

ERATOSTHENES Centre of
Excellence (ECoE)



1st virtual EXCELSIOR International Technical Workshop

15 July 2020

**Ground-based remote sensing supersite for atmospheric/climate research,
satellite calibration, and support of local services**

@excelsior2020eu



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TROPOS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857510



This project has received funding from the Government of the Republic of Cyprus through the Directorate General of the European's Programmes, Coordination and Development

CONSORTIUM



Overview

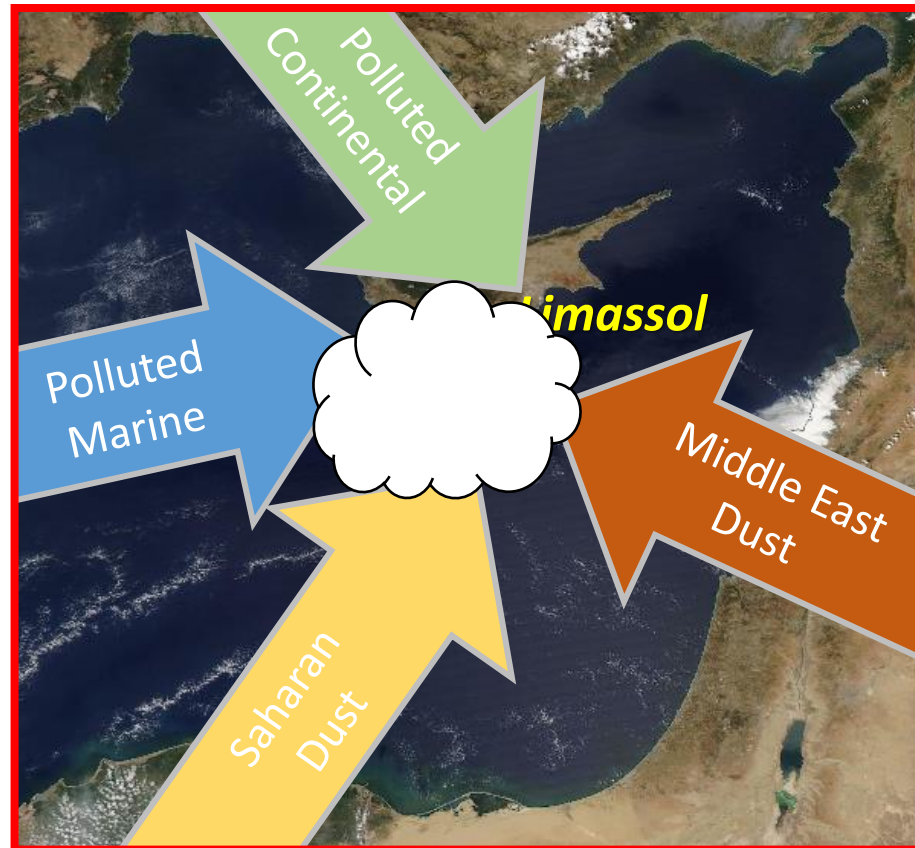
1. Introduction
2. CyCARE campaign at Limassol (2016—2018)
3. Validation of global satellite observations with PollyXT
4. Combined ground-based / spaceborne measurements of precipitation in EMMENA
5. Summary and outlook

1. Introduction / Motivation

- What impact do aerosol particles have on rain formation?
- How does air motion influence dust transport and/or air quality?
- Which precipitation forming process is dominating in the eastern Mediterranean? (Homogeneous freezing, heterogeneous freezing, warm rain)


→ **Cyprus is an ideal location to answer these questions...**

Cyprus – hot spot in the middle of the dust belt



Limassol – a dust hot spot not only in theory...



A satellite image of Cyprus is shown with a semi-transparent white overlay. The overlay contains a map outline of the island. The text is centered within this overlay.

2. CyCARE campaign at Limassol (2016—2018)

LACROS at Limassol during CyCARE

(Cyprus Aerosol, Clouds and Rain Experiment, Limassol, 2016—2018)



LACROS at Limassol during CyCARE



LACROS at Limassol during CyCARE

Microwave
radiometer
(water vapor)

Cloud radar
(clouds and rain)

Doppler lidar
(wind speed)

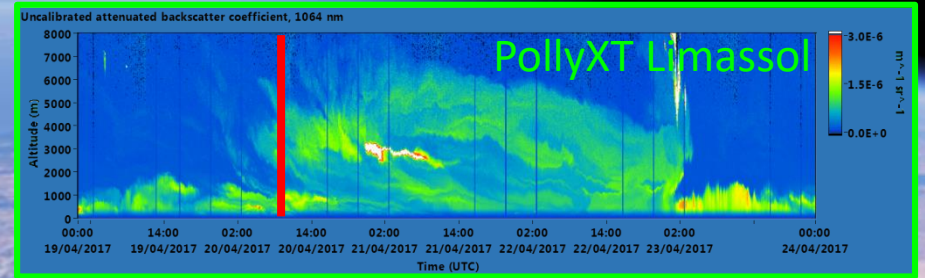
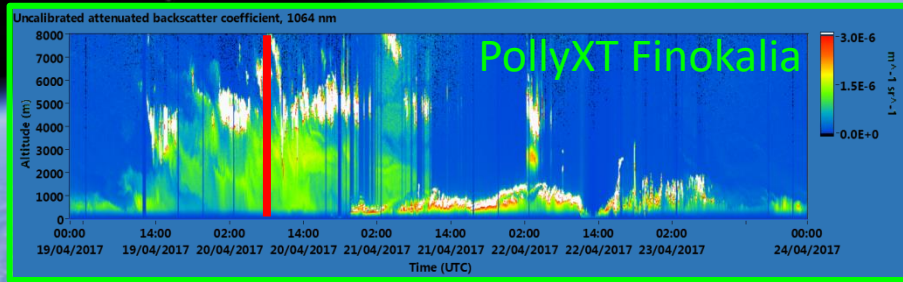
Disdro-
meter
(rain)

Raman lidar
(aerosol and
dust)

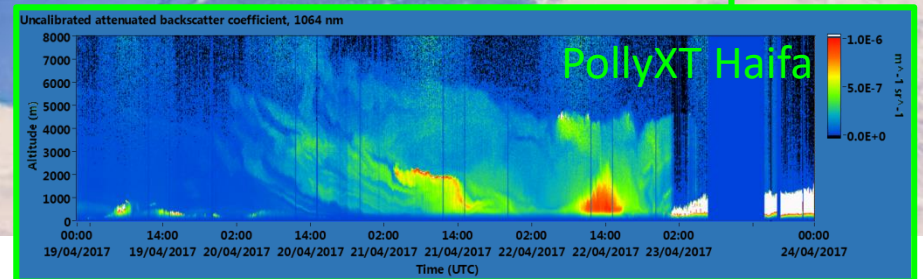
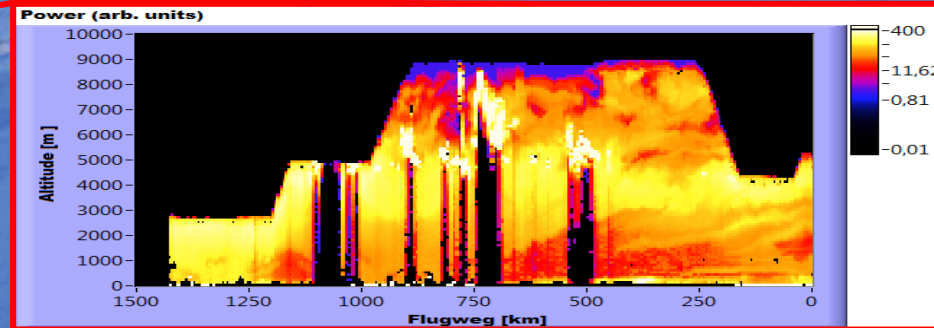


