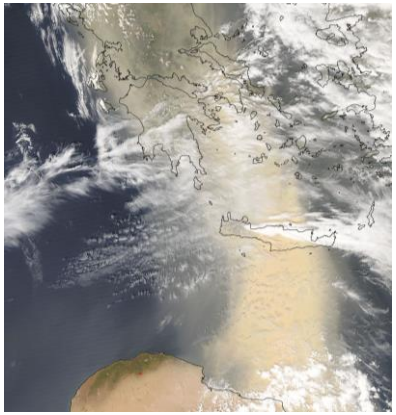
Vassilis Amiridis
BEYOND atmospheric services
IAASARS, National Observatory of Athens
Greece

SEVENTH FRAMEWORK PROGRAMME
FP7-Regpot-2012-13-1

Examples of systematic atmospheric hazards over Greece

Forest Fire Smoke

Saharan Dust



Smoke dispersion

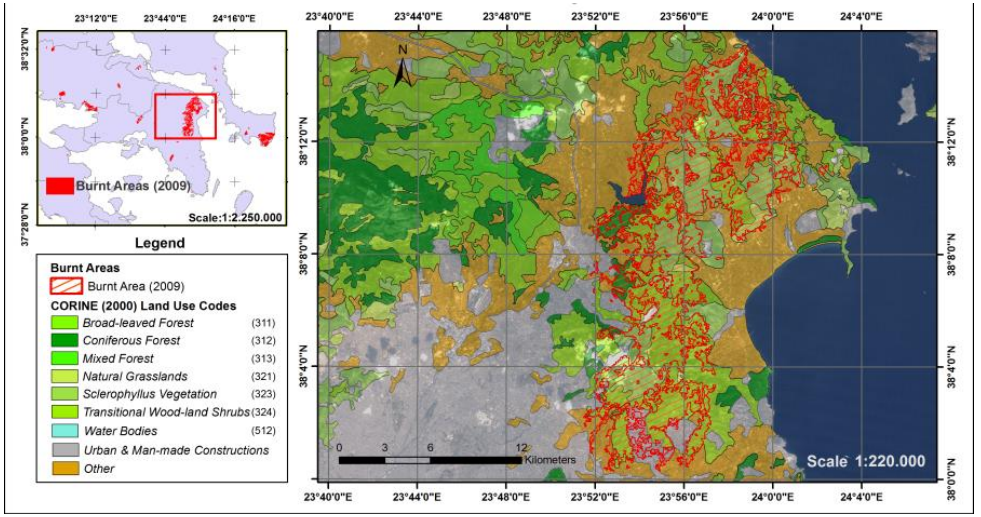
Remote sensing information:

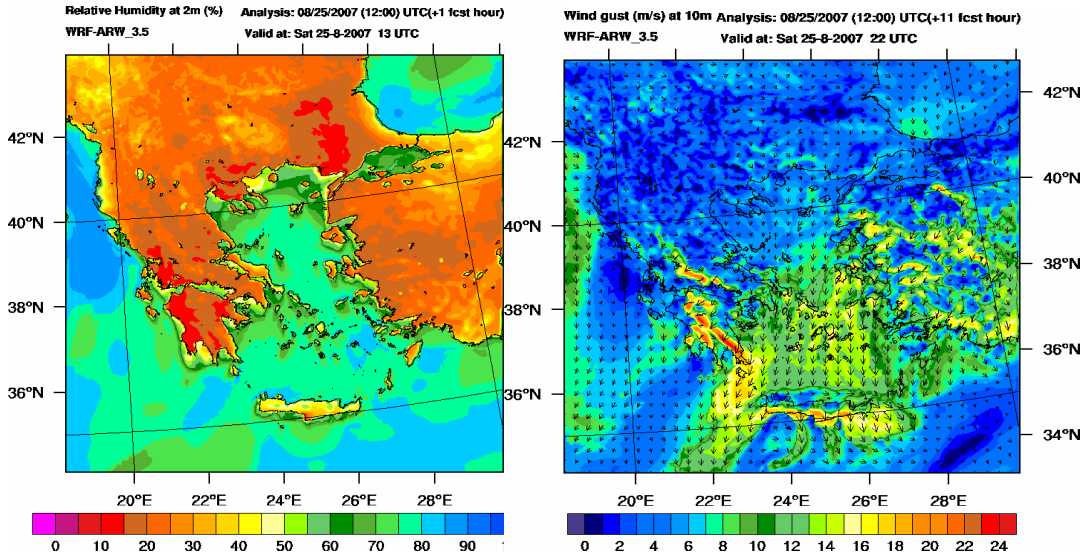
Burnt area
Fuel type
Fire Radiative Power

