Vassilis Amiridis

BEYOND atmospheric services

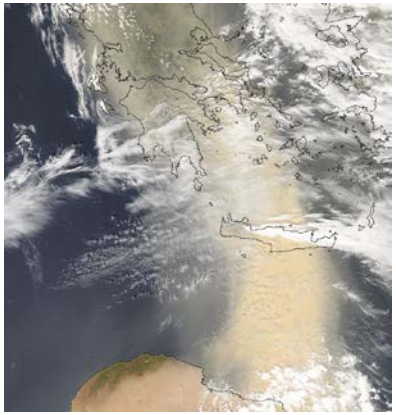
IAASARS, National Observatory of Athens
Greece

SEVENTH FRAMEWORK PROGRAMME
FP7-Regpot-2012-23-1

Examples of systematic atmospheric hazards over Greece

Forest Fire Smoke

Saharan Dust



Smoke dispersion

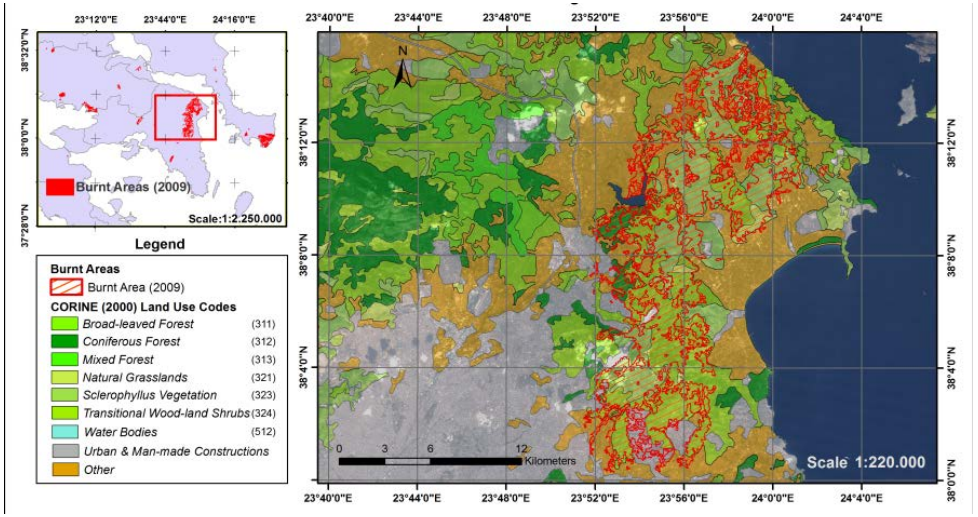
Remote sensing information:

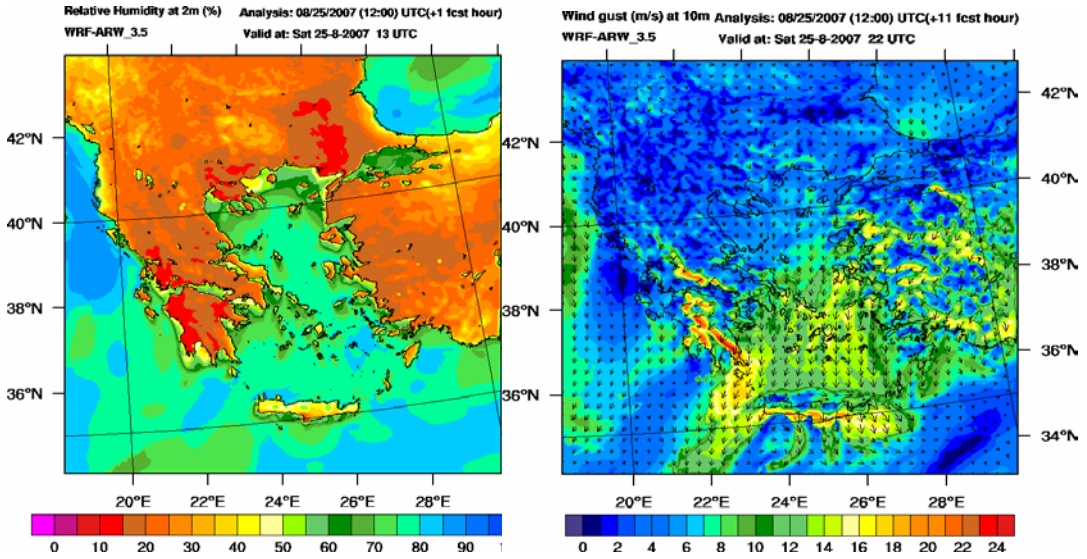
Burnt area
Fuel type
Fire Radiative Power

+

Modeling:

Meteorology





Smoke dispersion

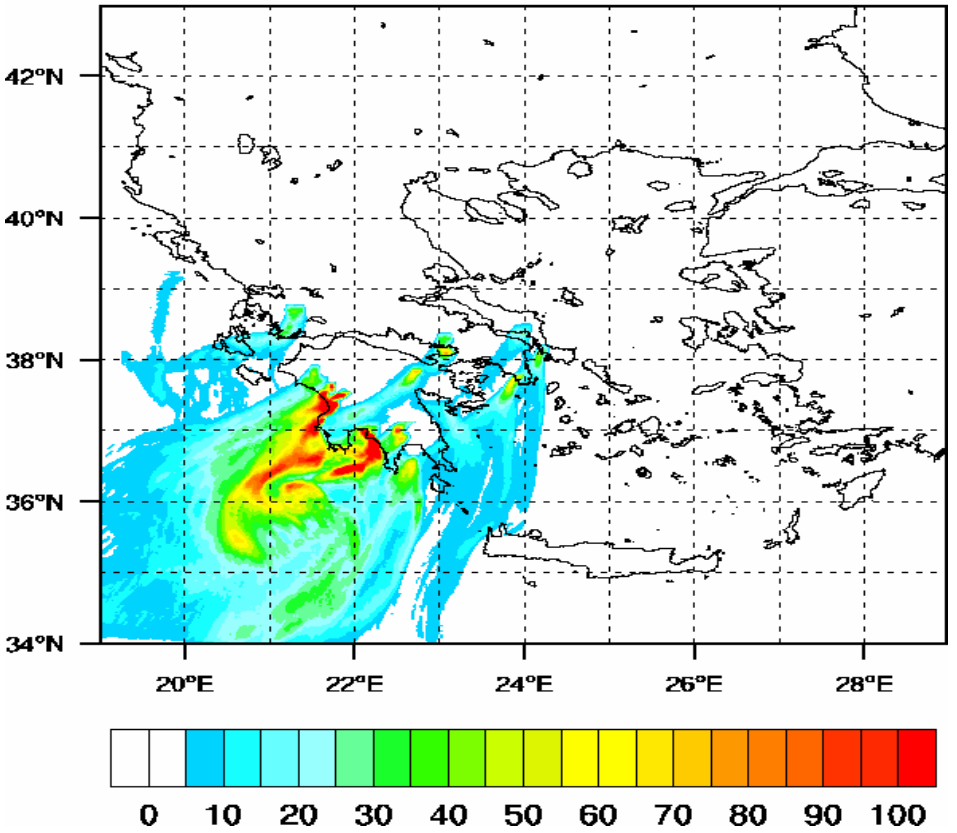
Wild fire smoke dispersion

Dispersion of smoke, MODIS 26 August 2007 09:30 UTC

FLEXPART - NOA

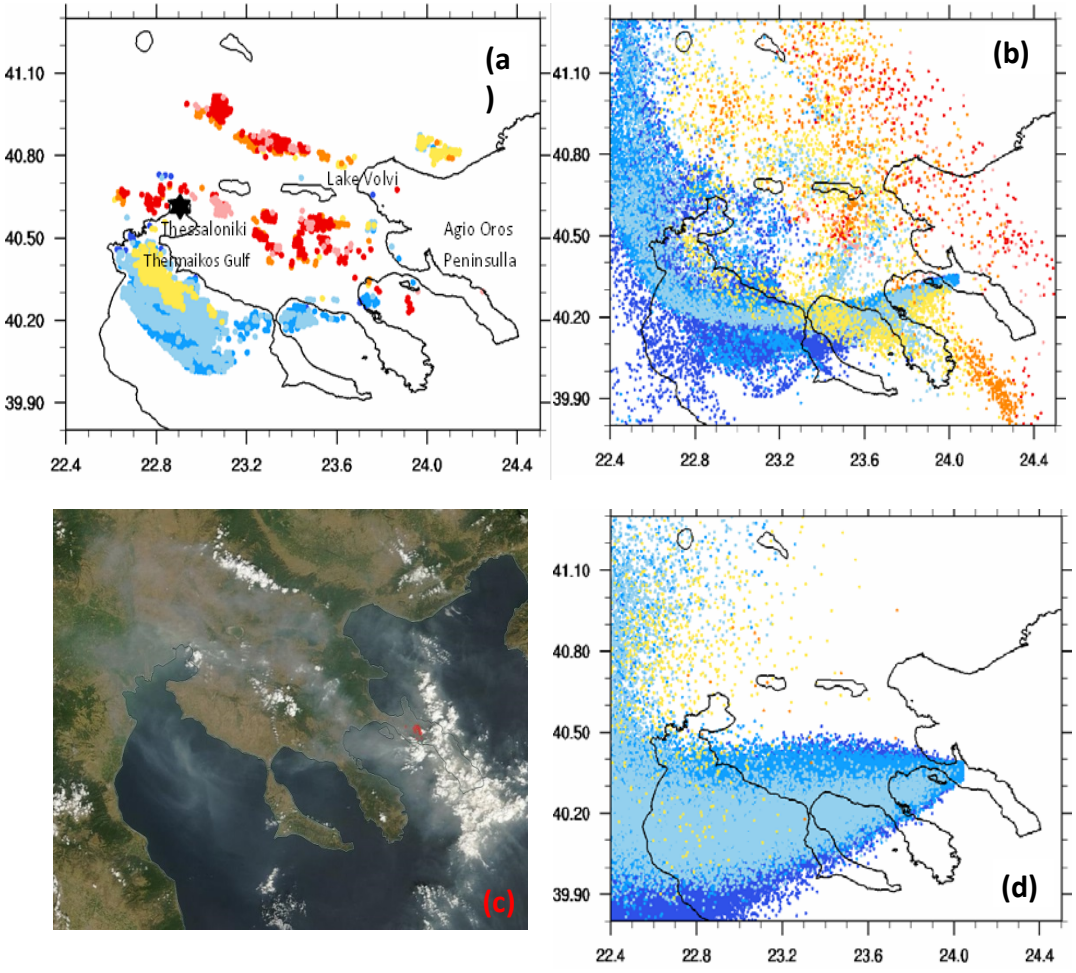
Biomass Burning (Organic Carbon -OC)

valid date:26-08-2007 0900UTC
Model layer: Integrated Column (ng m^{-3})