20 April 2017

Saharan dust outbreak

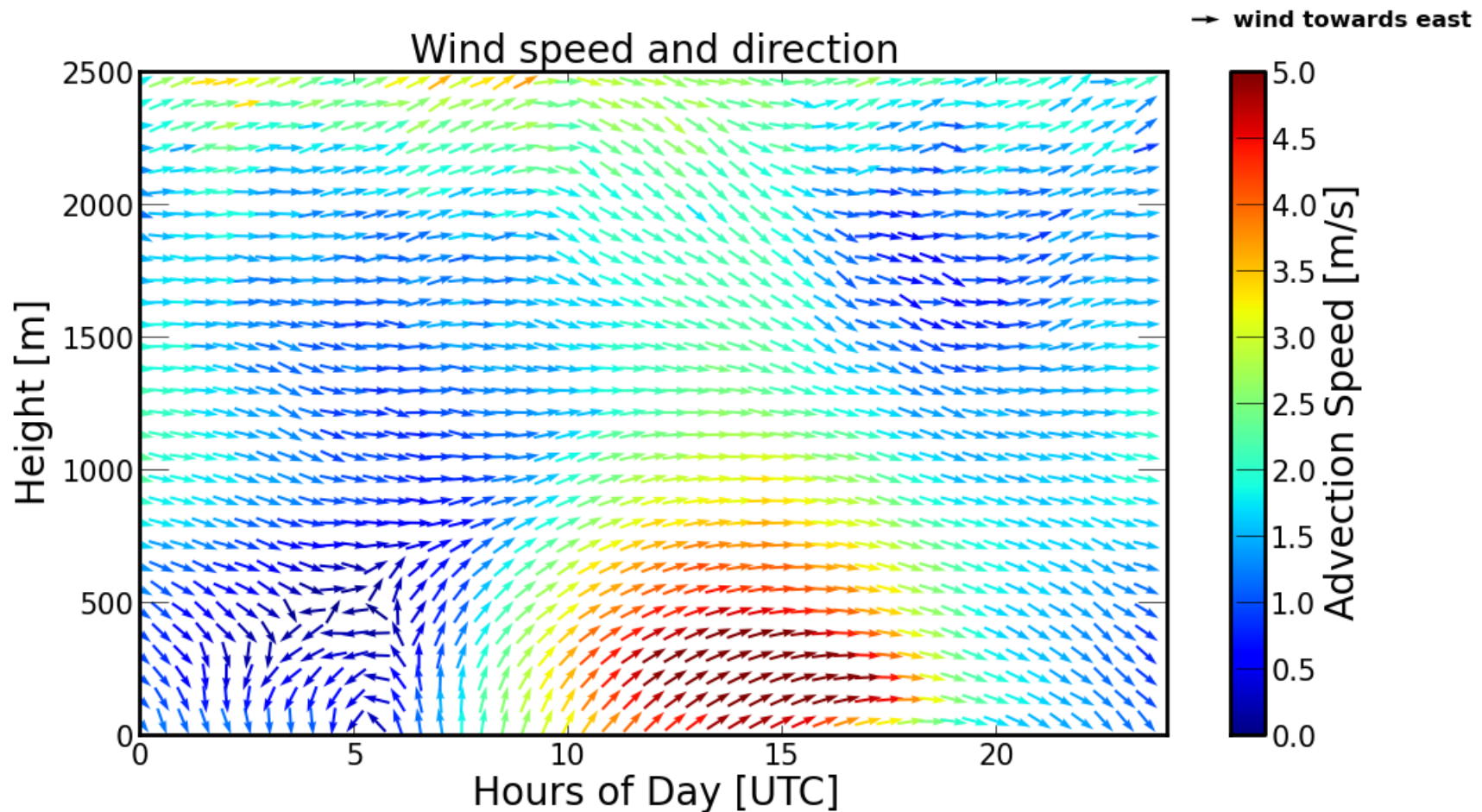


← to Malta

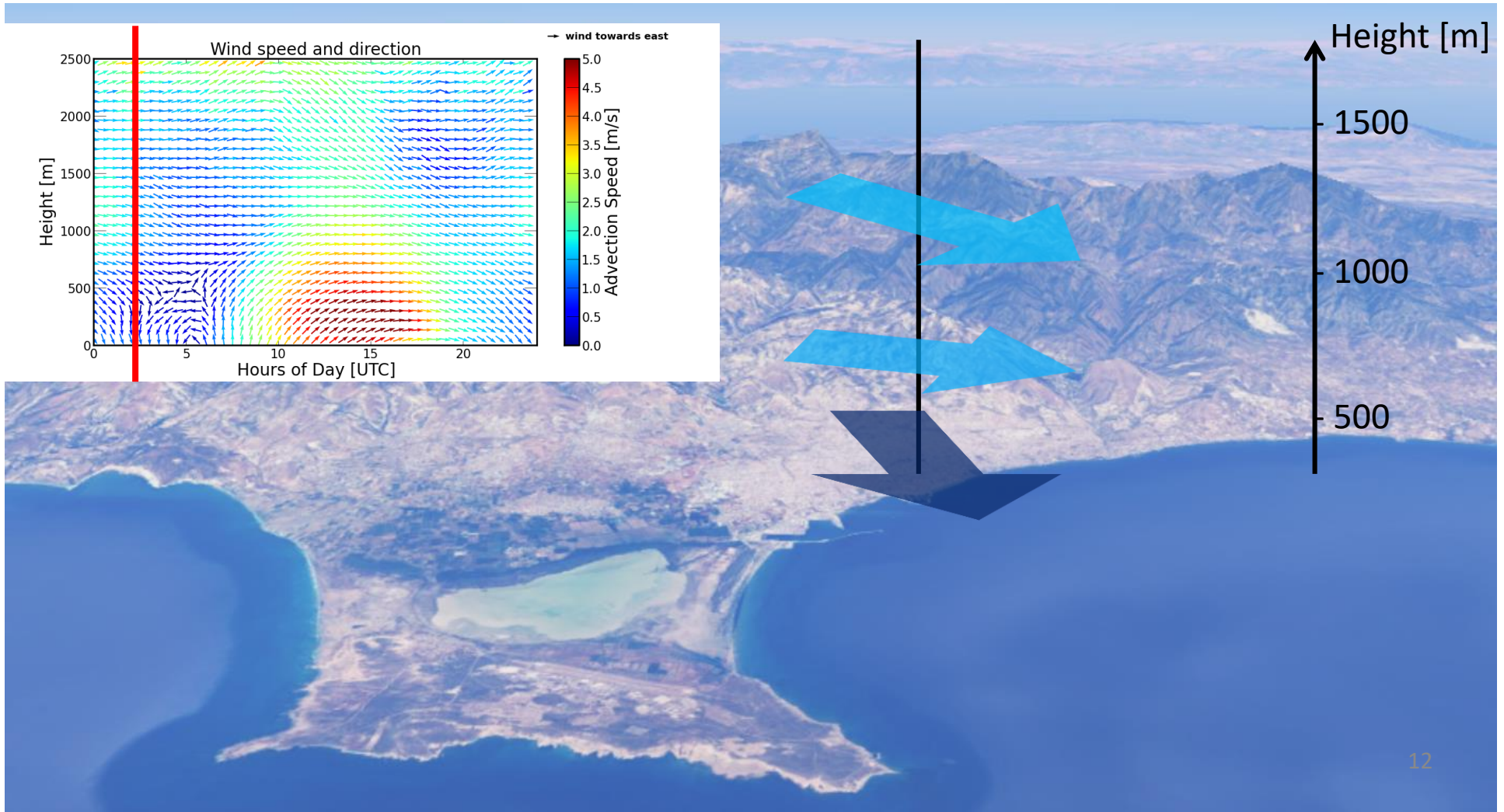
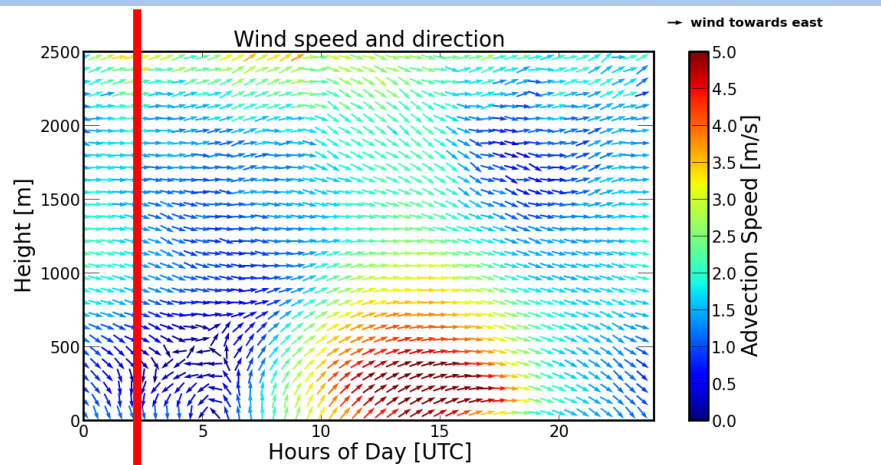


Local air dynamics at Limassol

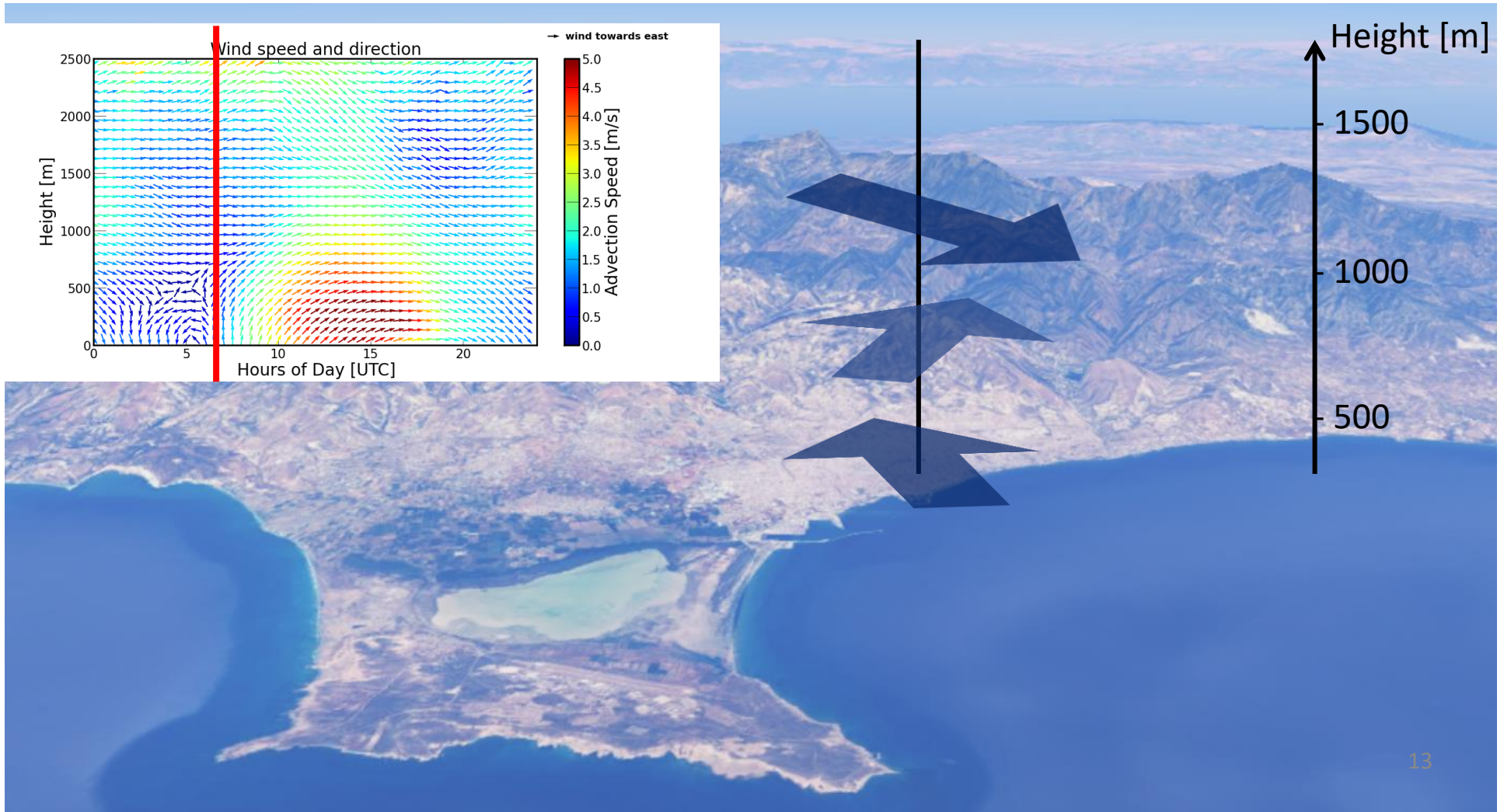
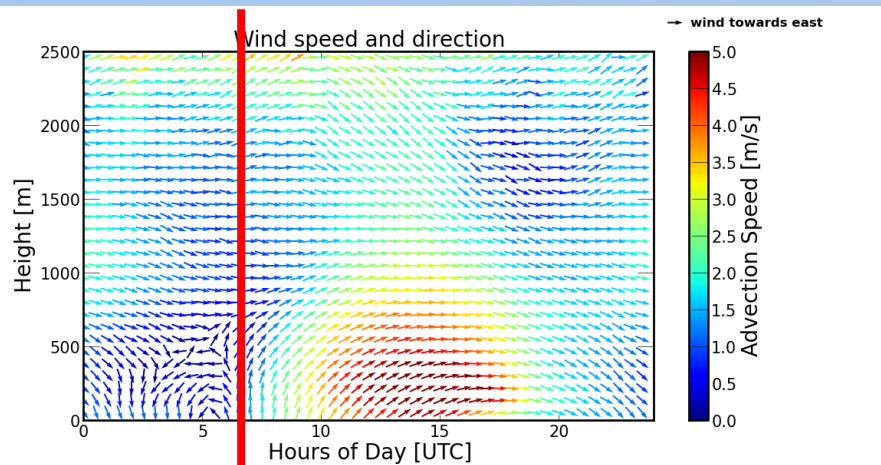
*One-year vector average of horizontal wind
(October 2016 – October 2017)*