+

Modeling:

Meteorology





Smoke dispersion

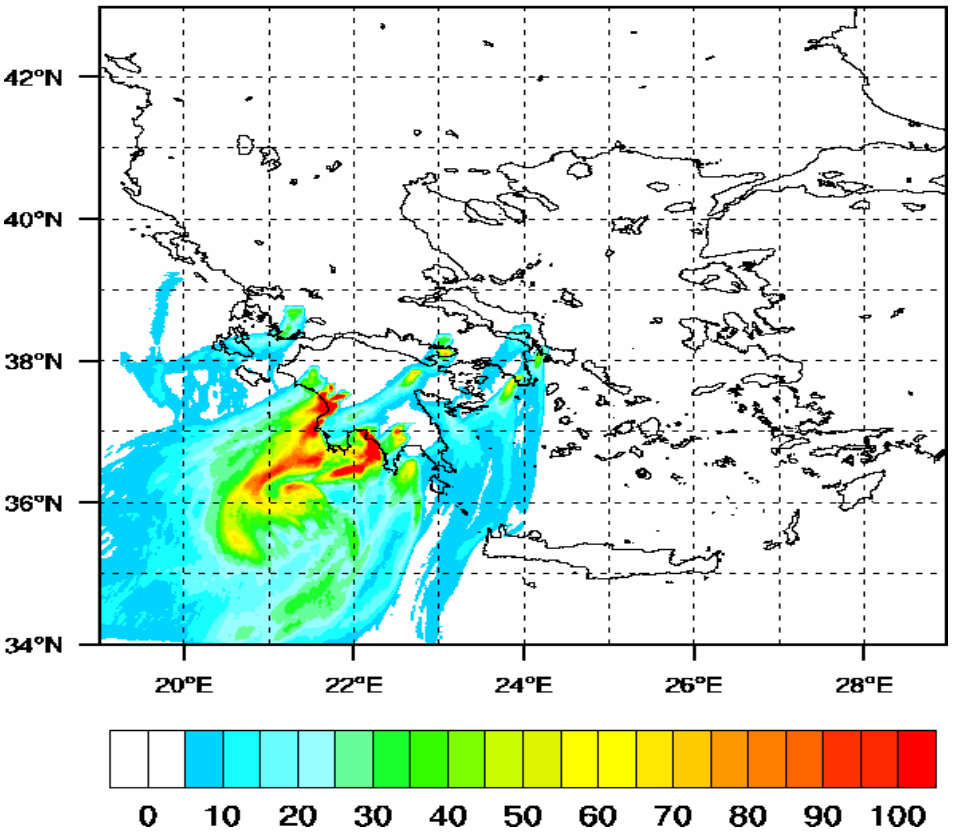
Wild fire smoke dispersion

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

FLEXPART - NOA

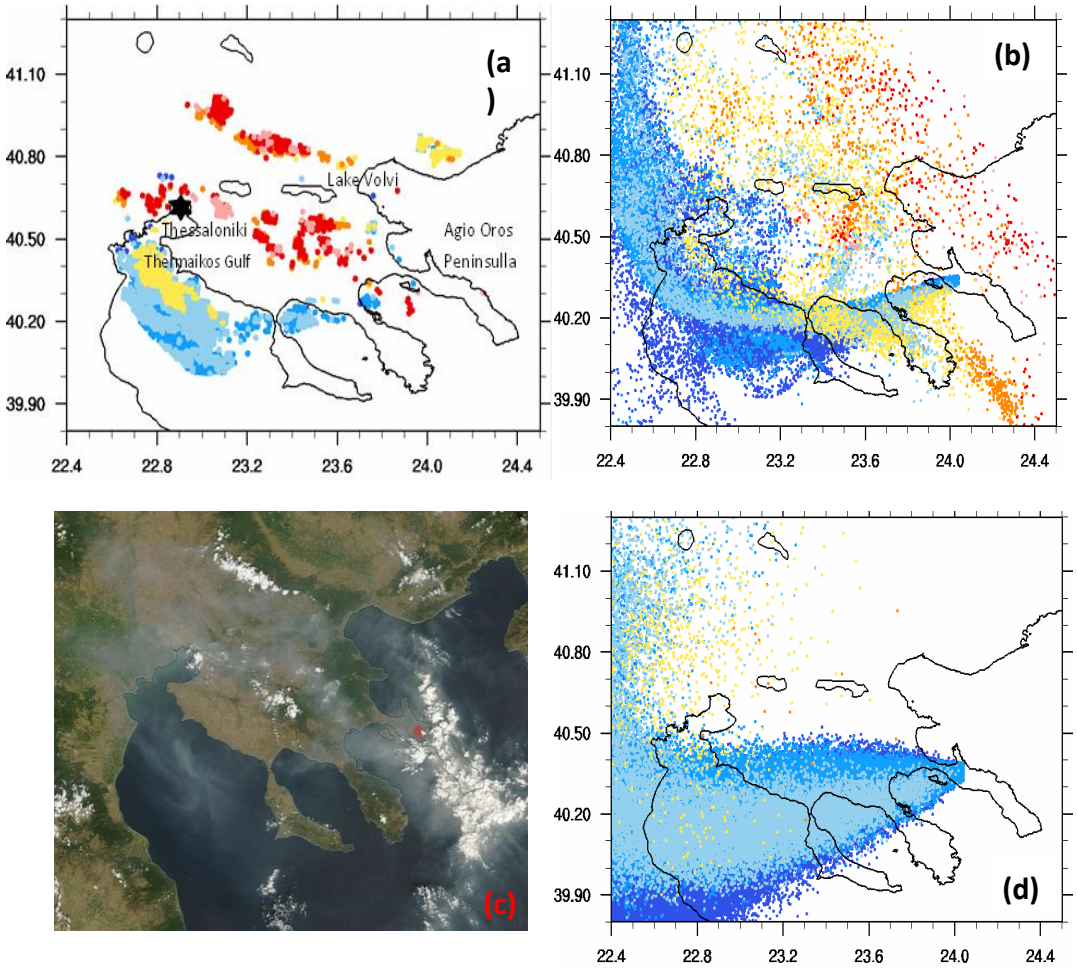
Biomass Burning (Organic Carbon -OC)