Solomos et al., 2015, Atm. Environment

Smoke dispersion

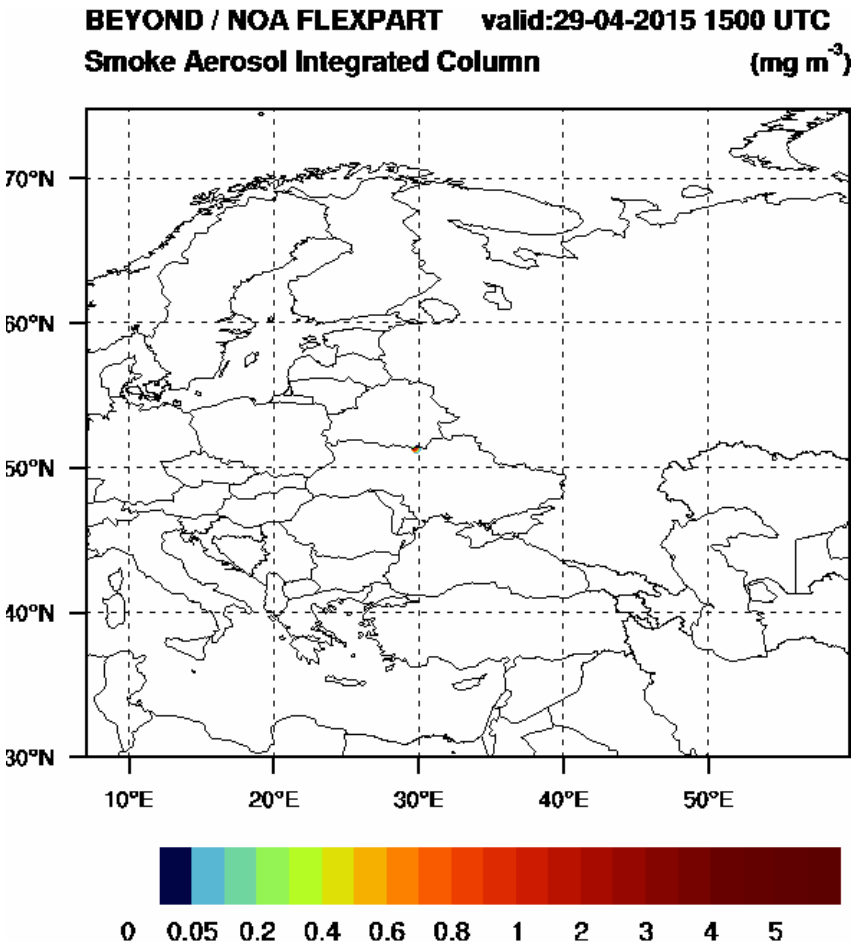


The FLEXPART-NOA smoke dispersion modeling system is operational and provides 3D forecast fields in Greece.

The system is a part of the FireHub service and is utilized automatically from the fire detection online system.

Solomos et al., 2015, Atm. Environment

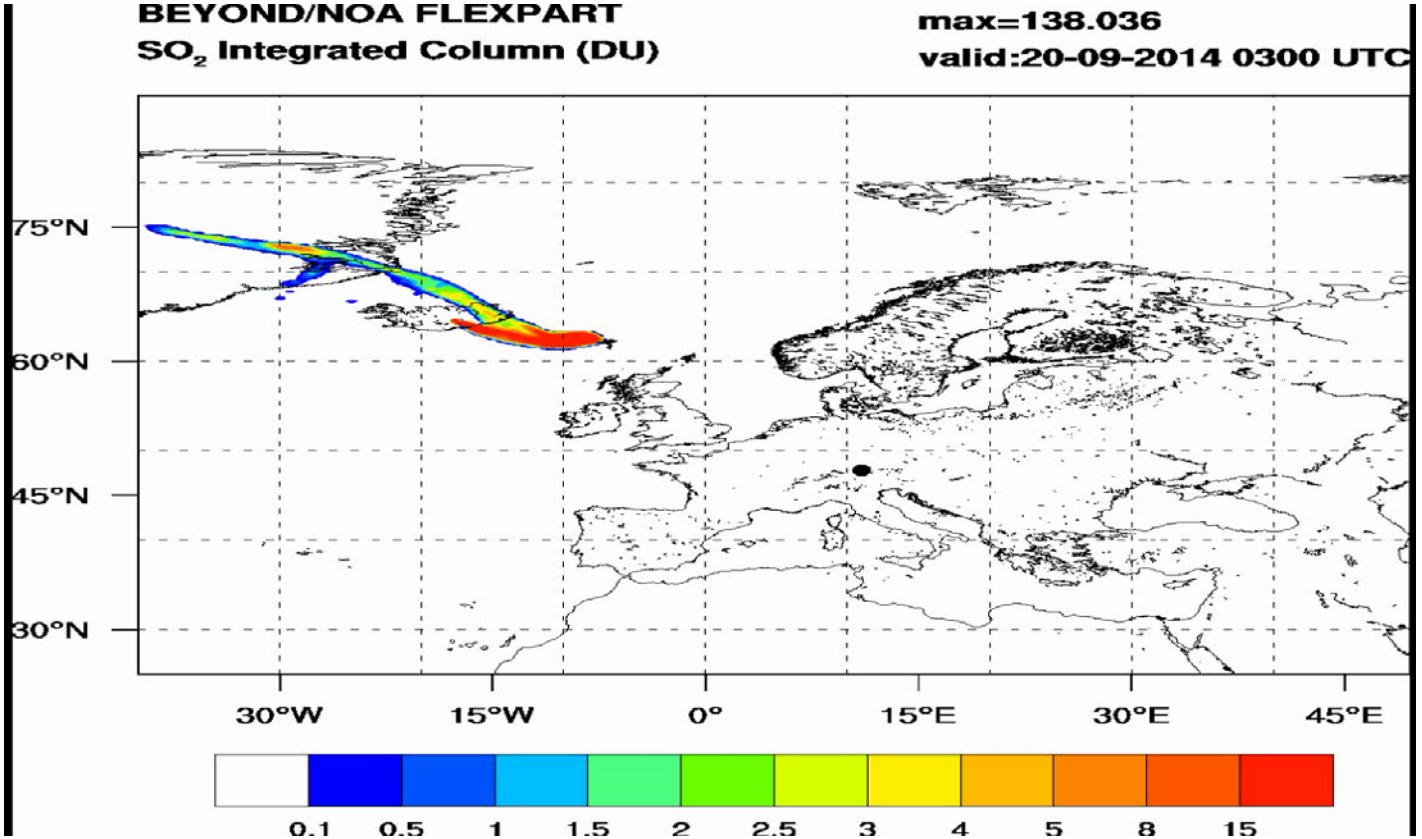
Industrial accident smoke dispersion



Early-warning system is stand by also for Europe. The example shows the simulation performed when we had a warning from our colleagues in Romania for the presence of biomass burning aerosols during the fires in Chernobyl – Ukraine in May 2015

