator): Use of resources***

Overall the Other Direct Costs for CUT was less than 15%. However, during the first 15 months of the project, several activities have been carried out (such as open fees for publications; conference registrations, travels etc.), while part of the Other Direct Costs allocated for CUT have been used for dissemination purposes (such as flyers, printed material and other), actions considered necessary to be accomplished by the first year of the project. This accumulation of important activities led to surpass the 15%, however the overall Other Direct Costs category for the whole duration of the project will not be altered.

Annex A**QUESTIONNAIRE ANNEXED TO PART B OF THE PERIODIC REPORT****H2020-TWINN-2015****First Reporting Period Review**

1. *How has the Twinning exercise so far, helped to raise the research profile of the coordinating institution within the country and abroad?*

Even though the ATHENA project was officially launched 15 months before today (i.e. period covering the first reporting review), the project had immediately a significant impact to the coordinating institution (CUT), intrinsic to the positive evaluation and consequently funding of the project. Firstly, it gave the unique opportunity to a low performing country (Cyprus) to lead a H2020 project by its twinning to leading institutions and organizations of Europe, namely CNR and DLR. These high performing institutions have from the beginning closely collaborated with the coordinator in order to maximize the impact of the outcomes and deliverables. New topics, such as Copernicus products, active satellite sensors, interferometry, geophysical prospection, looting etc. have been added in the “agenda” of the CUT team members, who had the chance to see in practice for the specific needs of cultural heritage, their use and benefits. Another point, quite interesting for CUT, is the fact that ATHENA project has opened a fruitful and continuous dialogue between CUT team members and the local stakeholders. Already some bilateral agreements (i.e. MoU) will be signed shortly providing an added value for the coordinating institution.

Furthermore, Twinning exercise offered the opportunity to the coordinating institution research members to come in contact under an official framework, that of ATHENA project, with other European institutions, present the project and their work in scientific conferences and thus create new collaborations.

Finally, ATHENA has provided a great opportunity to seek and expand the research capabilities of the local team members, working with the leading institutions, in regions beyond Cyprus. We think, that the significant amount of publications carried out until now demonstrates the impact of the ATHENA project to the local team members.

2. *How has the Twinning exercise so far, helped to raise the research excellence of the coordinating institution in the chosen field of research?*

ATHENA has opened up new horizons in the field of remote sensing archaeology and cultural heritage. Prior to ATHENA project, local team members were mainly focused in optical remote sensing and some other relevant issues. Through the various activities of the ATHENA project (e.g. workshops, virtual trainings, common publications) the local team members had a unique opportunity to work in new research fields and consequently expand and raise their research excellence through scientific publication in peer reviewed journals.

3. Have you seen so far a leap forward in terms of reputation, attractiveness and opening of new networks of the coordinating institution as a result of the Twinning exercise?

During the ATHENA project, CUT team members have raised significantly their research excellence and this has been also linked to the reputation and attractiveness of the local institution. Recent success of CUT in relevant research projects, are linked with the ATHENA impact (e.g. H2020, Interreg calls etc). In addition, special sessions (e.g. EGU), special books (e.g. Springer), special issues in high prestigious journals (e.g. JAS Reports, MDPI) are also means of the success of the Twinning project. A last achievement, was the positive evaluation and funding (as per September 2017) of the H2020 Teaming call Phase one, where the Twinning exercise through the ATHENA project worked as a springboard towards this success.

4. Has there been an improvement in terms of being able to attract more competitive research funding (national/EU/international) by the coordinating institution as a result of the Twinning exercise?

Yes, ATHENA project has helped to attract competitive research funds such as H2020 Teaming projects (2017) and Interreg CY-Gr project (2017), relevant to the topics of the Twinning project. In addition, other proposals are under evaluation with relevant topics to the ATHENA project in national and EU.

5. How have the non-Widening consortium beneficiaries contributed so far, and how have they been effecting and optimising the low performing partner institutions, in the Widening country?

Both CNR and DLR have been working closely together with CUT, so as to maximize the impact of the workshops and training sessions (e.g. to build the material upon the profile of the CUT researchers). In addition, non-Widening consortium team members have been

physical present in the meetings with the local stakeholders, providing in this way their experience and know how. Last, but not least, CNR and DLR have used their networks and connections in order to bring them closely to the CUT team members, favoring new collaboration for the Widening consortium beneficiary.

6. *What were the main measures applied during the implementation of the Action so far, which have significantly enhanced the expected impacts of the project (i.e. staff exchanges, experts visits, short-term onsite or visual trainings, workshops, conferences' attendance, organisation of joint summer schools type activities, dissemination, exploitation, outreach activities, etc.)?*

Mainly workshops have been enhanced the expected impact of the project since it provided a very good opportunity to demonstrated the expertise of the local team members in a wider relevant audience. In addition, these workshops have been also a mean to meet and discuss with other researchers relevant issues and future collaboration. Staff exchange was also very useful, linked with the physical excursions to cultural heritage sites of Cyprus, so as to better understand the local needs and problems.

7. *Any other aspects/points that you would like to communicate to the European Commission? Any particular difficulties or benefits at a consortium level?*

-

Annex B**Reply to the Interim Report Comments.**

Periodic technical report, Part A: Section 9. Gender. Please specify the gender of the researchers involved in the project and the gender dimension in the project

Section 9 has been completed in Part A. No gender dimension is involved in the project. The gender of the researchers involved in the project has been also added.

Periodic technical report, Part B:- Under Section 6 Deviation form Annex I and Annex II - Technical Report, please report briefly on the occurred costs (Other Direct Costs - Travel) that were not foreseen/described in the Description of Action

Overall the Other Direct Costs for CUT was less than 15%. However, during the first 15 months of the project, several activities have been carried out (such as open fees for publications; conference registrations, travels etc.), while part of the Other Direct Costs allocated for CUT have been used for dissemination purposes (such as flyers, printed material and other), actions considered necessary to be accomplished by the first year of the project. This accumulation of important activities led to surpass the 15%, however the overall Other Direct Costs category for the whole duration of the project will not be altered.

Periodic technical report, Part B:Section 1.2.1 Work Package 1, Deliverable D1.5: This deliverable reproduces the same information presented in the Core part of the Periodic Technical report and the deliverable is flagged as "public". Therefore the information reported under D.1.5 is assessed while analysing the Core part of the Technical Report however, approval will not be given in the "Participant Portal so to avoid the publication of confidential information included in the Periodic report.

Yes, we agree with the above statement. D.1.5 should be flagged as "Confidential".

Section 1.2.2 Work Package 2

- Deviation from DoA in the leadership of the D2.2 => CUT instead of CNR originally planned. The same of activities reported in WP 4 (DLP was originally indicated while

CNR&DLR are currently leading the WP's activities). Please report and justify the change in the technical report Section 6 - Deviations from Annex I and Annex II

As far as the leadership of D2.2 concerns, there is no deviation from the DoA, since CNR was originally planned as the responsible institution for the said deliverable. Please note that CUT is responsible for one of the Tasks related to the D2.2. (please refer to Grant Agreement specifically “Description of work and role of partners“ for WP2 at page 98 and Table 1.3.2 “List of deliverables” at page 89-92)

Regarding WP4 no deviations have been occurred. DLR, as initially planned, is the Leader of the entire WP4, but the various activities of the WP are led both by CNR and DLR since they concern the various trainings and knowledge transfer actions from the two institutions to the Widening partner (Cyprus-CUT) (please refer to Grant Agreement specifically “Description of work and role of partners“ for WP4 at pages 103-105 and Table 1.3.2 “List of deliverables” at page 89-92)