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



Solomos et al., 2015, Atm. Environment

Smoke dispersion

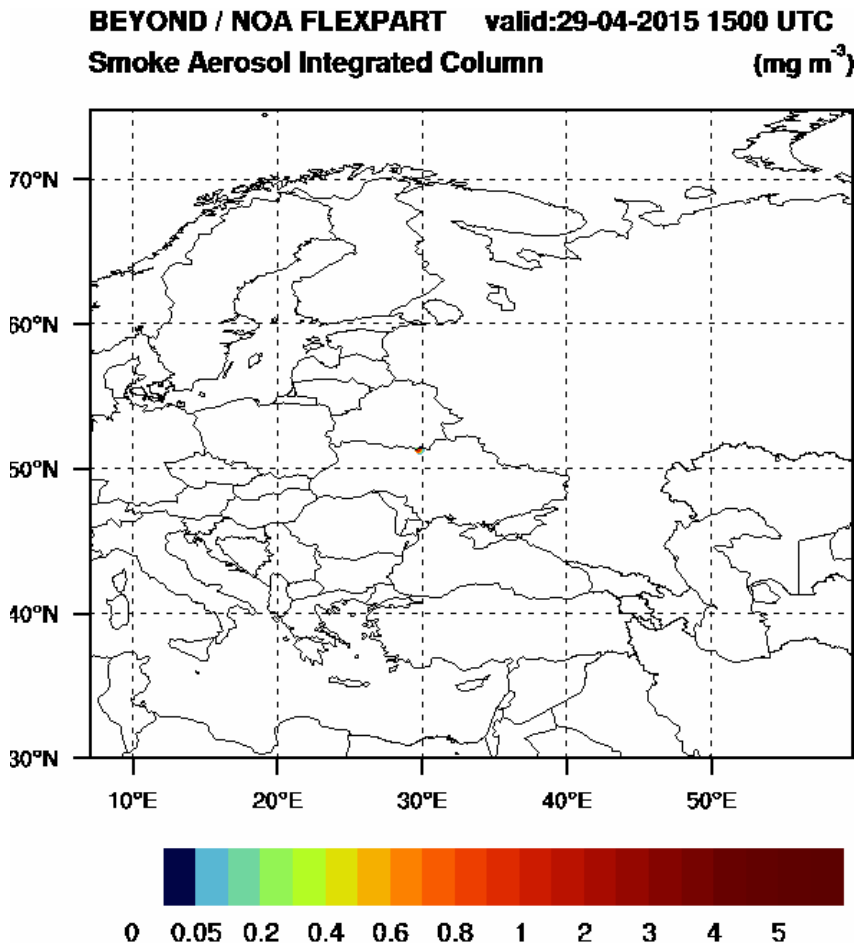


The FLEXPART-NOA smoke dispersion modeling system is operational and provides 3D forecast fields in Greece.