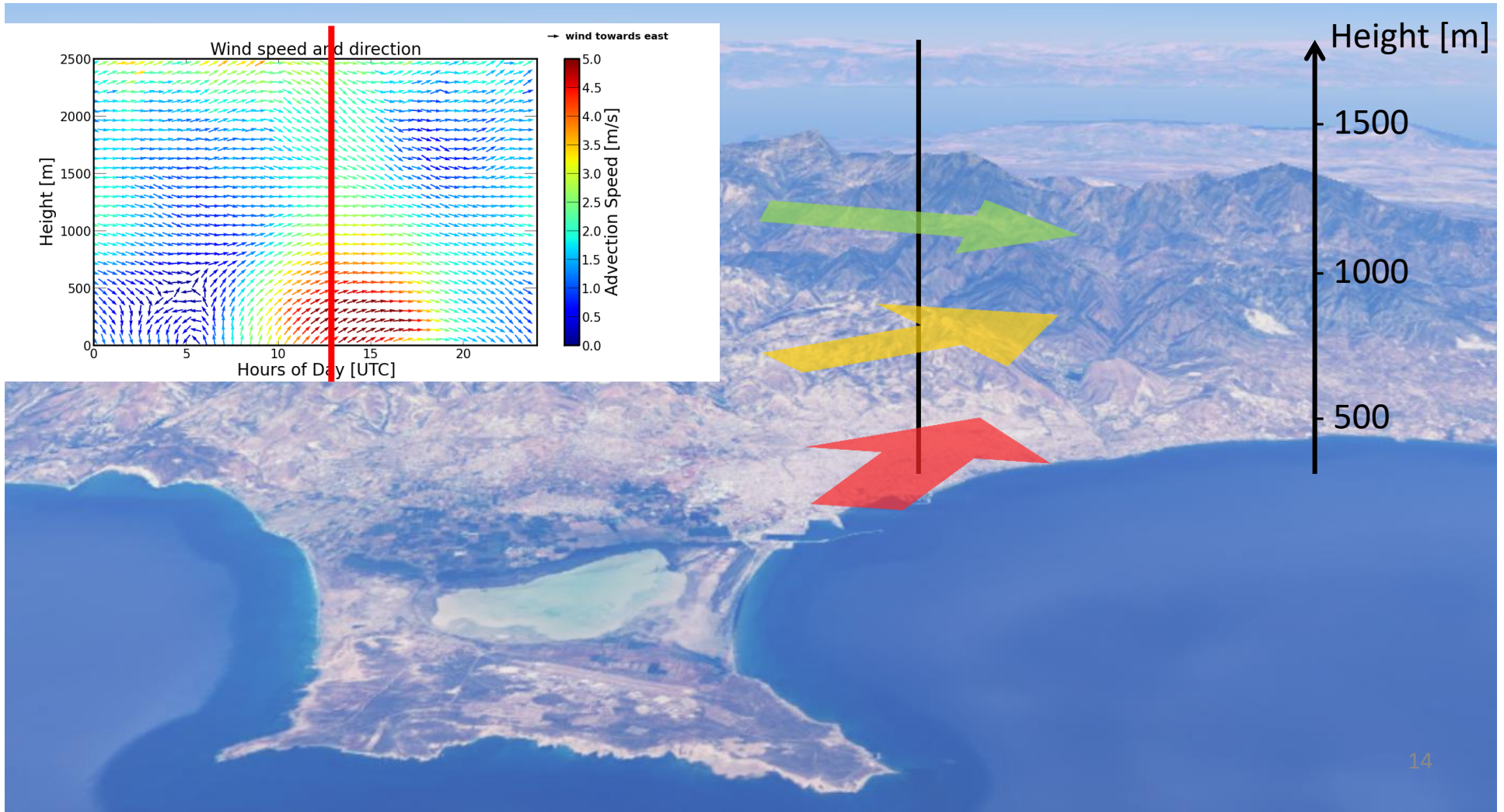
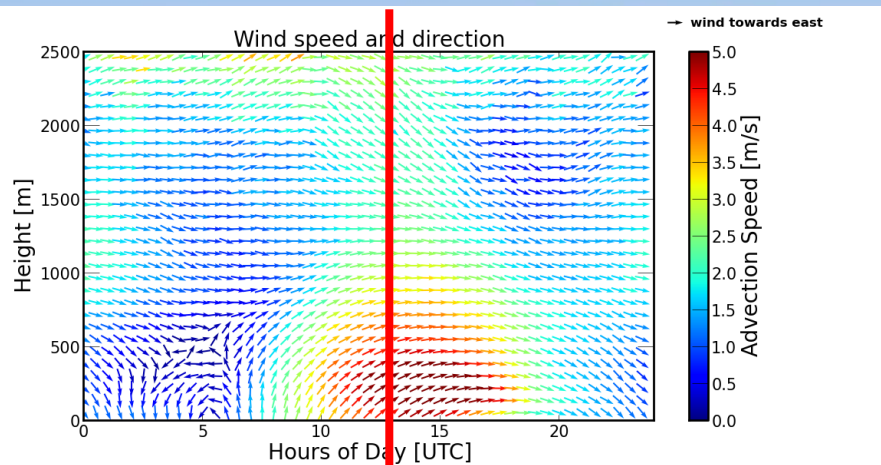
Local air dynamics at Limassol