Collaboration with INOE and Doina Nicolae

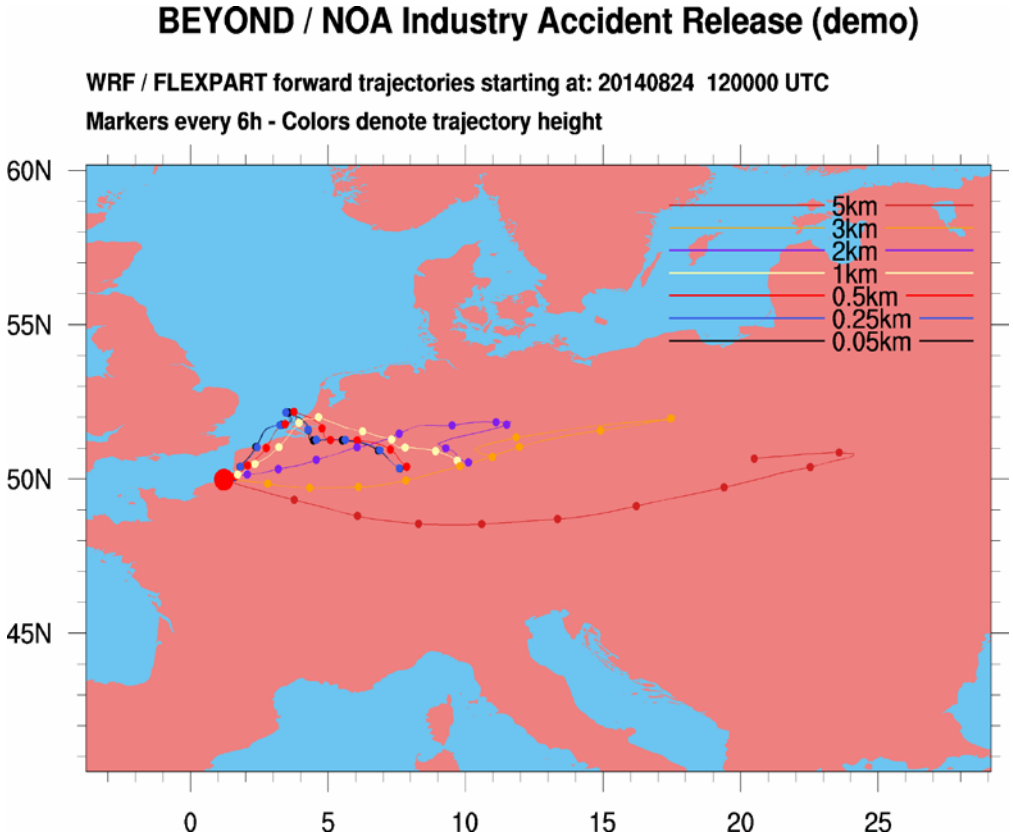
Volcanic ash dispersion



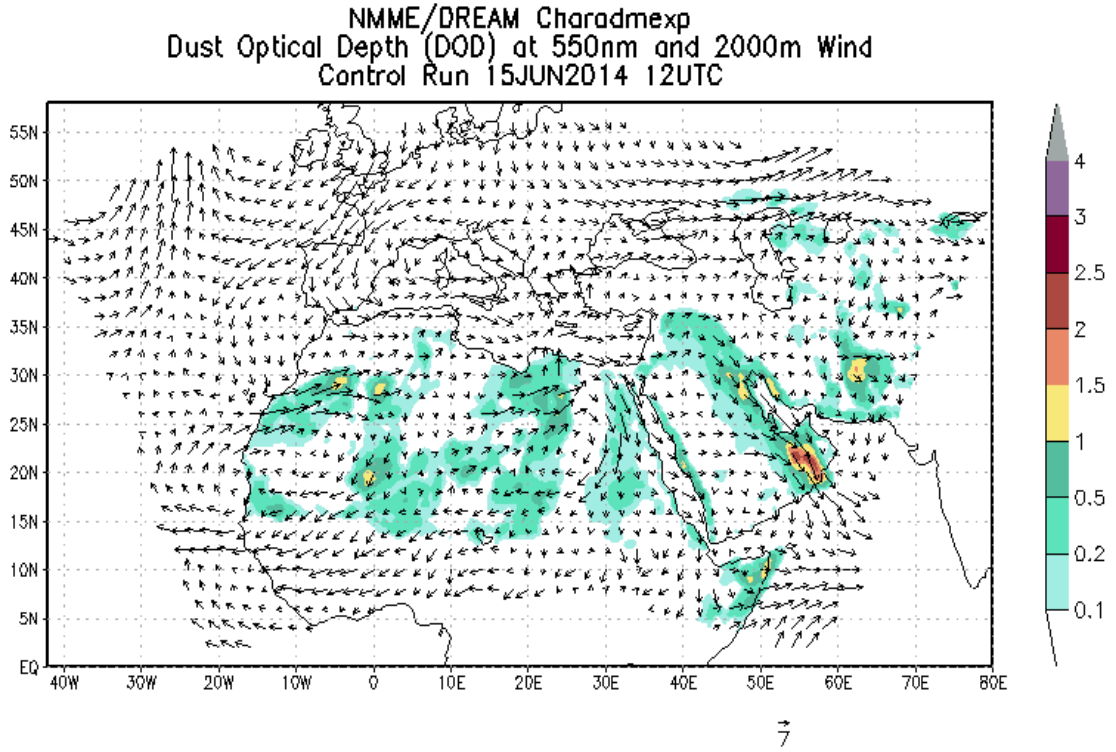
Amiridis et al., 2015, ESA-ATMOS Conference

Nuclear accident release

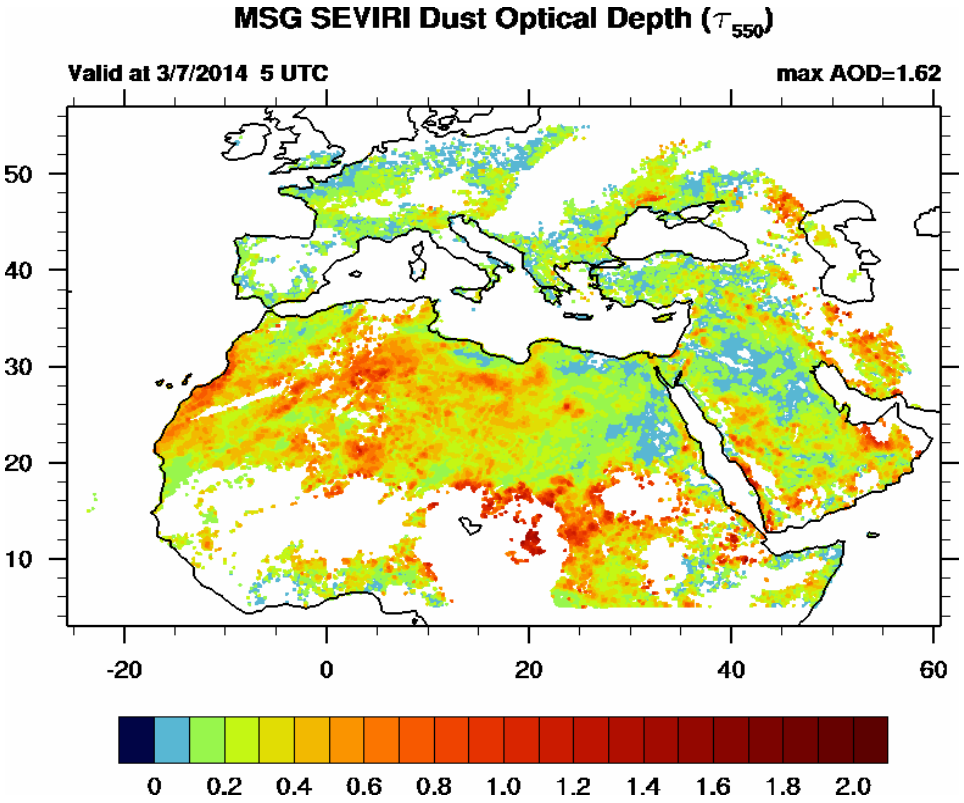
- Prognostic forward trajectories for a conceptual scenario of nuclear accident over Europe.
- The big red dot indicates the location of the release.
- Different color lines indicate various height releases.
- When one knows the actual (observed) height of gas or particle releases the plume path is estimated from the corresponding trajectories.



Desert dust modeling and forecasting

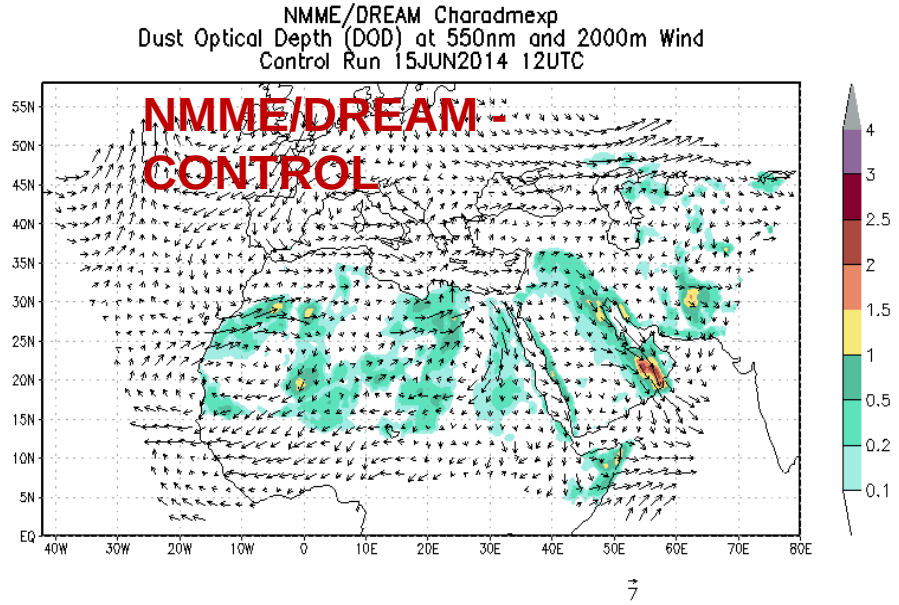


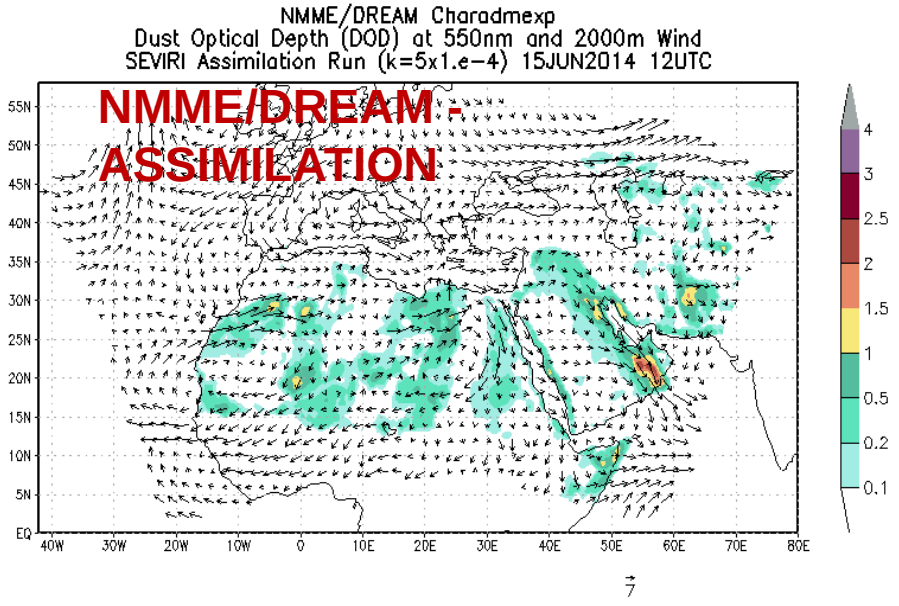
Desert dust modeling and forecasting



Dust Optical Depth from the UK Met Office SEVIRI retrieval algorithm
(Data provided by Yash Pradhan for the CHARADMExp campaign)