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

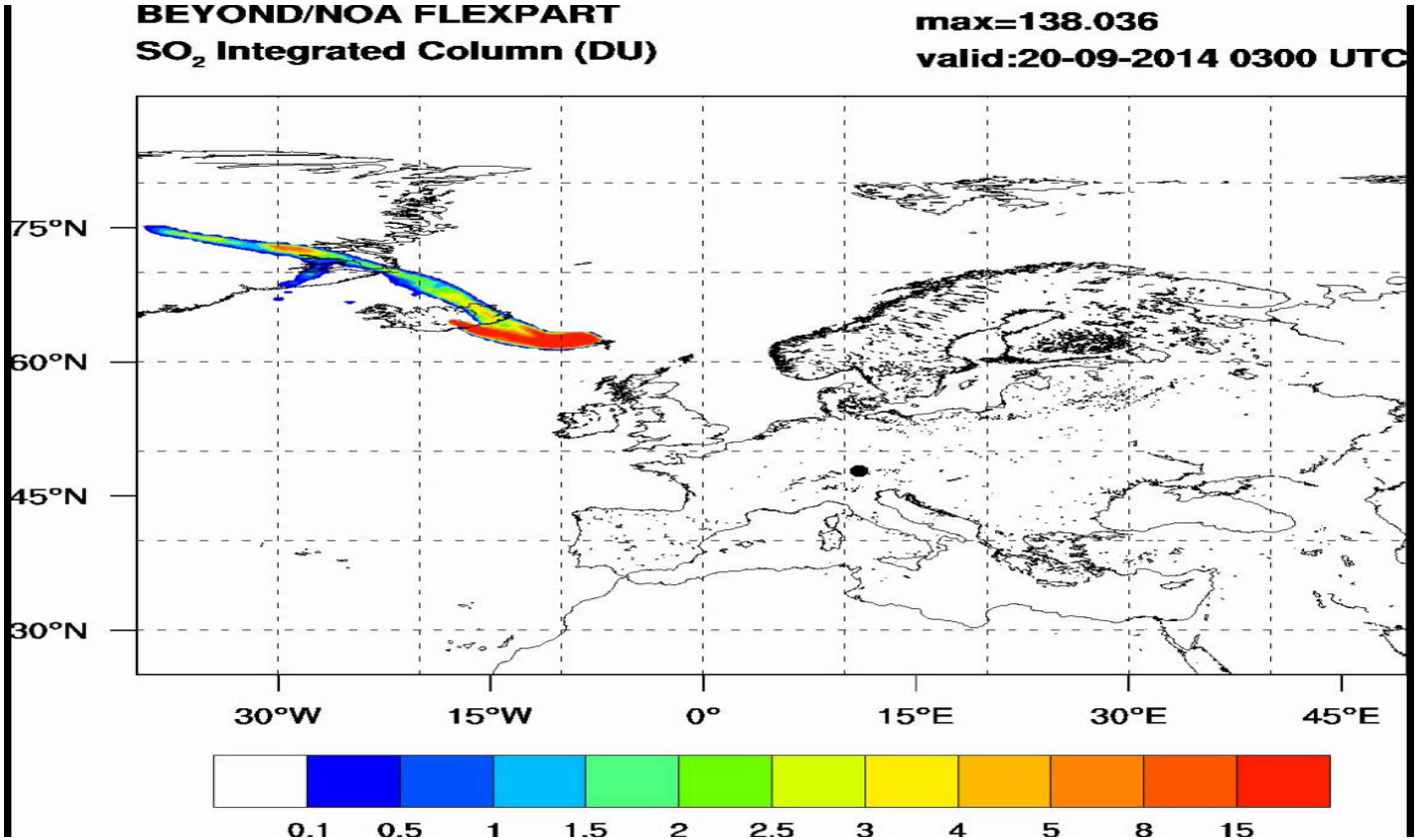
Industrial accident smoke dispersion



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