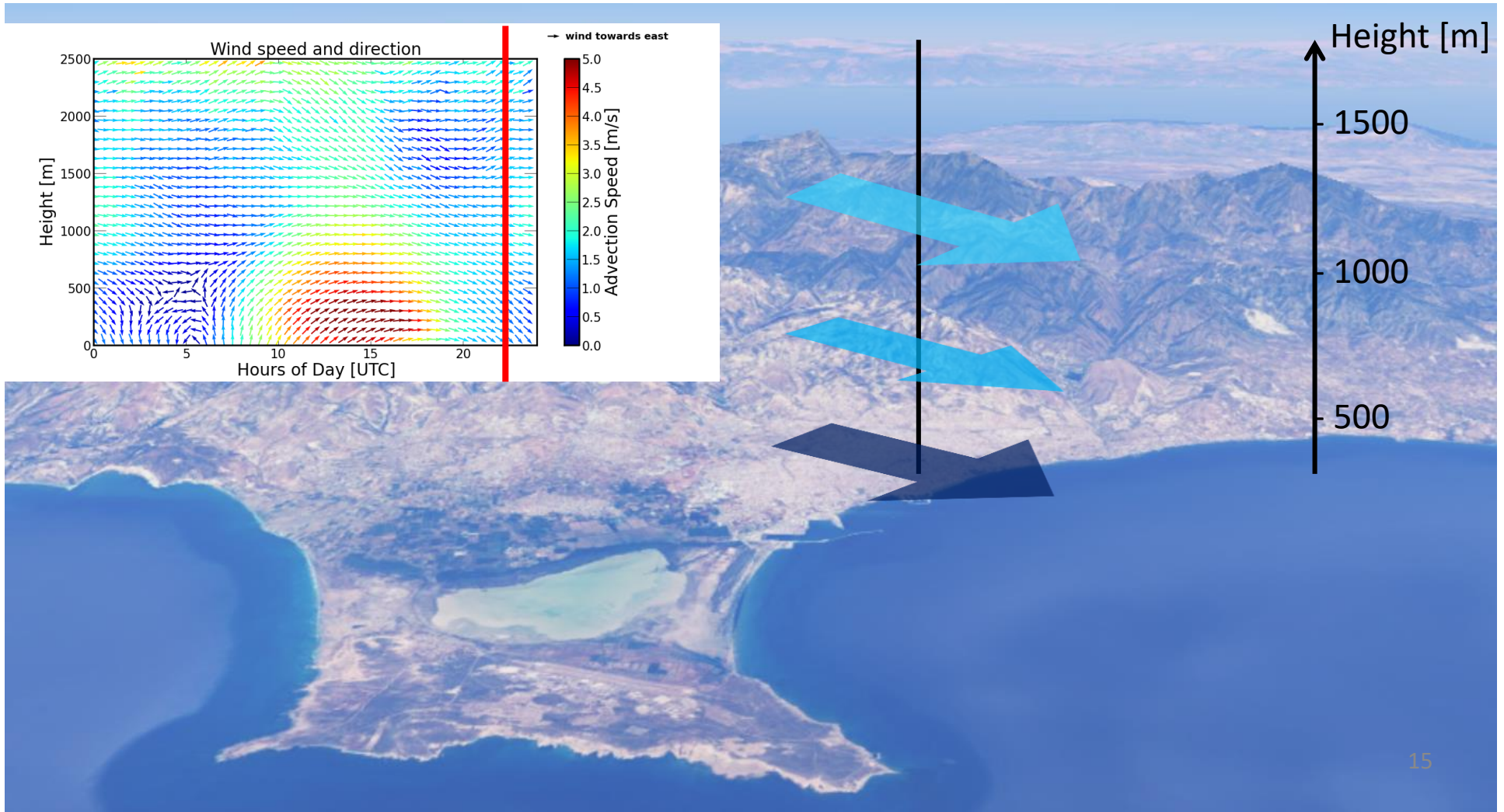
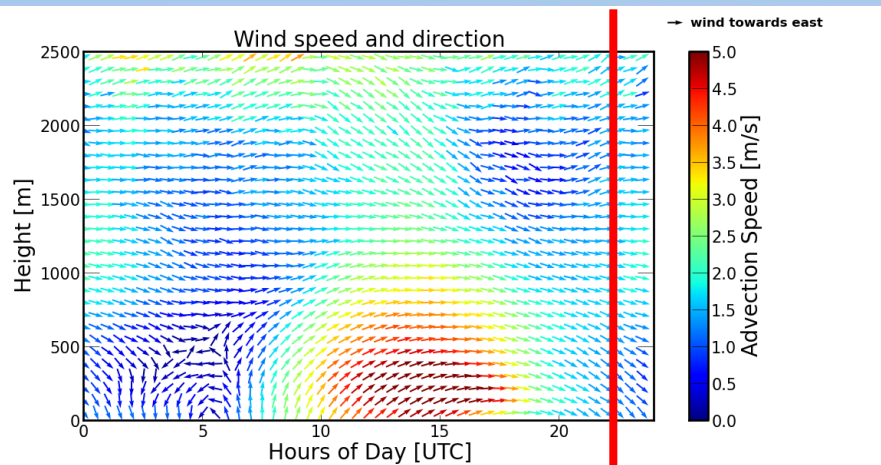
Local air dynamics at Limassol



Local air dynamics at Limassol



Local air dynamics at Limassol



The background image shows an outdoor research facility. In the foreground, there are several white and blue containers or equipment racks. One container has a yellow warning sign. In the background, there is a building with a red roof and some trees. The sky is blue with some clouds.

And now the EXCELSIOR Teaming project:

**Copy & paste LACROS and run it
continuously at Limassol at the
ERATOSTHENES Center of Excellence.**

First step done: Brand-New ECoE-PollyXT built at TROPOS

Crane
(packed)

Roof platform

← PollyXT-
Lidar (inside)

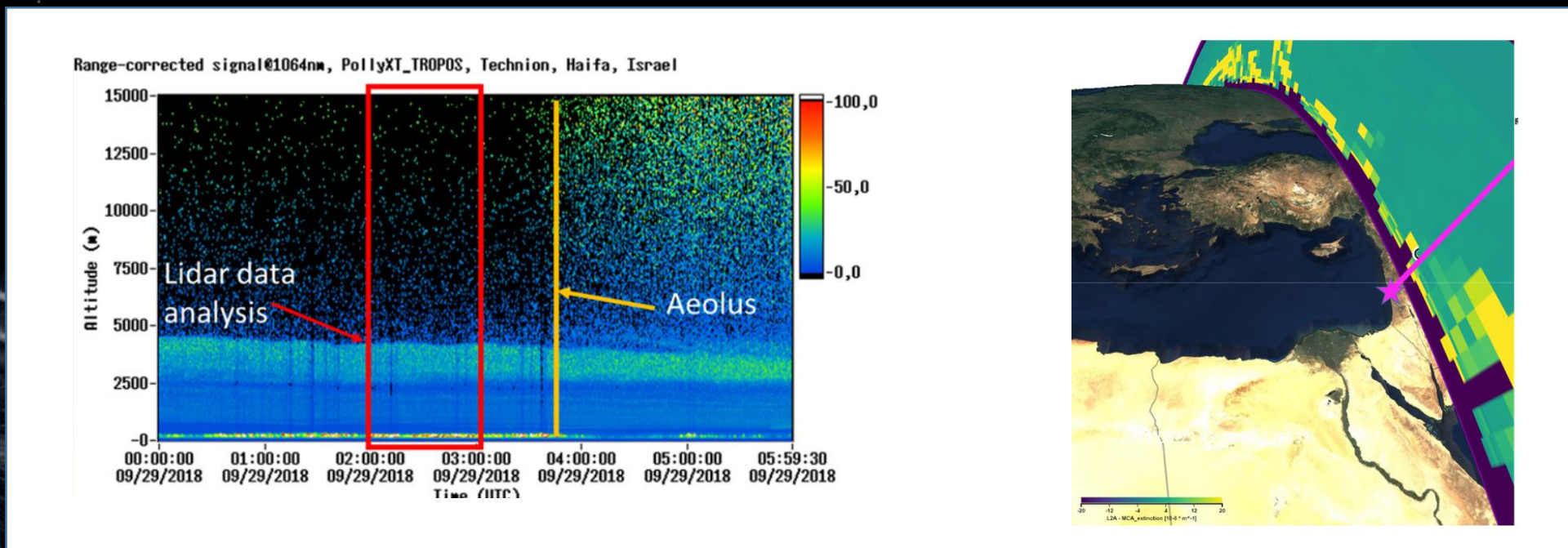
Water reservoir for
automated window
cleaning

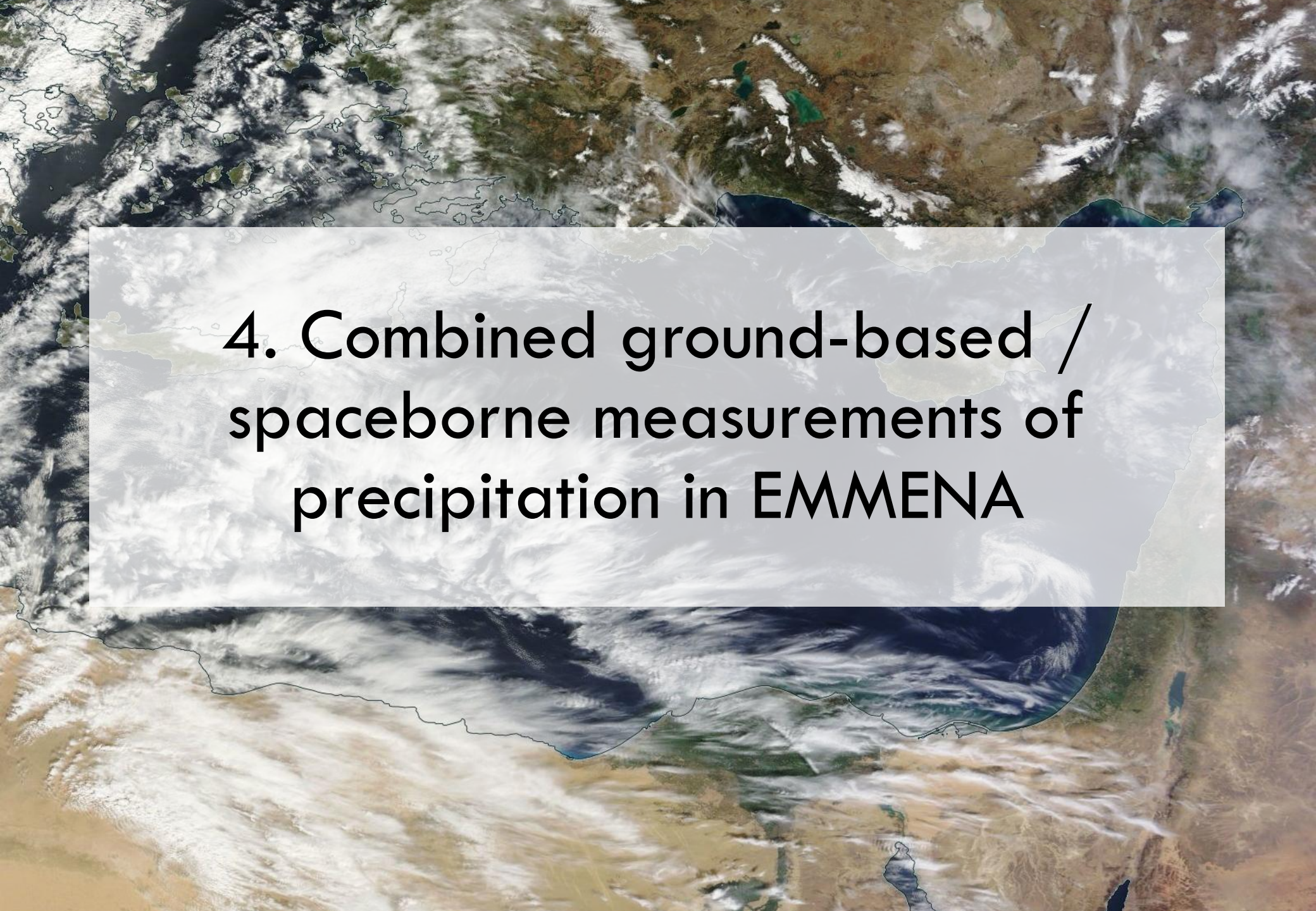


A satellite image of Earth showing a large-scale weather system, likely a cyclone or storm, over the Indian Ocean. The image displays swirling white clouds over a dark blue ocean, with landmasses visible in shades of brown and green. A semi-transparent white box is overlaid on the center of the image, containing the text.