Desert dust modeling and forecasting

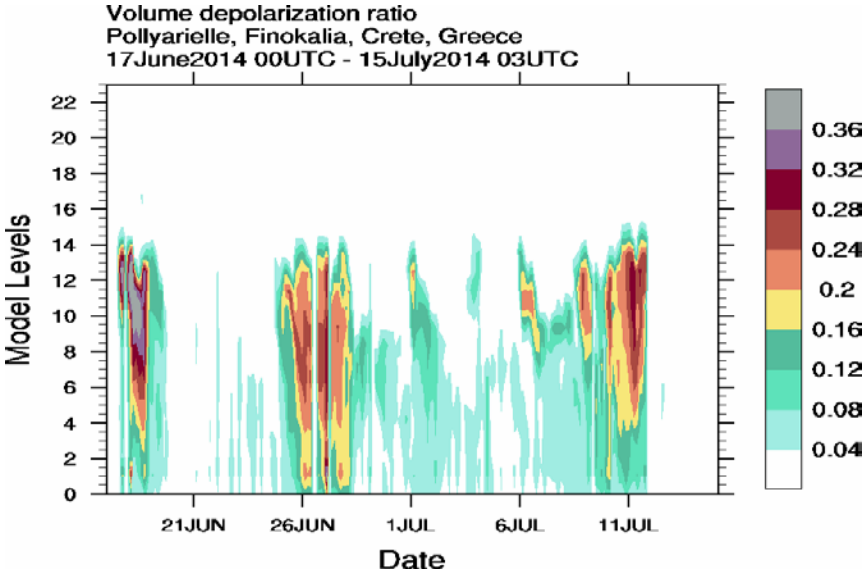


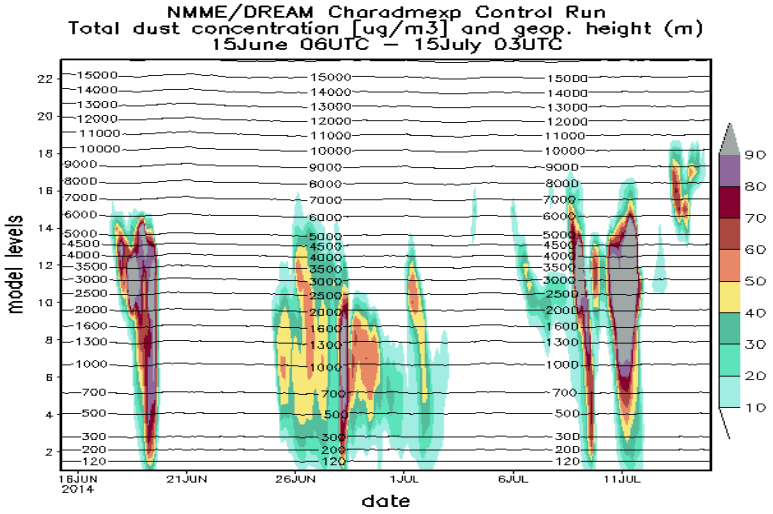


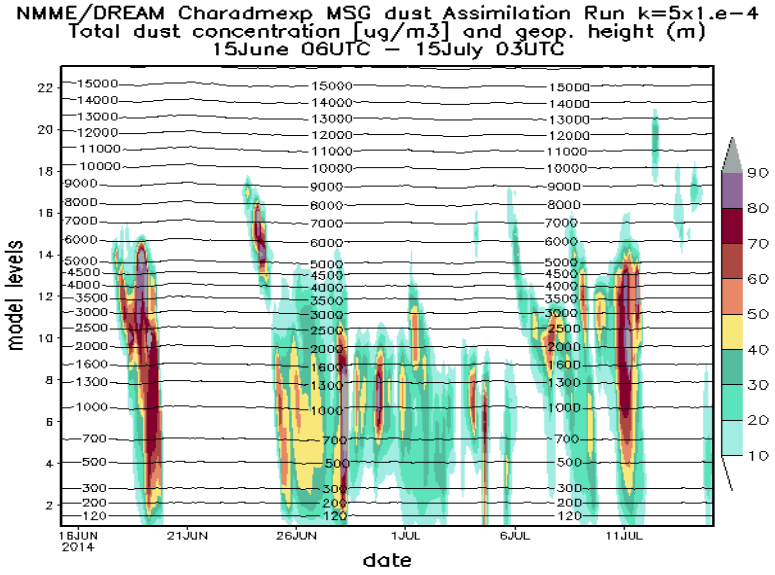
Assimilation Effects

- Cuts dust production over Arabian Peninsula
- Saharan dust sources are represented in finer detail
- Dust increases over Iberian Peninsula
- Sahel sources may be too strong

Desert dust modeling and forecasting







In collaboration with Slobodan Nickovic
Nickovic et al., 2016 (in preparation)

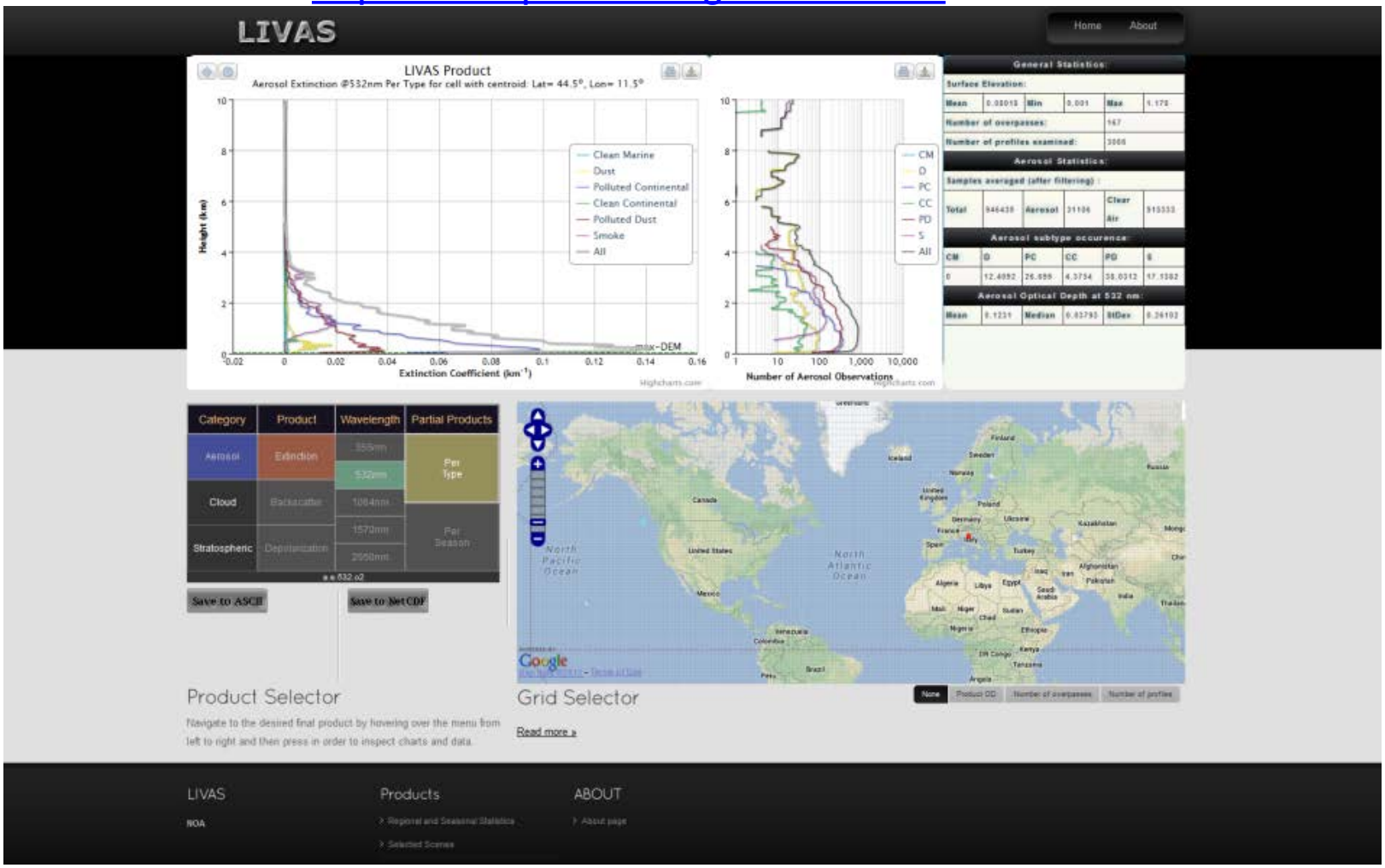
Aeolus and Livas

In Greek mythology, Aeolus was the ‘keeper of the winds’.

Aeolus ruled over 8 gods, each responsible for a particular wind blowing from certain direction, with LIVAS being responsible for south-eastern winds.