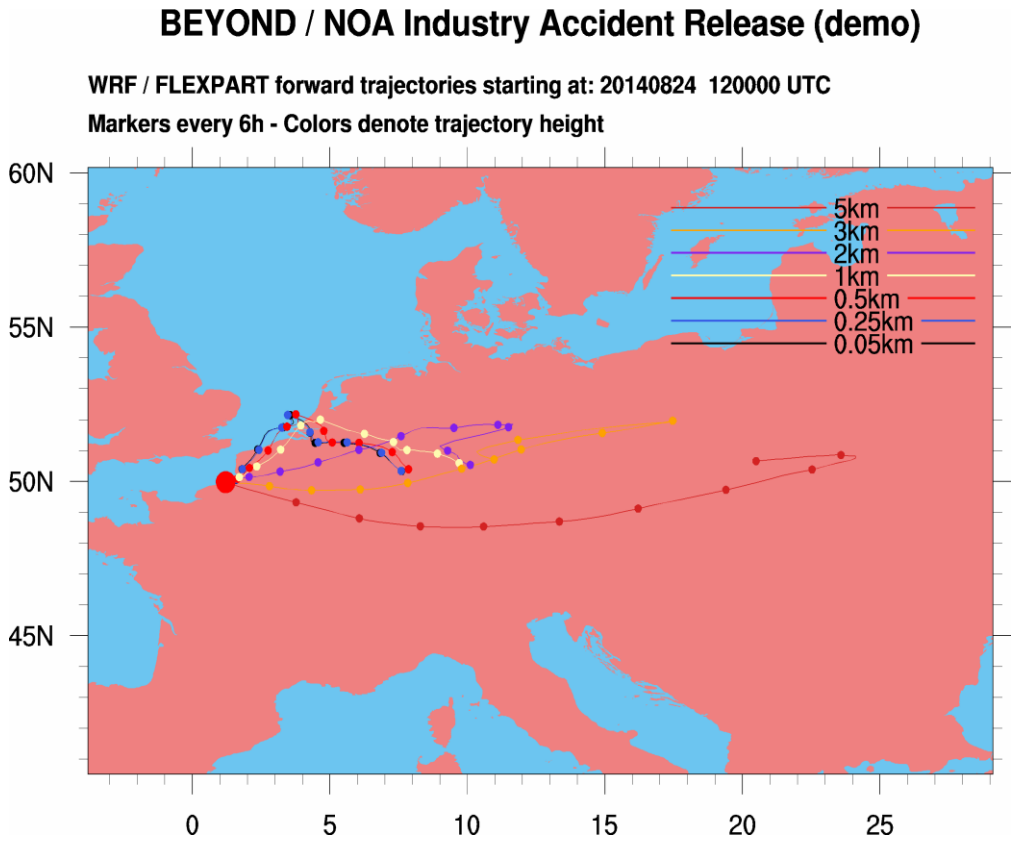
Volcanic ash dispersion



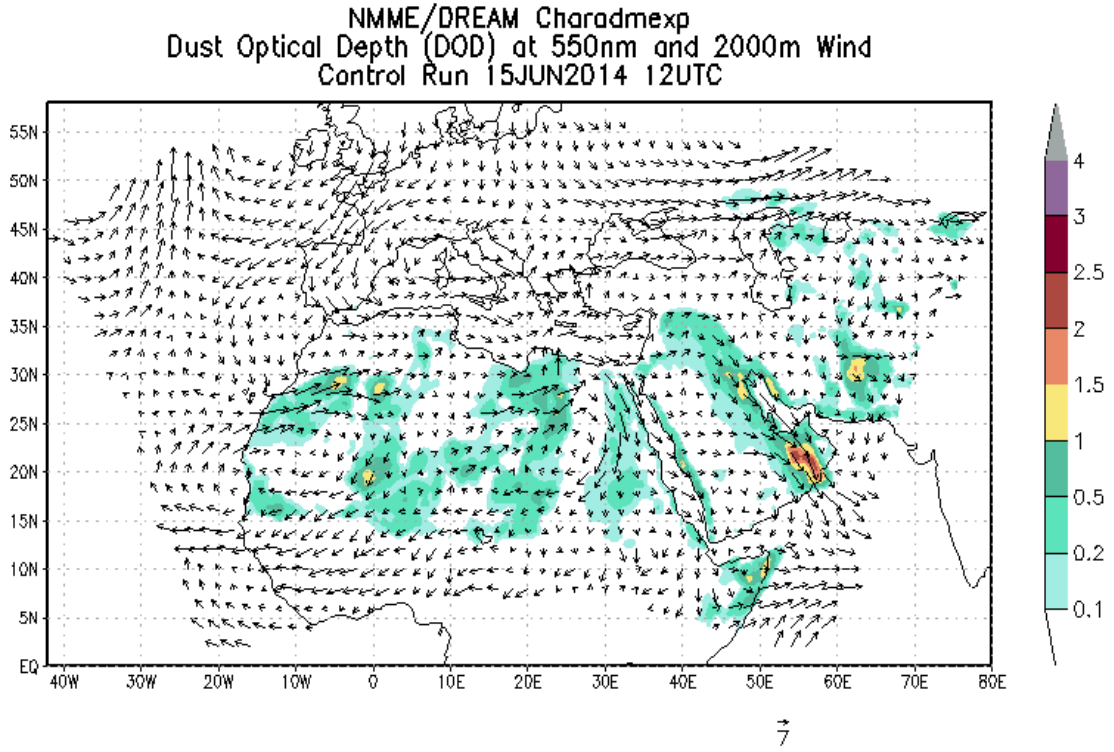
Amiridis et al., 2015, ESA-ATMOS Conference