3. Validation of global satellite observations with PollyXT

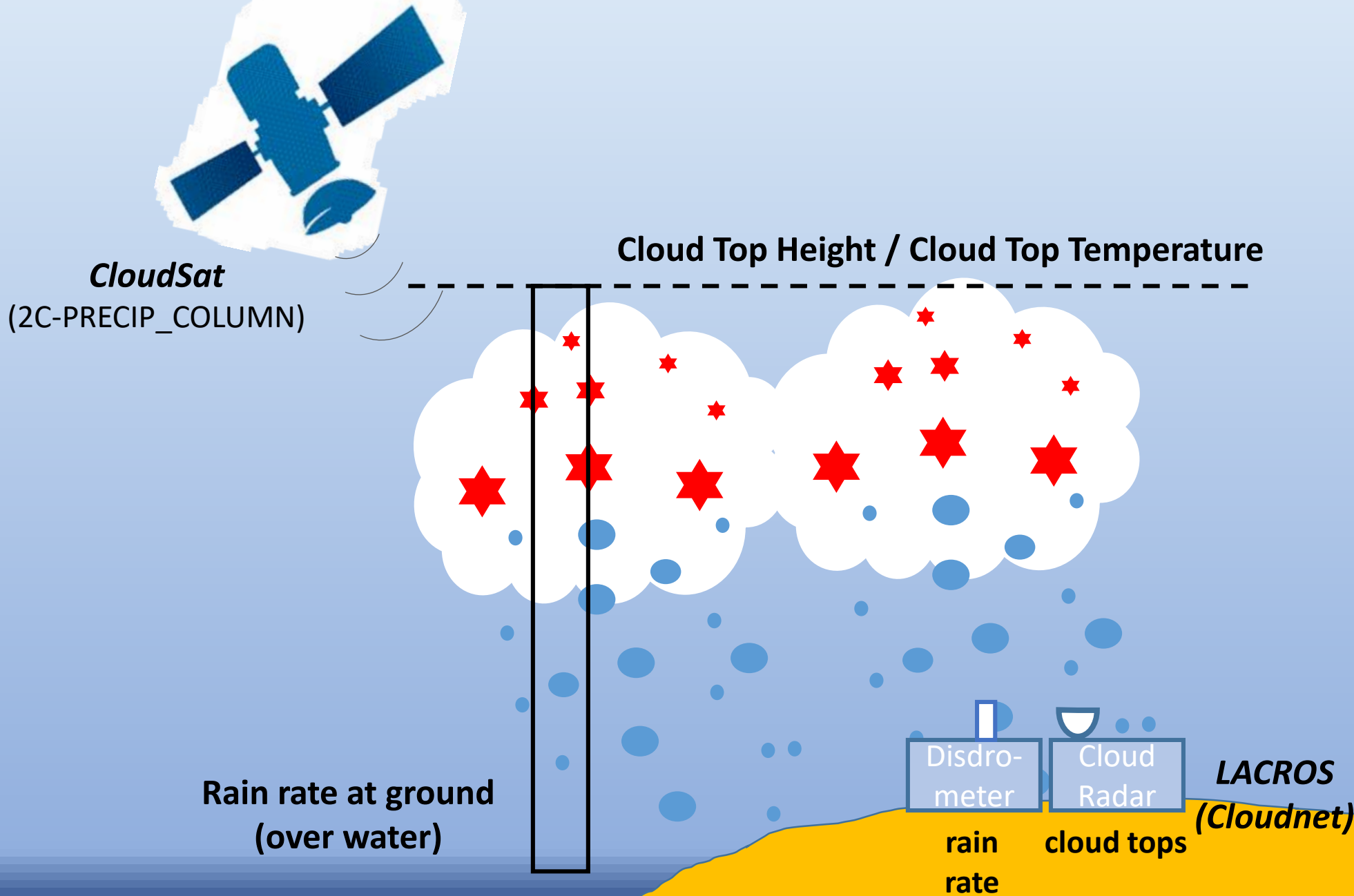
AEOLUS satellite cal/val in the eastern mediterranean



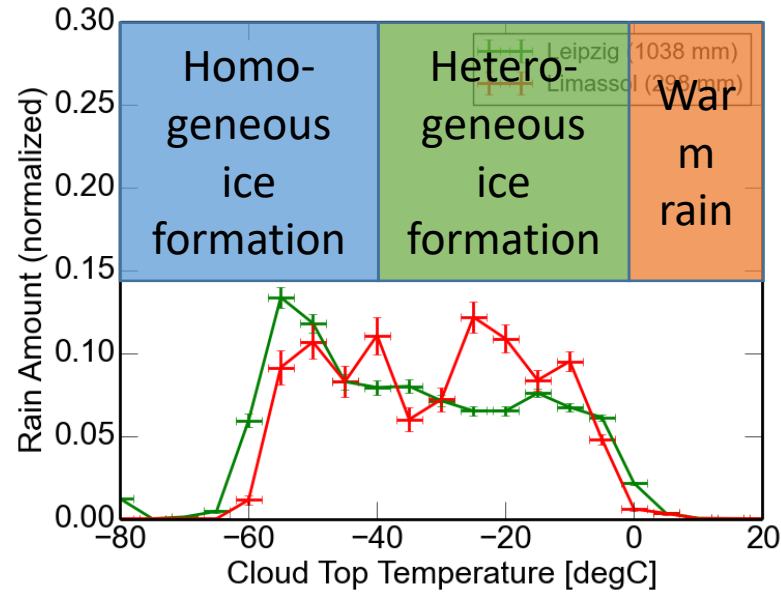
A satellite image of the Middle East region, showing the Mediterranean Sea to the west, the Red Sea to the south, and the Persian Gulf to the east. The landmasses are visible with various colors representing vegetation and terrain. A semi-transparent white rectangular box is overlaid in the center of the image, containing the text.

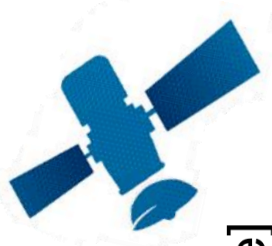
4. Combined ground-based / spaceborne measurements of precipitation in EMMENA

Global observations of rain formation

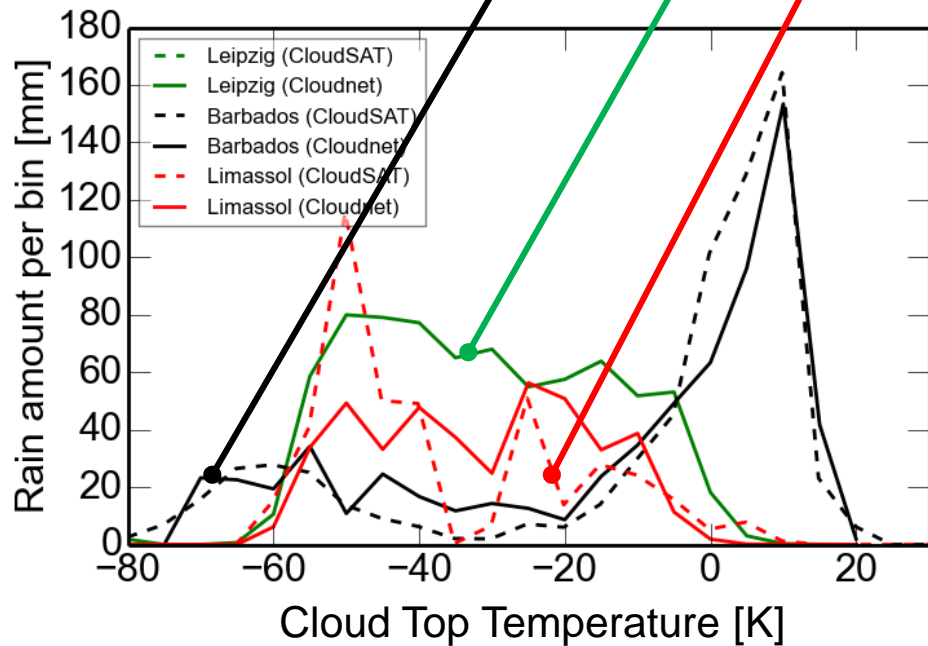
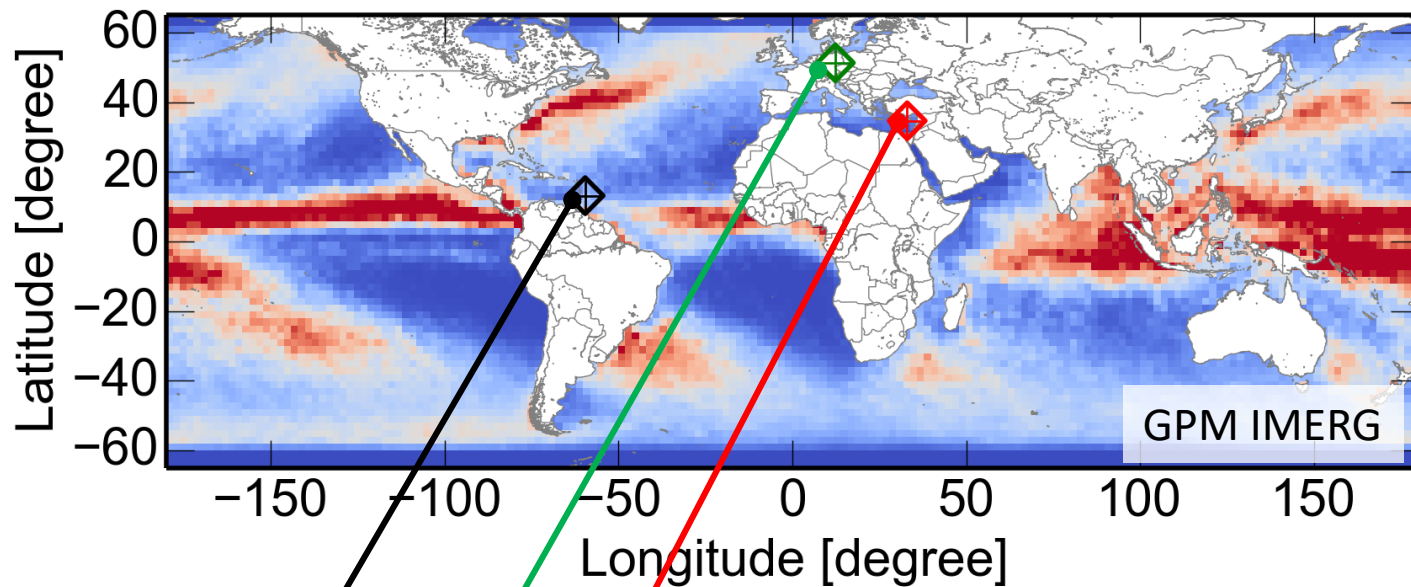