LIVAS dust product

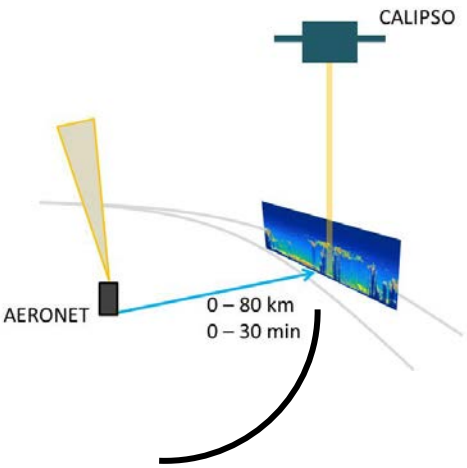
http://lidar.space.noa.gr:8080/livas/



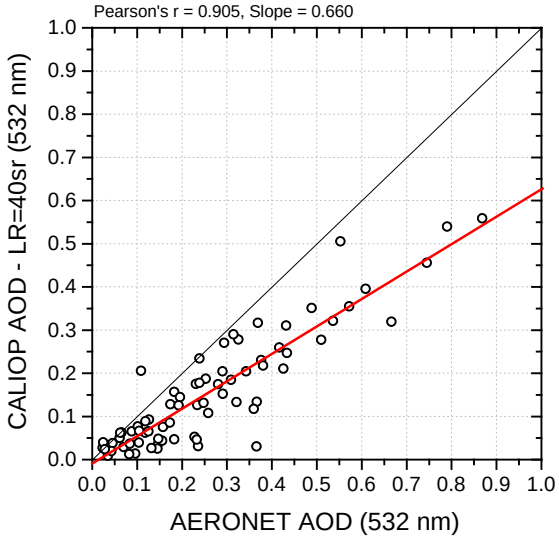
Amiridis et al., 2015, ACP

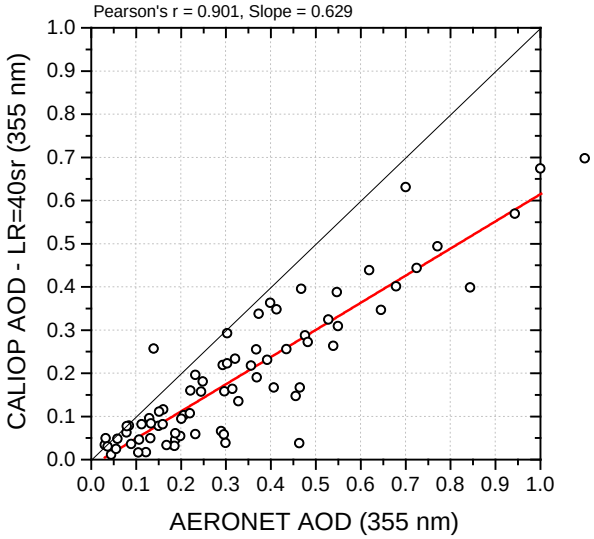
LIVAS dust product

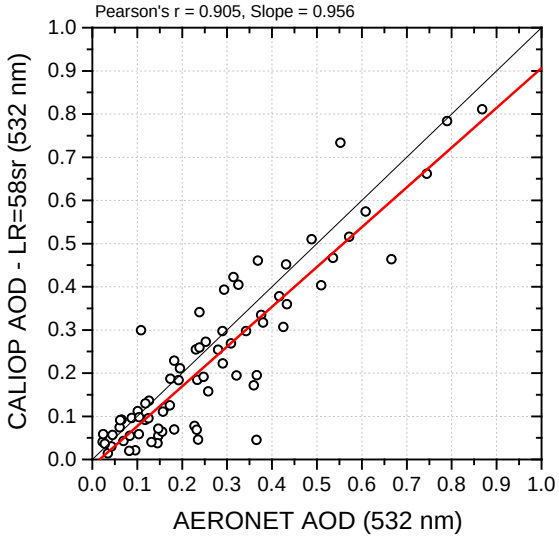
CALIPSO-AERONET Collocation

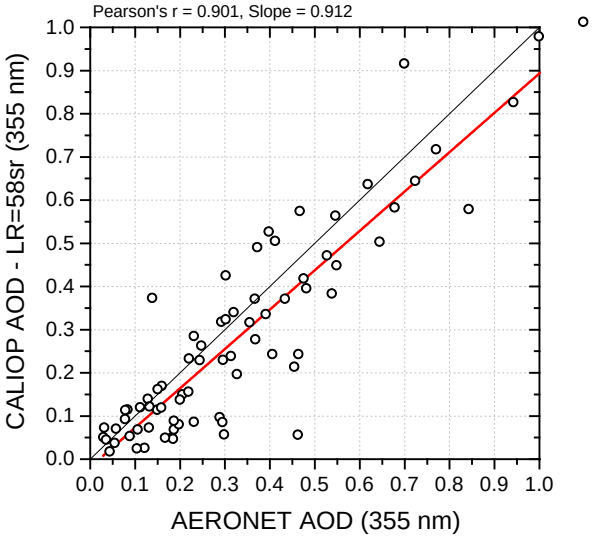


In pure Dust cases from CALIPSO typing



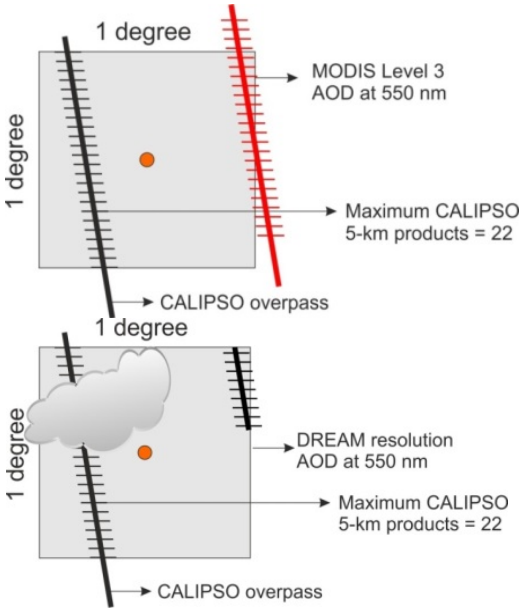




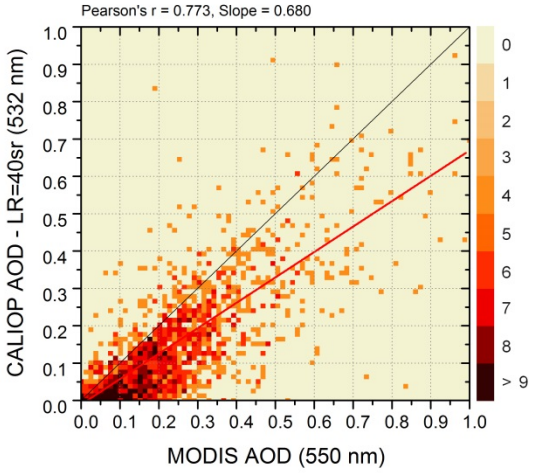


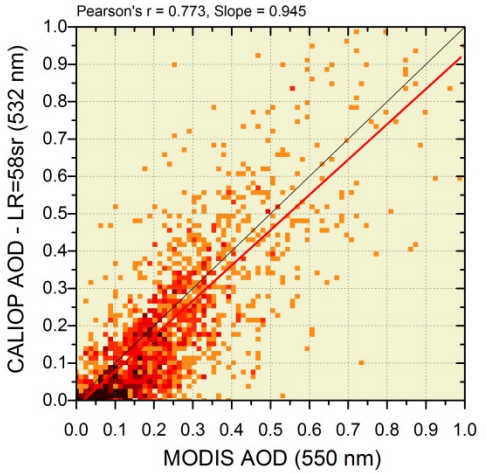
Amiridis et al., 2013, ACP

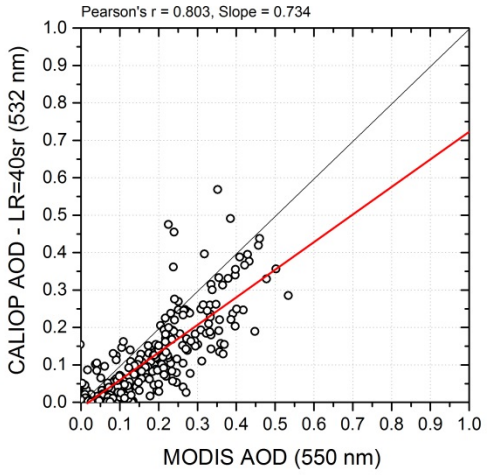
CALIPSO-MODIS Collocation

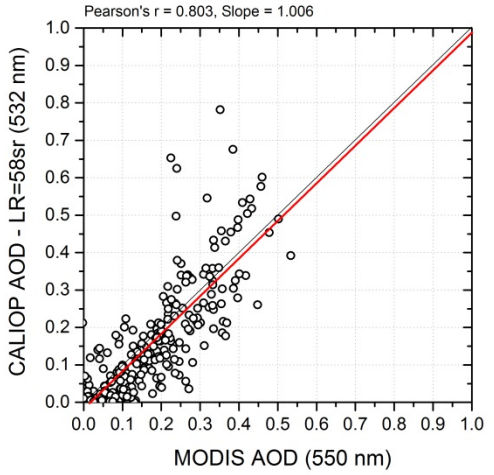


Red overpasses rejected

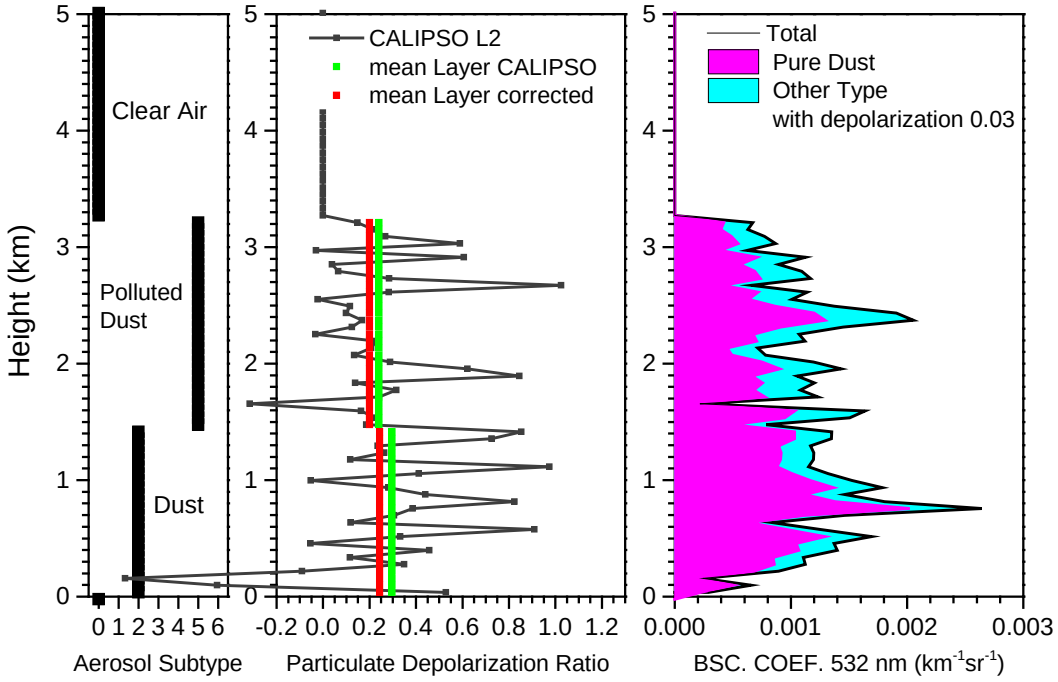


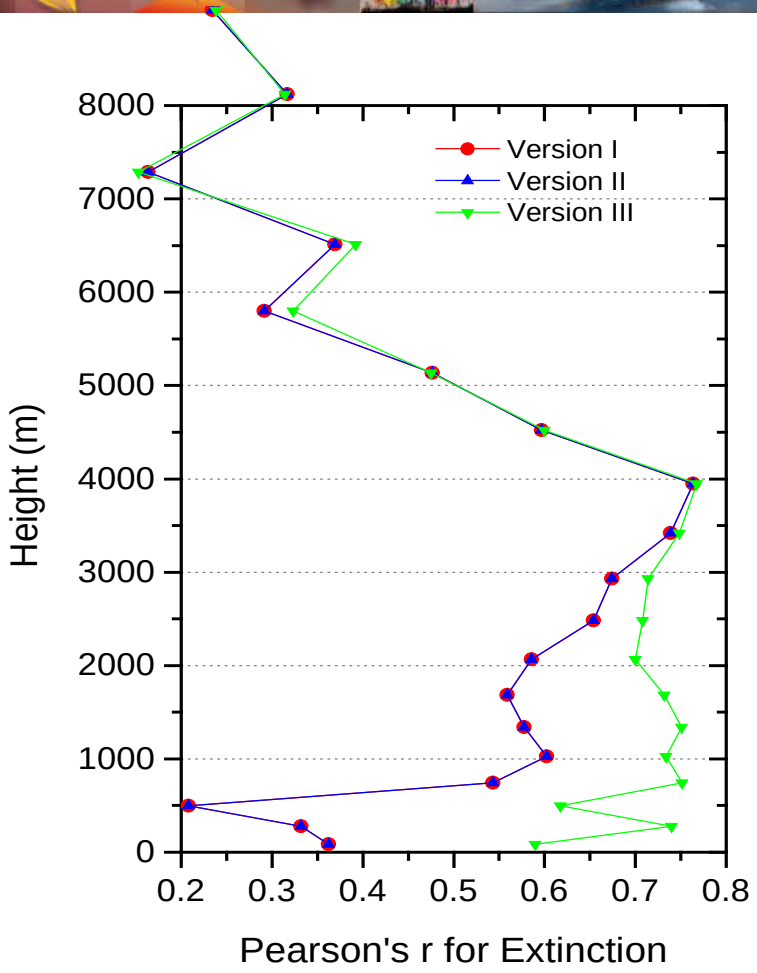






Amiridis et al., 2013, ACP

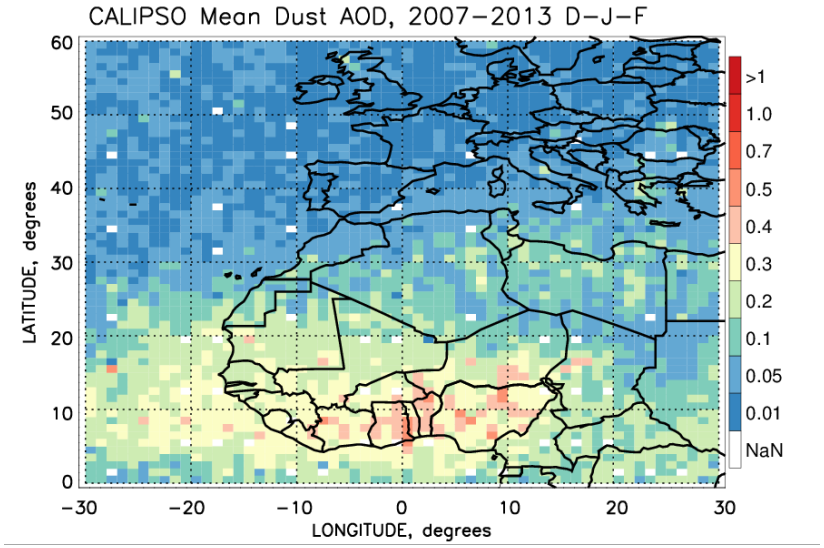