Nuclear accident release

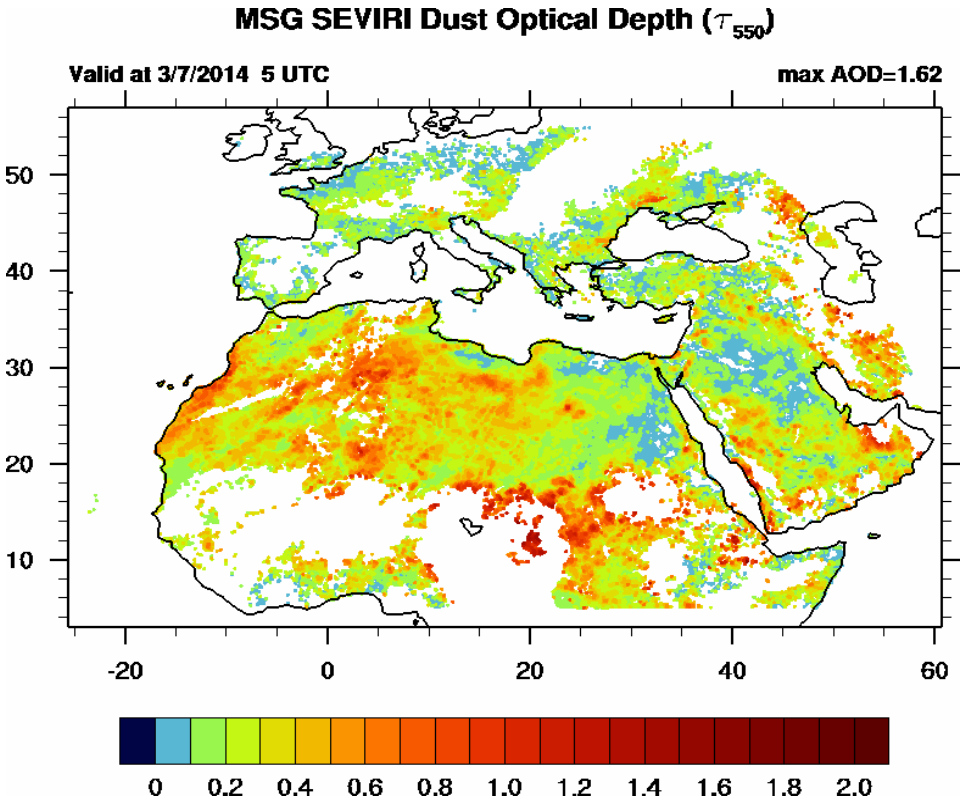
- Prognostic forward trajectories for a conceptual scenario of nuclear accident over Europe.
- The big red dot indicates the location of the release.
- Different color lines indicate various height releases.
- When one knows the actual (observed) height of gas or particle releases the plume path is estimated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