Temperature impact on precipitation formation (**LACROS** measurements)

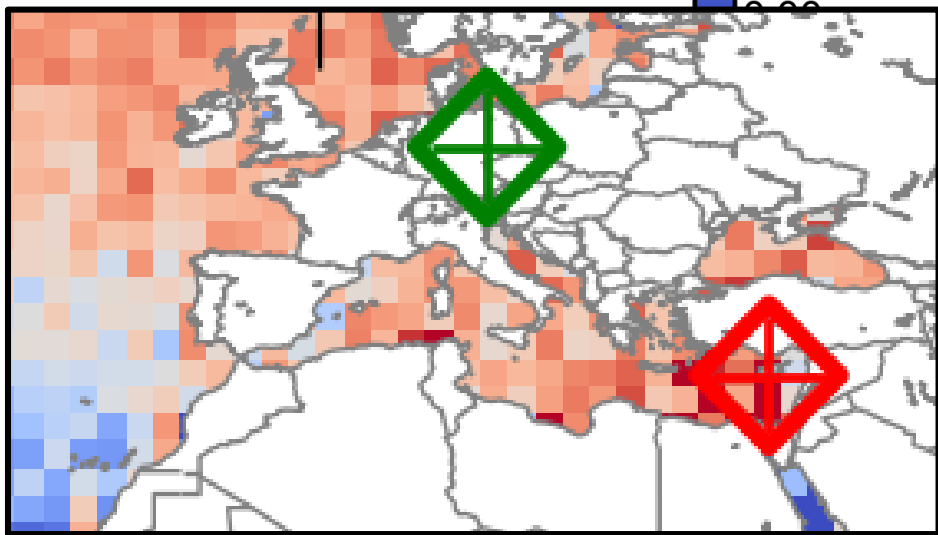
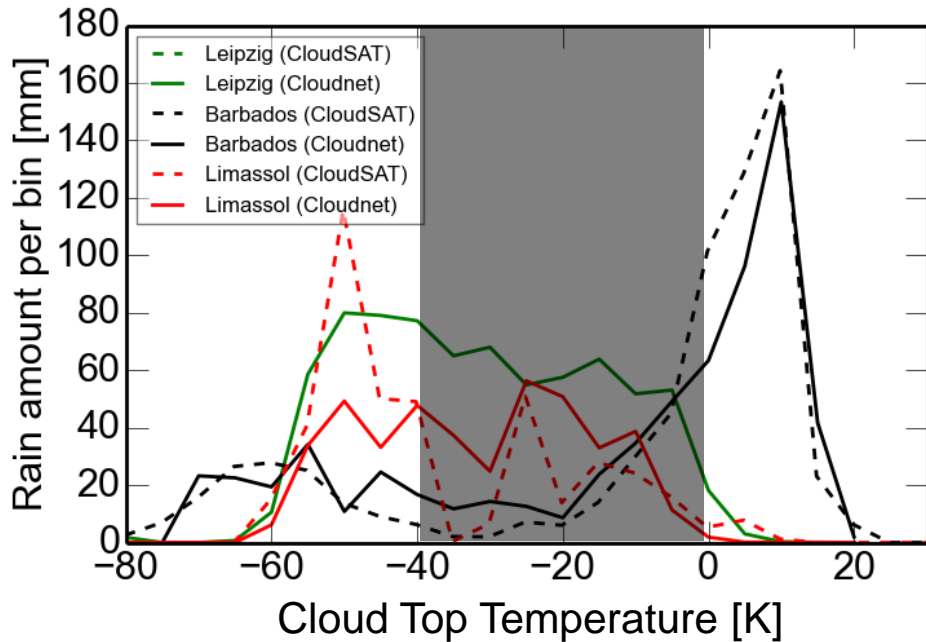
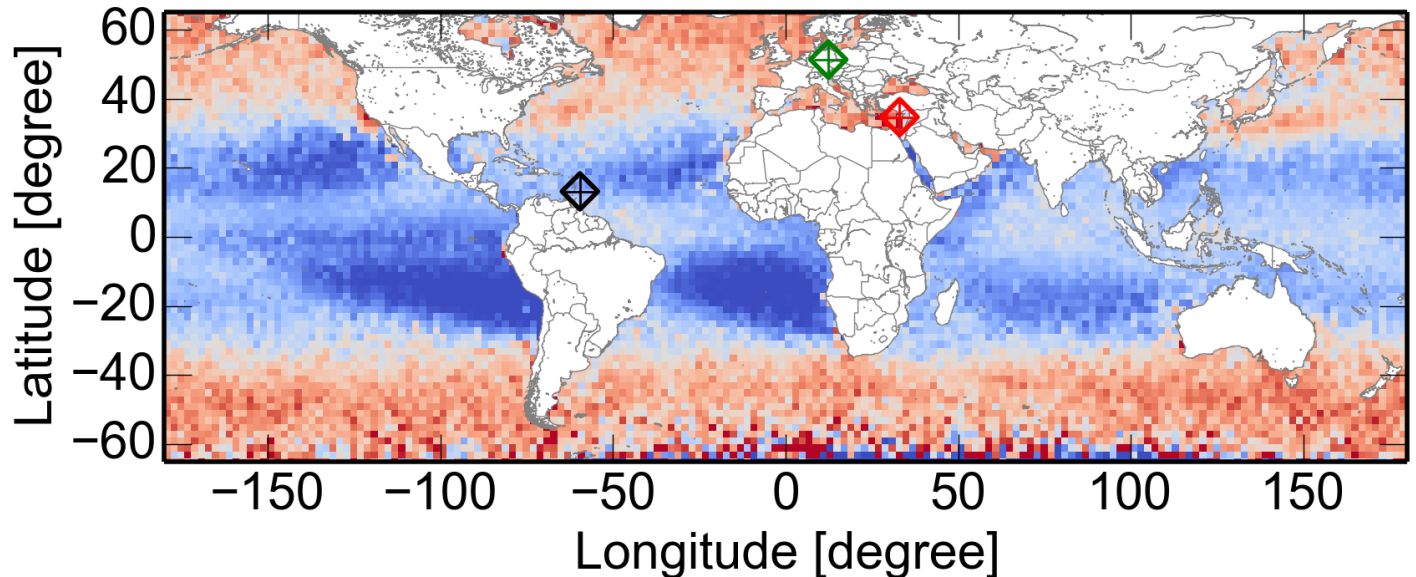




CloudSat measurements



Ratio of heterogeneously formed rain



5. Summary & Outlook

- Cyprus is an ideal location for aerosol & cloud related research in the center of the dust belt
- The ERATOSTHENES Center of Excellence will be equipped with a ground-based remote-sensing supersite (GBS) to get a kick-start into state-of-the-art atmospheric research
- The supersite will support independent research, satellite cal/val activities and be a research „light house“ for the EMMENA region

THANK YOU FOR YOUR ATTENTION

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The project EXCELSIOR has received funding under Horizon 2020
WIDESPREAD-01-2018-2019: Teaming Phase 2
Coordination and support action
Grant agreement No. 857510
Proposal acronym: EXCELSIOR



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Activities on Cyprus during CyCARE (October 2016 to August 2017)



x Agia Marina
UAV flights (Cyprus Institute, Nicosia)
In-situ measurements



x Paphos
DLR Falcon
(B. Weinzierl)
IOP: April 2017

x Limassol

LACROS (TROPOS / CUT-TEPAK)

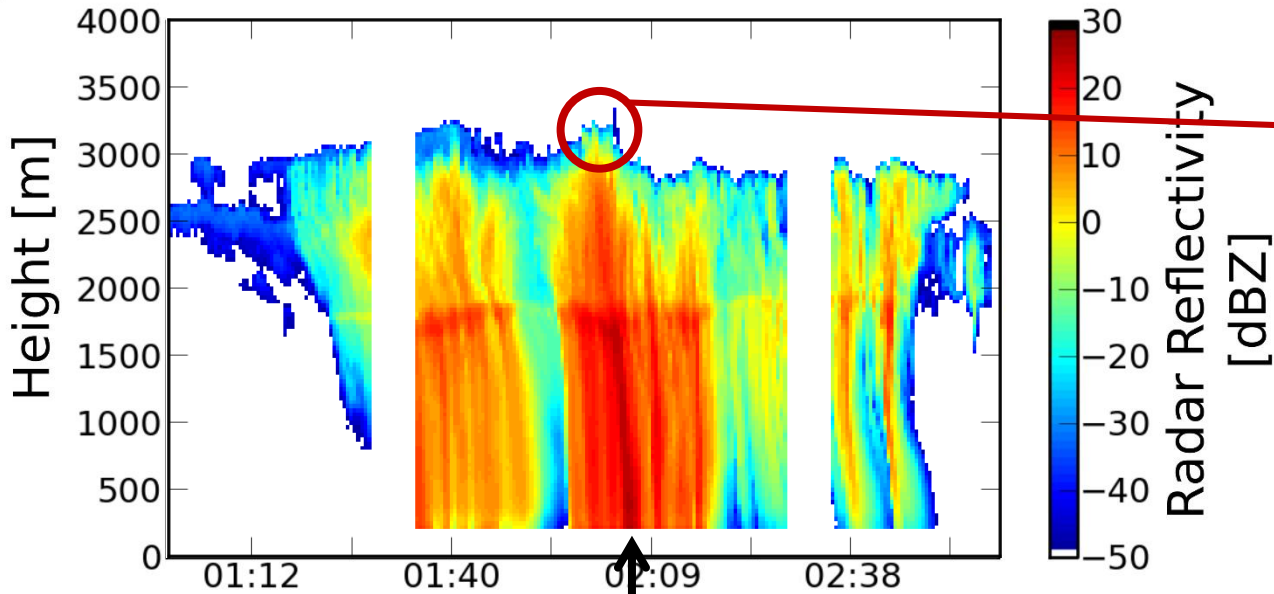
Doppler-Depol lidar (FMI)