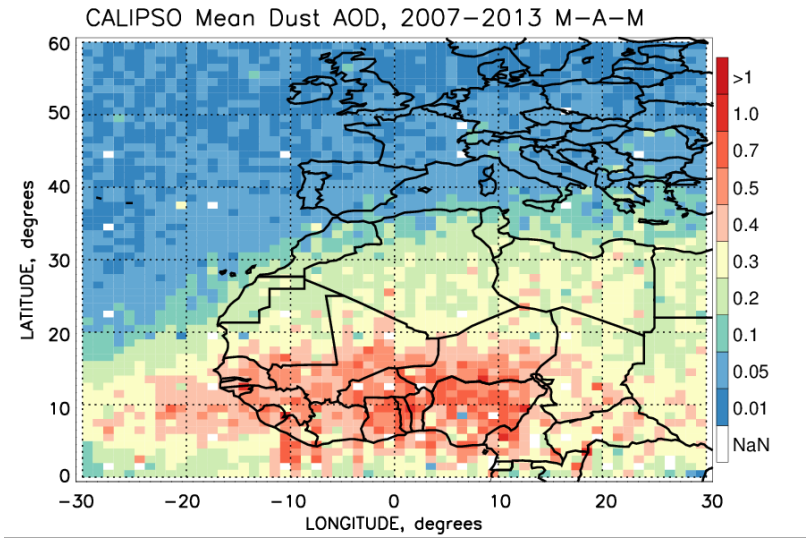


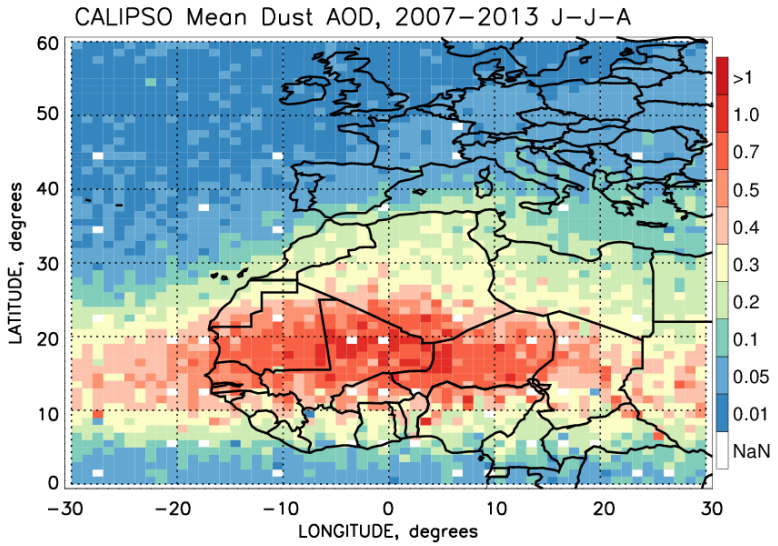
$$\beta_1 = \beta_t \frac{(\delta_p - \delta_2)(1 + \delta_1)}{(\delta_1 - \delta_2)(1 + \delta_p)}$$

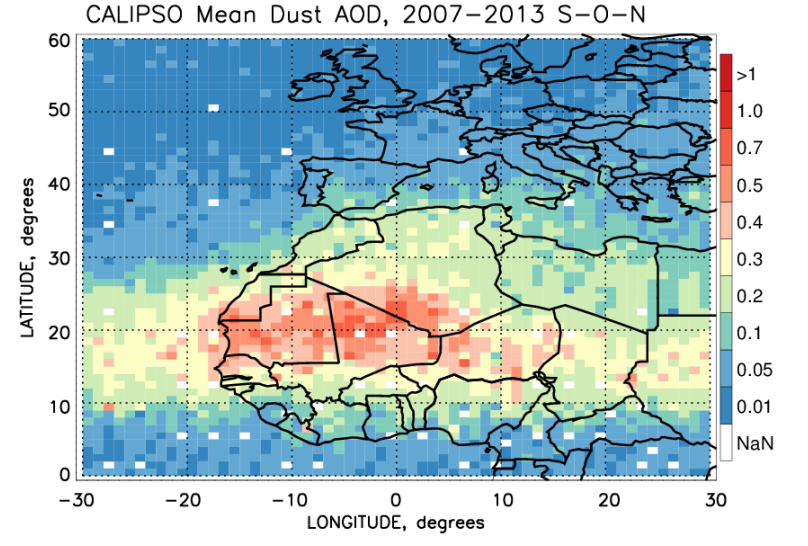
Amiridis et al., 2013, ACP


BE OND
Building a Centre of Excellence
for EO-based monitoring of Natural Disasters
IAASARS

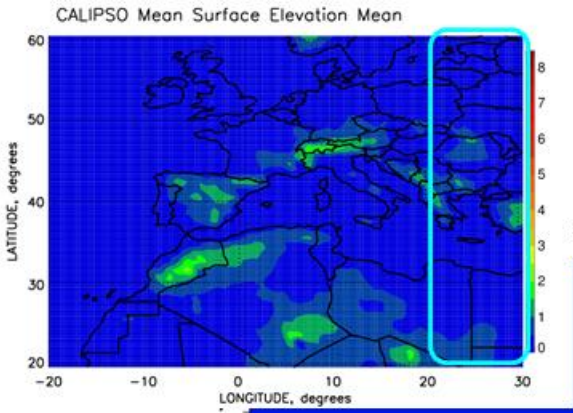

CALIPSO Mean Dust AOD, 2007–2013 D–J–F
LATITUDE, degrees
LONGITUDE, degrees
>1
1.0
0.7
0.5
0.4
0.3
0.2
0.1
0.05
0.01
NaN

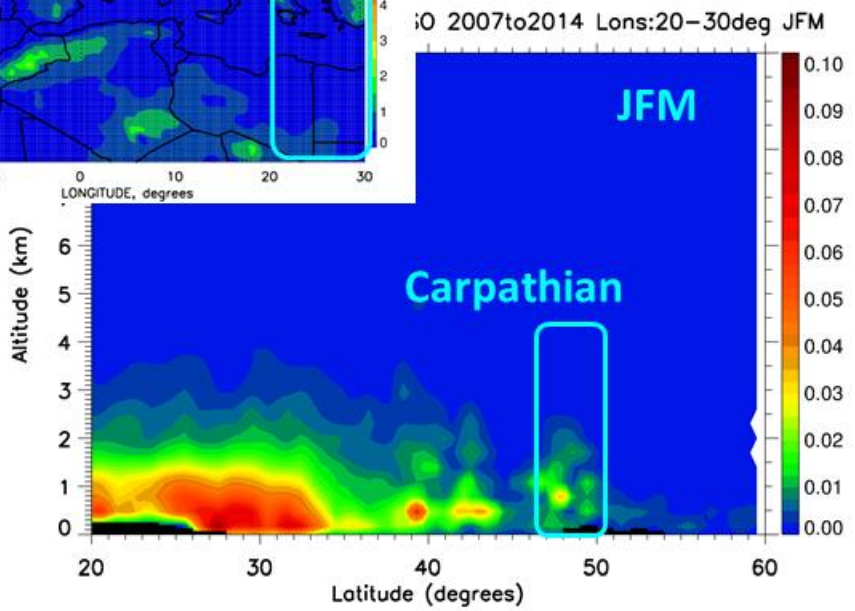

CALIPSO Mean Dust AOD, 2007–2013 M–A–M
LATITUDE, degrees
LONGITUDE, degrees
>1
1.0
0.7
0.5
0.4
0.3
0.2
0.1
0.05
0.01
NaN

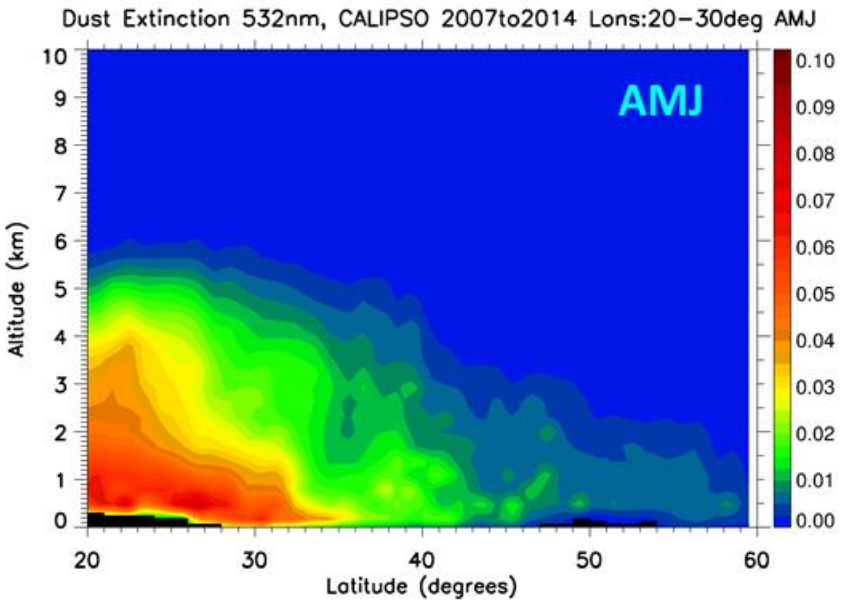

CALIPSO Mean Dust AOD, 2007–2013 J–J–A
LATITUDE, degrees
LONGITUDE, degrees
>1
1.0
0.7
0.5
0.4
0.3
0.2
0.1
0.05
0.01
NaN