Desert dust modeling and forecasting

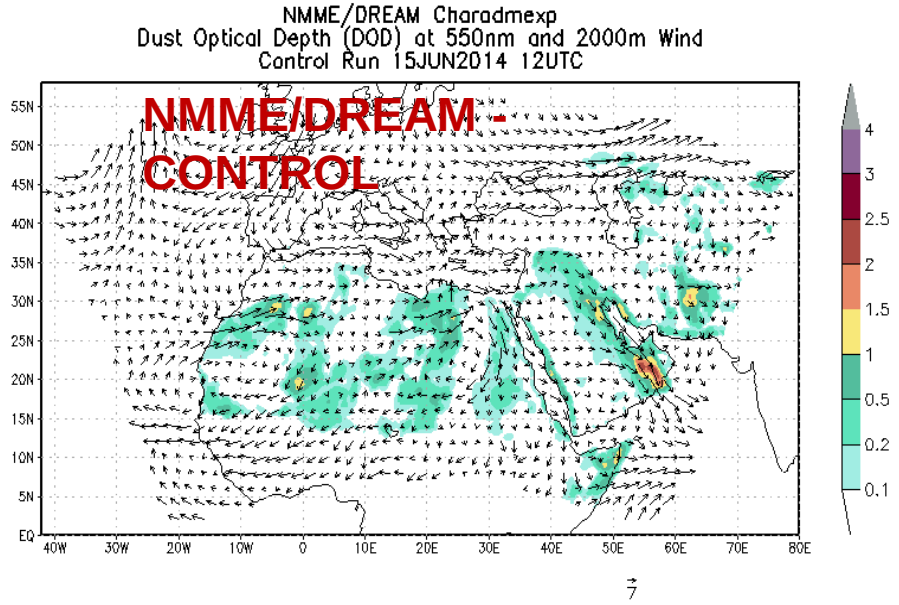


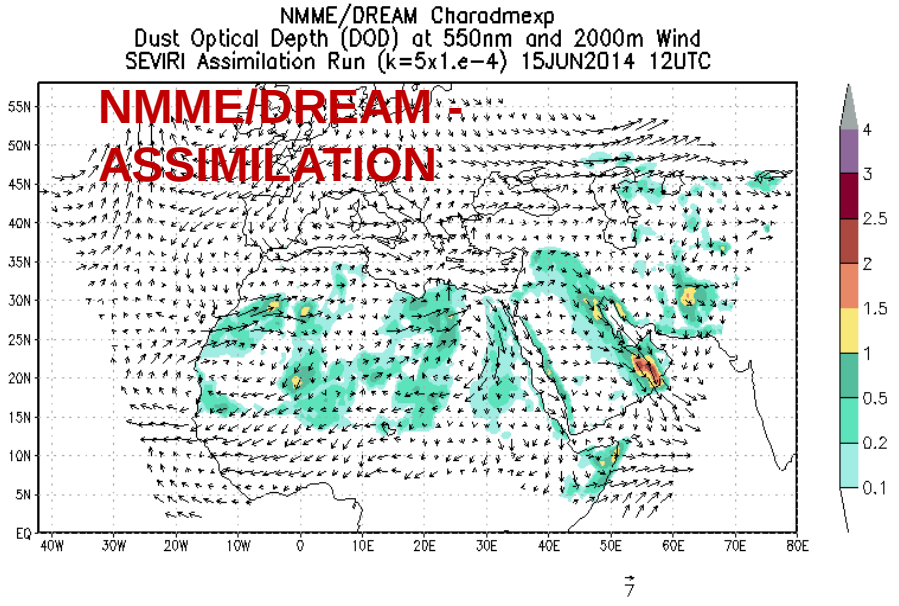
Desert dust modeling and forecasting