POLIS (LMU Munich)

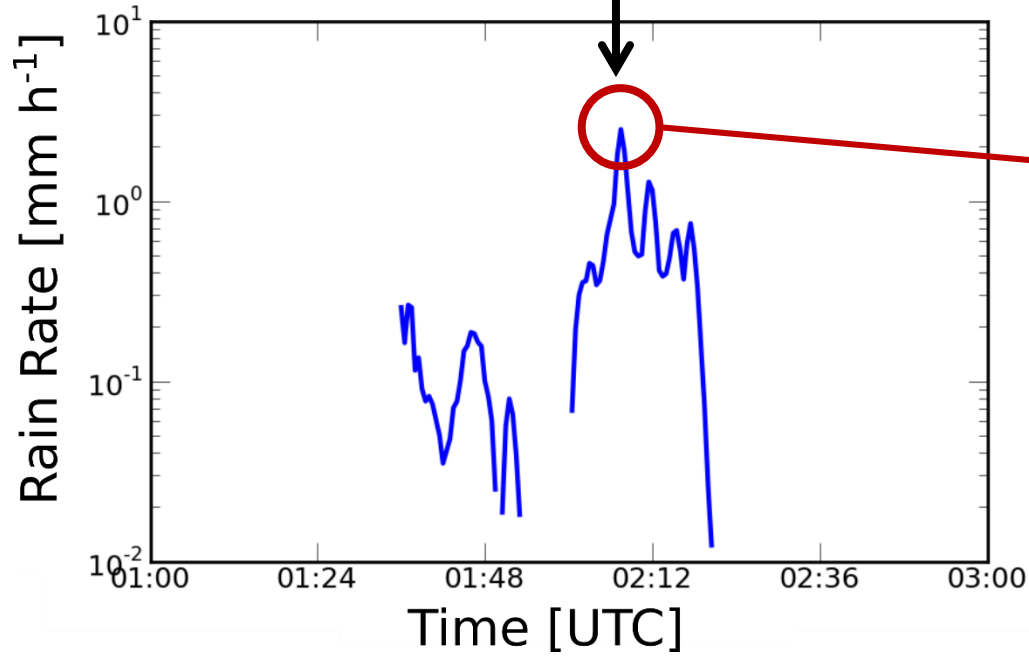
In-Situ (University of Herfordshire)



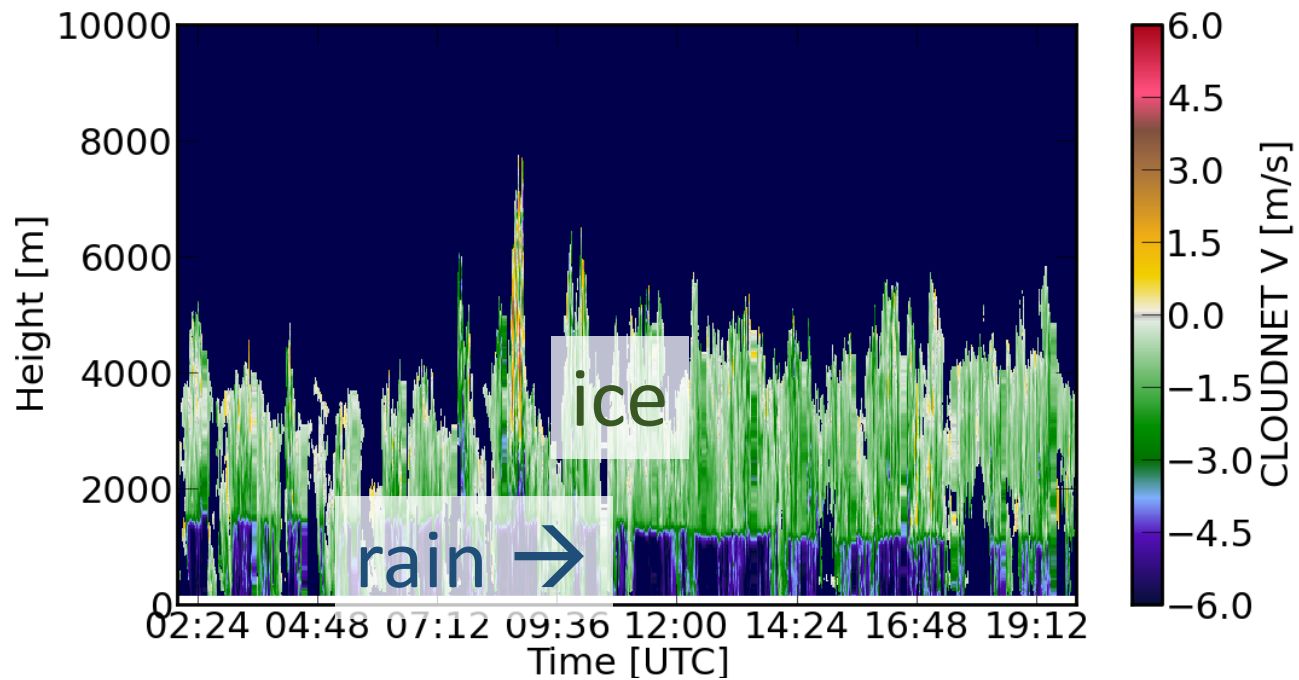
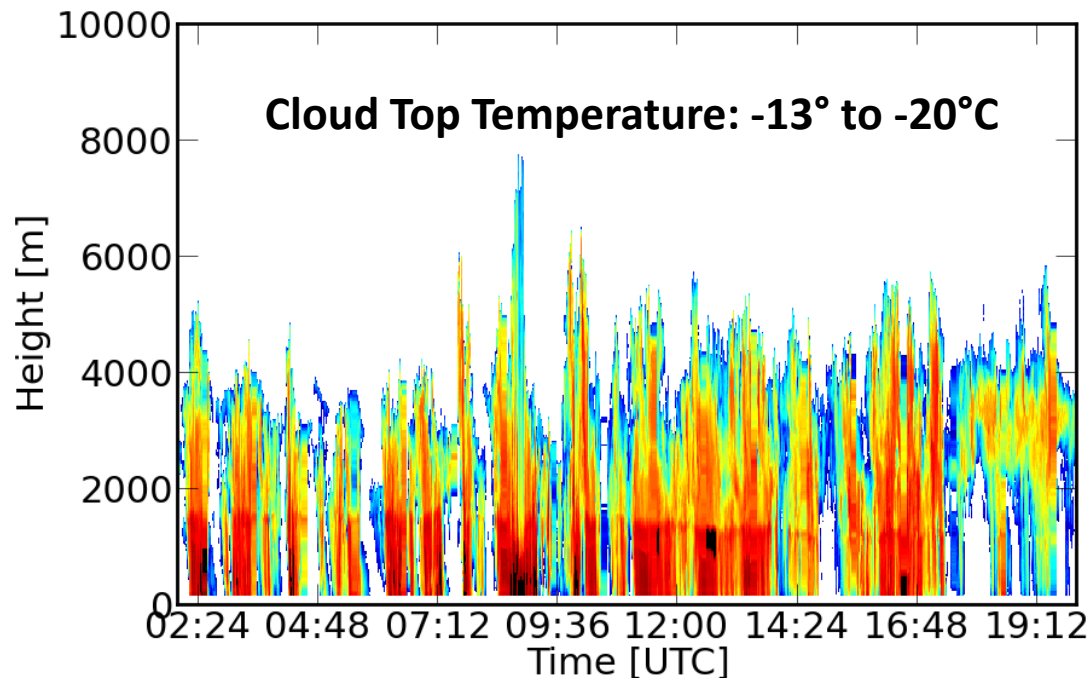
Fallstreak tracking



Cloud Top Height (CTH)
Cloud Top Temperature (CTT)