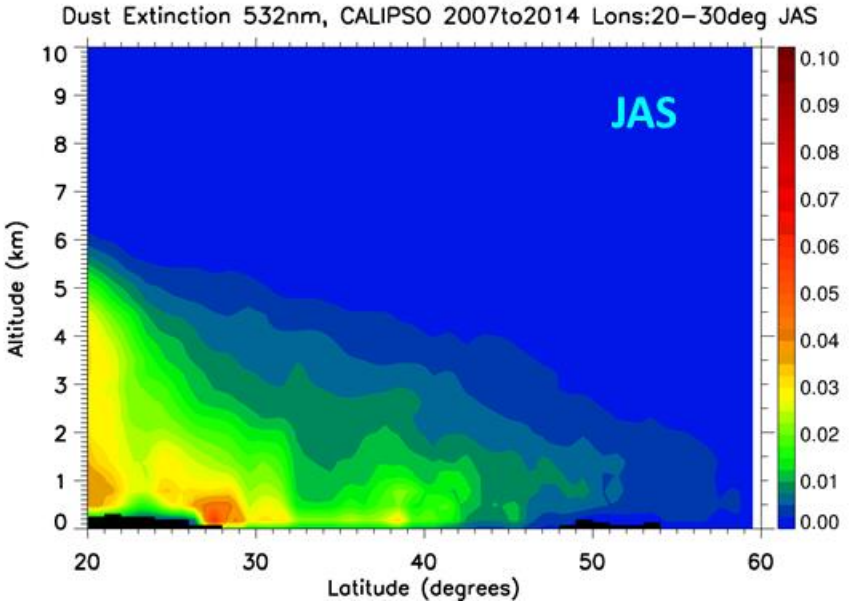

CALIPSO Mean Dust AOD, 2007–2013 S–O–N
LATITUDE, degrees
LONGITUDE, degrees
>1
1.0
0.7
0.5
0.4
0.3
0.2
0.1
0.05
0.01
NaN

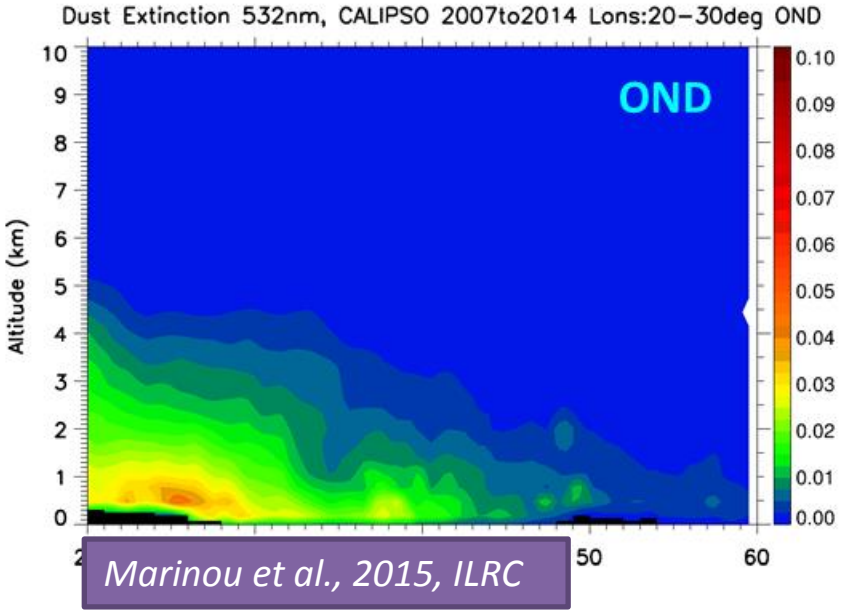
Extinction Coefficient 20-30 deg Longitude











Marinou et al., 2015, ILRC

Starting from DUST and expanding to other aerosol types, the final BEYOND product in UV is envisioned to serve as the link between CALIPSO and EarthCARE, in order to bridge the missions for the provision of a multi-decadal harmonized climatic record.

From CALIPSO

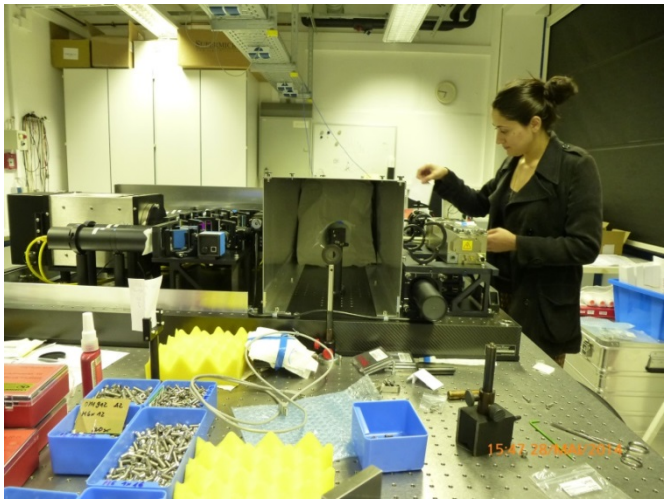
EARLINET

To EarthCARE

ADM-Aeolus??

PollyXT Lidar System

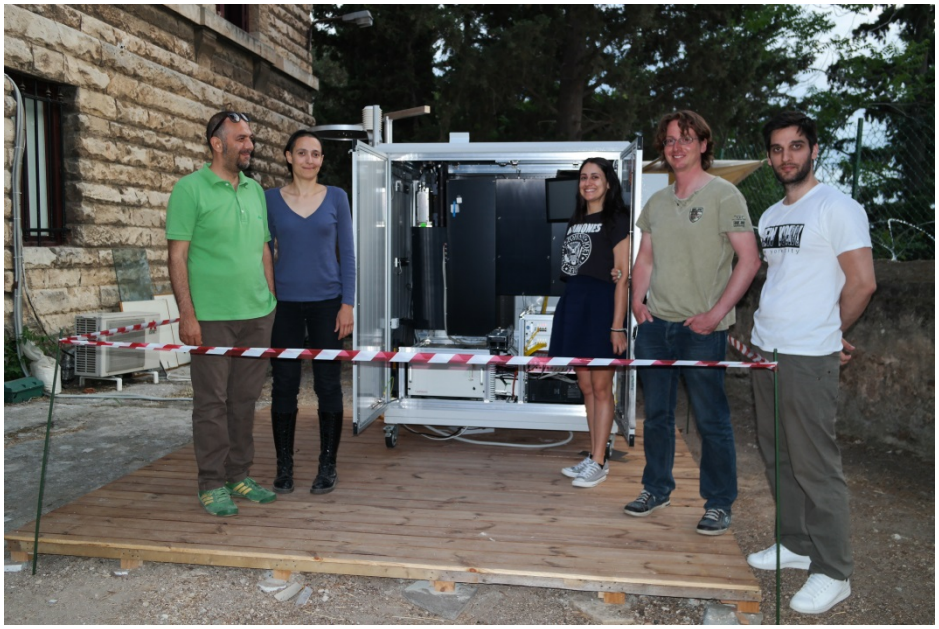
In BEYOND, we developed a sophisticated multi-wavelength backscatter/Raman/depolarization lidar in collaboration with TROPOS Institute in Leipzig, Germany, the so-called **PollyXT lidar**



Engelmann et al., 2016, AMT

Baars et al., 2016, ACP

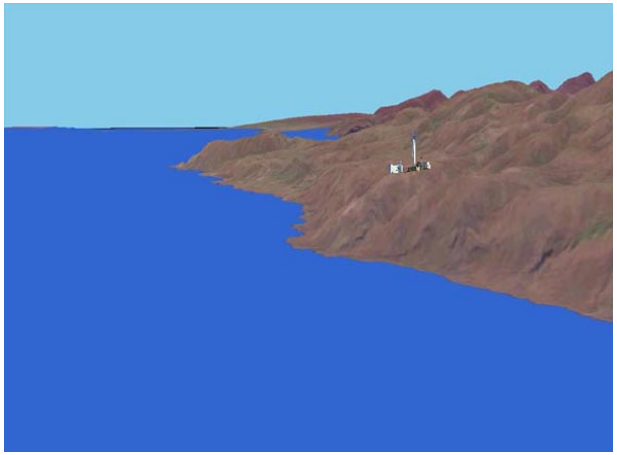
PollyXT Lidar System



The system operated in the NOA premises in Thiseion (Athens center), collocated to the sunphotometric station.

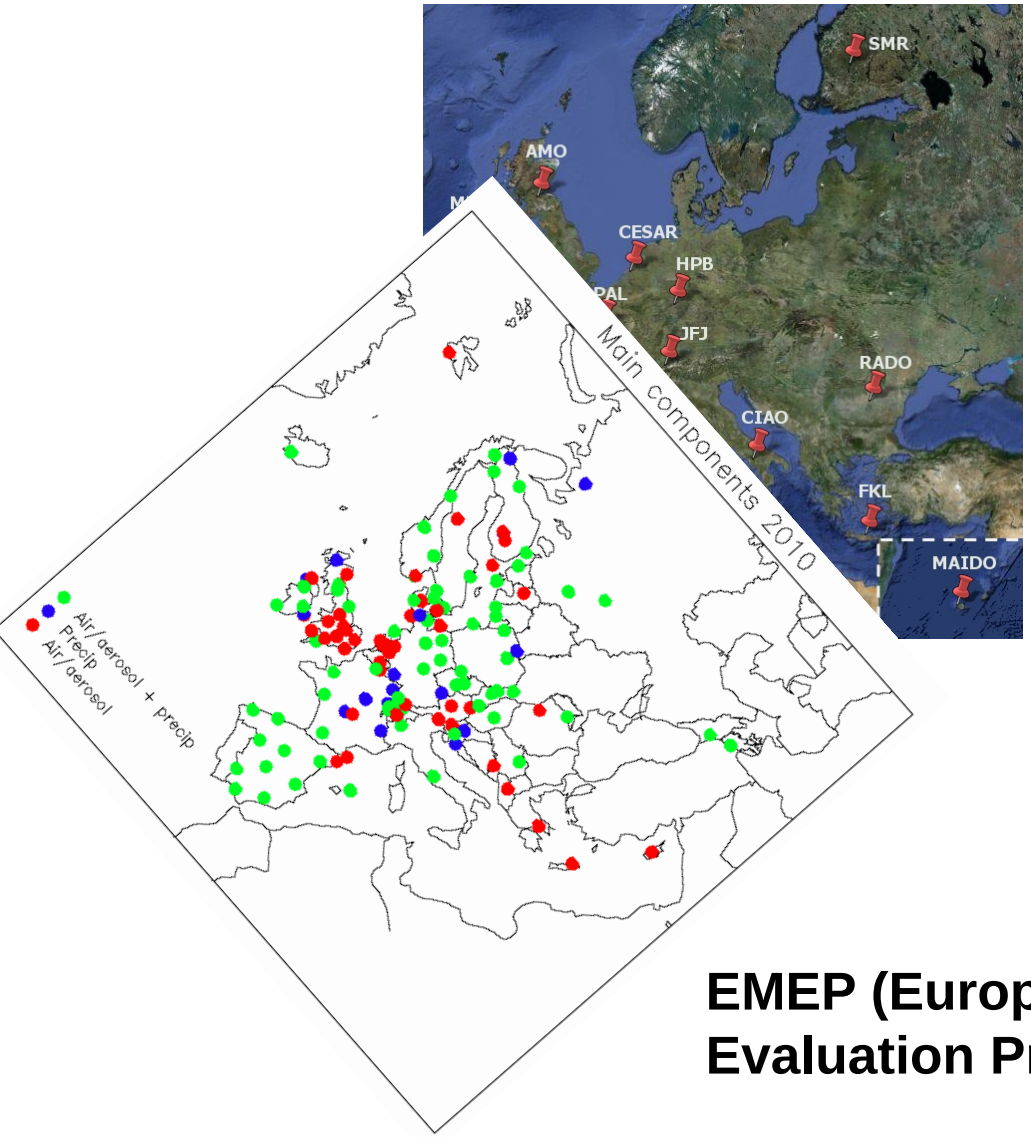
This is a test mode operation, where we perform consistency and quality assurance tests for the 24/7 system operation and calibration.

Finokalia station



Latitude = 35.34^{0}N - Longitude = 25.67^{0}E - Elevation = 252 a.s.l.


PILS
PFEIFFER VACUUM
Magee Scientific
Aethalometer™



ACTRIS

ICOS (Integrated Carbon Observation System)

EMEP (European Monitoring and Evaluation Programme)

EMORAL (Esa's Mobile RAman Lidar)

Products:

- Aerosol Extinction Profile, at 355 nm and 532 nm
- Aerosol Backscatter Profile, at 355 nm and 532 nm
- Linear particle depolarization ratio, at 355 nm

Utilization of EMORAL lidar during HYFLEX campaign, for the evaluation of atmospheric correction and sun-induced fluorescence retrieval methods

Scheduled future activities

ACTRIS-2 campaigns: NOA will organize 4 experimental campaigns @ Athens, Crete, Granada, Melpitz

Night-time retrievals with sun/lunar/star photometer and Raman lidar

CIMEL sunphotometer

Polly^{XT} OCEANET lidar

In-situ measurements with Unmanned Aerial Vehicles (UAVs) and/or tethered balloons

Athens and Melpitz campaigns are implemented already

Large scale experimental campaign in Eastern Mediterranean – April 2017

NOA:
Replicate LACROS
@ Crete

TROPOS:
LACROS @ Cyprus

data projects depositories reading tutorials NOA VARIOUS

CHARADMExp | About | Location | Participants | Instruments & Models | Data | Logbook | News

CHARADMExp campaign

Characterization of Aerosol mixtures of Dust And Marine origin

The campaign

The CHARADMExp campaign aims to derive optical, microphysical and chemical properties of marine component and its mixture with dust, employing sophisticated instrumentation installed on an appropriate site. Specifically, aerosol characterization will be established by ground-based active/passive remote sensing techniques, surface in-situ measurements and airborne UAV observations.

The campaign will take place from **20th of June until 10th of July** at the Finokalia site, Creta, Greece.

The site

The site for the campaign is the monitoring station of Finokalia, Greece where only marine and dust particles are present 95% of the time (smoke can be advected as well during the August-September forest fire period). Finokalia station is located at a remote coastal site in the northeast of the island Crete, Greece, in the Eastern Mediterranean (35.338°N, 25.670°E, 252 asl). The station is located at the top of a hilly elevation (150m above sea level), facing the sea within a sector of 270° to 90°. No touristic or other human activities can be found at a distance shorter than 20 km within the aforementioned sector. In-situ measurements are performed in Finokalia continuously for the last 20 years.

Recent activity

News

- ITaRS participation in CHARADMExp (Jul 10th)
- UAV measurements (video) (Jul 1st)
- Cyprus Institute UAVs are heading to Sitia's airport (Jun 26th)
- Saharan dust is approaching (Jun 24th)
- Getting prepared for UAV flights over Crete (Jun 23rd)

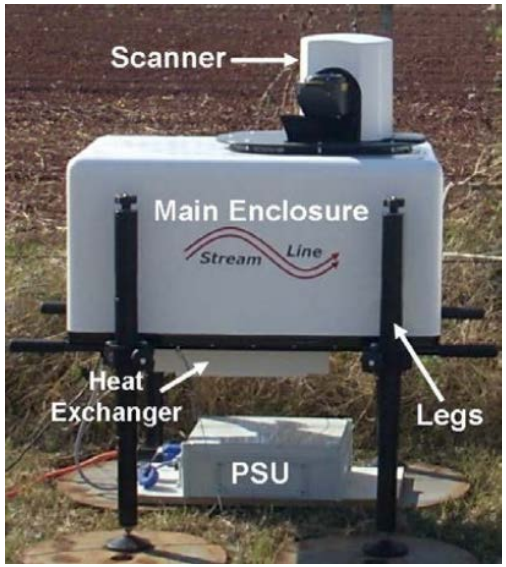
Uploaded data

- HALO realtime (Sep 9th)
- FLEXPART (Jul 31st)
- WRF WIND (Jul 31st)
- WRF WIND (Jul 31st)

http://charadmexp.gr/

- 3 backscatter channels (355, 532, 1064 nm)
- 2 extinction Raman channels (387, 607 nm)
- 2 depolarization channels (355, 532 nm)
- 1 water vapor channel (407 nm)
- 1 near-range channel (532, 607 nm)

- 2 backscatter channels (355, 532 nm)
- 1 extinction Raman channel (387 nm)
- 2 depolarization channels (355, 532 nm)



- 1 backscatter channel (1.5 μm)
- Doppler lidar capable of providing wind speed and direction and turbulence

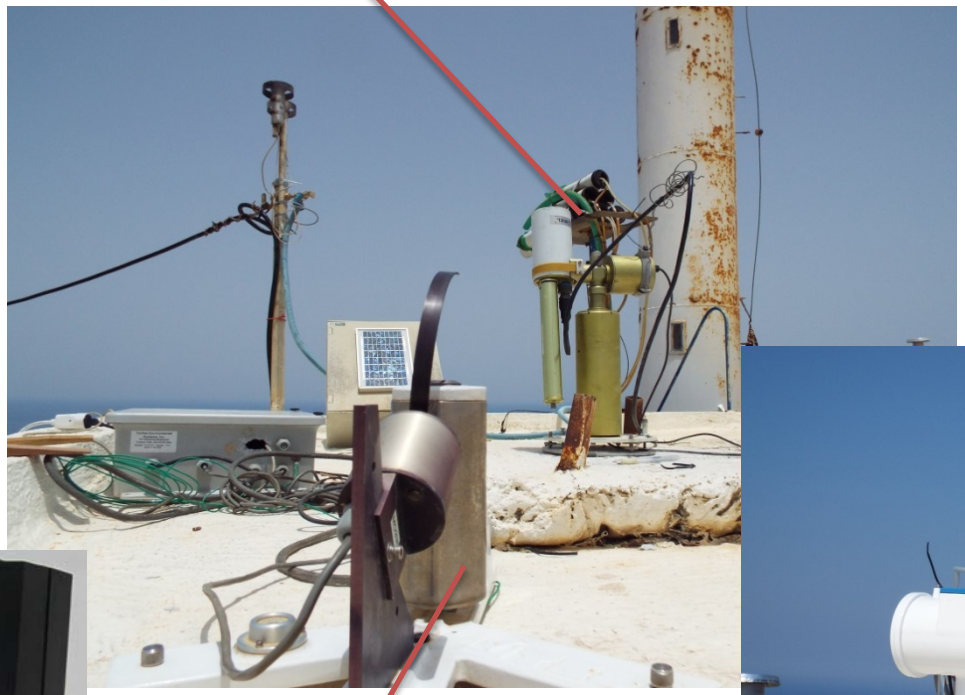
MicroWave Radiometer HATPRO

Measures the brightness temperatures in the range between 2.7K (cosmic background) and ambient temperature

Capable of providing:

1. Liquid Water Path (LWP)
2. Integrated Water Vapor (IWV)
3. Temperature and RH profiles within the PBL (for CHARADMexp, the synergy with the lidars will be utilized to derive WV profiles)

AERONET-CIMEL



PSR

Microtops II

UV-MFR

Ground Control Unit

Black carbon (aethalometer)

Ozone (UV absorption)

Condensation Particle Counter (CP

Conclusions and Future actions

1. Langrangian atmospheric models (FLEXPART) utilized in the BEYOND in conjunction with RS data to provide smoke and volcanic ash dispersion forecasts.
2. Eulerian state-of-the-art models (NMME/DREAM) were utilized to simulate the atmospheric desert dust cycle. Assimilation of MSG dust retrievals showed to improve forecasts when compared to ground-based lidar profiles.
3. Assimilation of 3D fields from CALIPSO dust LIVAS product of BEYOND is under development. For this development we aim to use UV dust extinction wavelengths in order to be consistent with future ESA missions (ADM-Aeolus and EarthCARE).

End-Users for BEYOND Atmospheric Services

- Climate Change Agencies
- Health Sector
- Remote Sensing Agencies
- Hazard Mitigation Policies
- Risk Assessment
- Military Applications