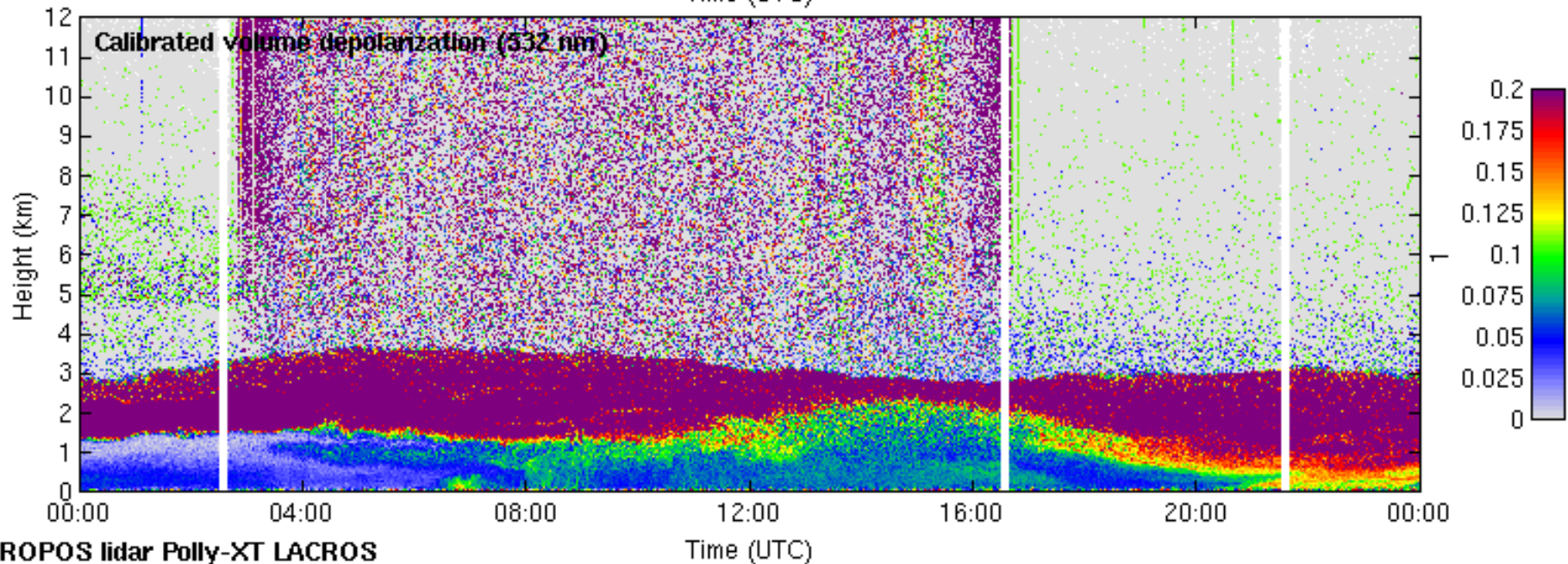
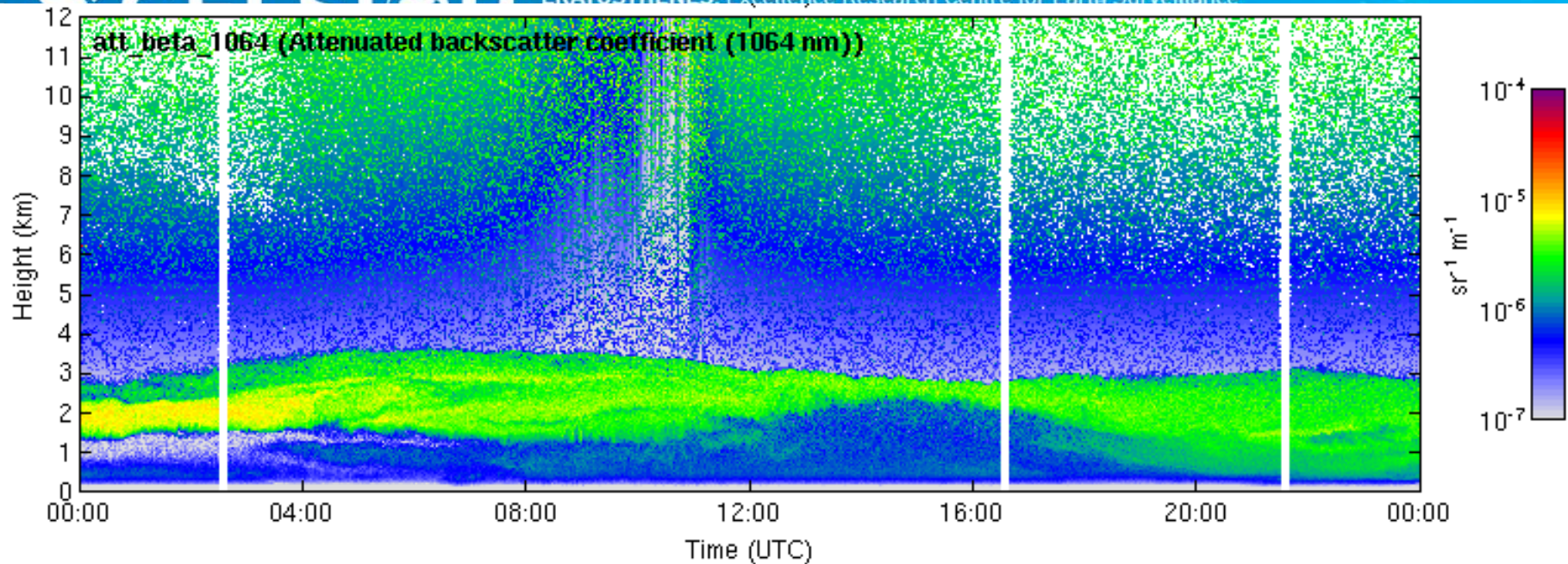


Rain rate (RR) at the beginning of each fallstreak (Disdrometer)



>30mm
precipitation

What is
driving rain
formation in
this case?



Connecting the ECoE to global remote-sensing networks...



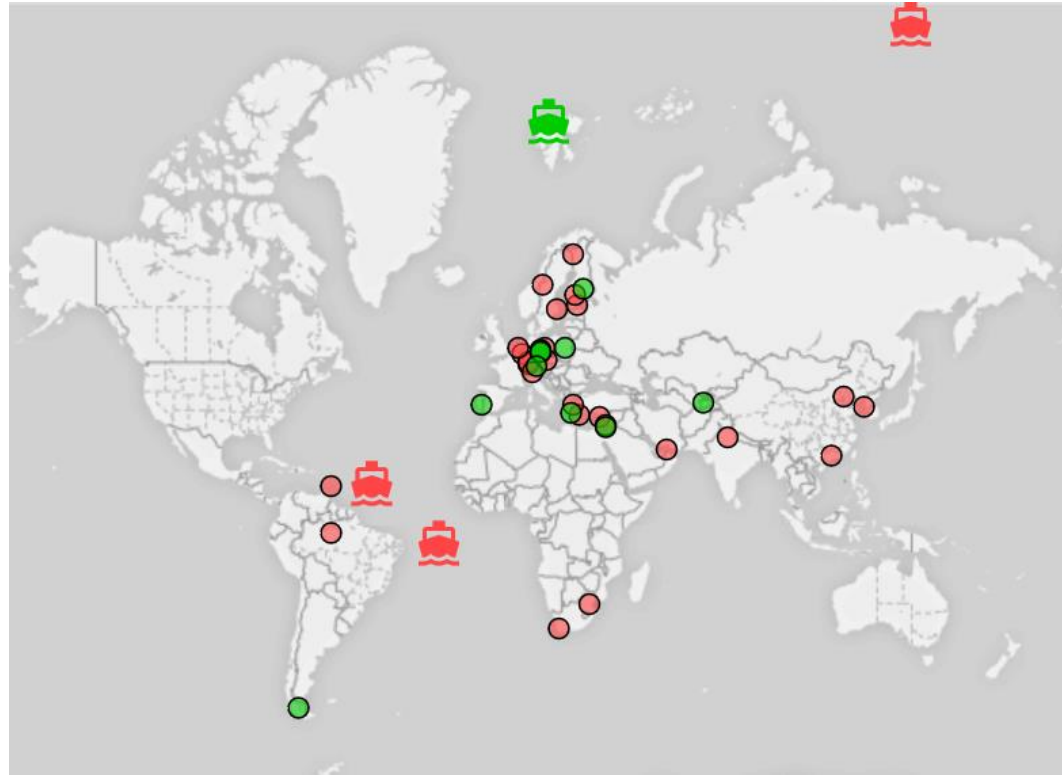
ERATOSTHENES
& Space-Based



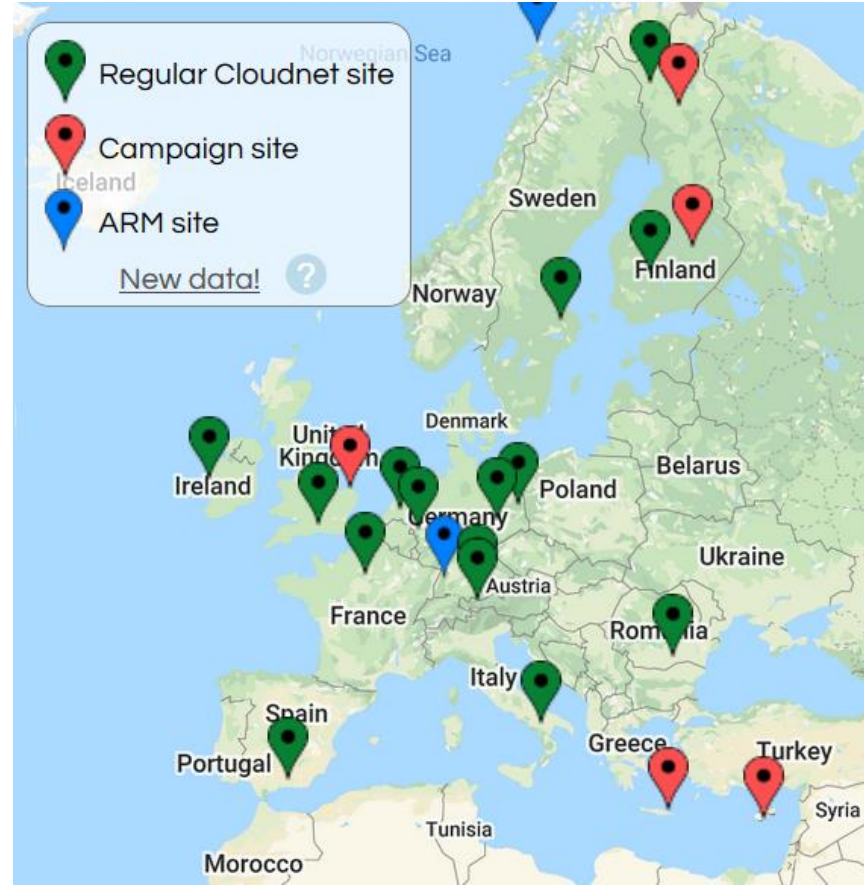
for Earth Surveillance

EARLINET/PollyNET

Cloudnet



- active PollyNET sites
- PollyNET campaign sites



Study of aerosol-cloud-dynamics interaction with LACROS