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

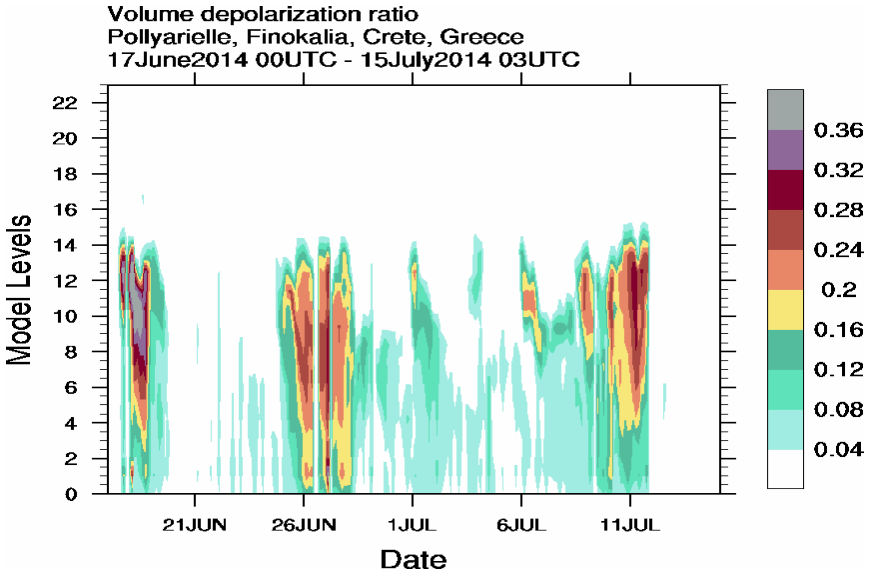


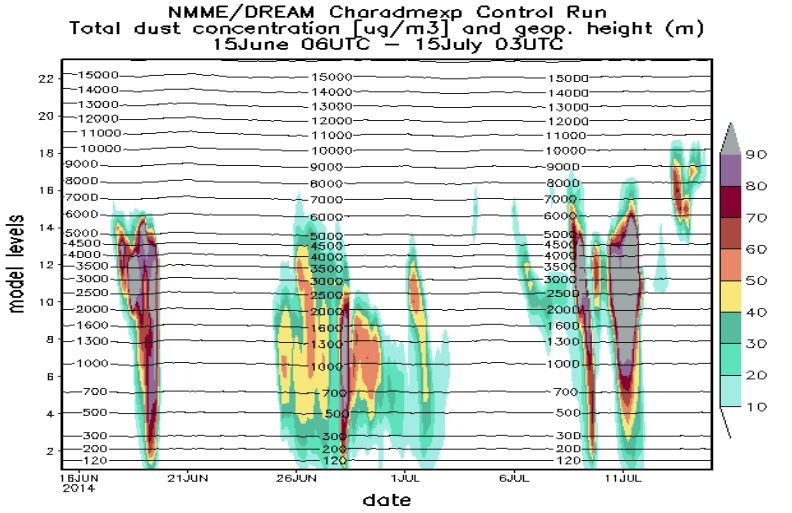


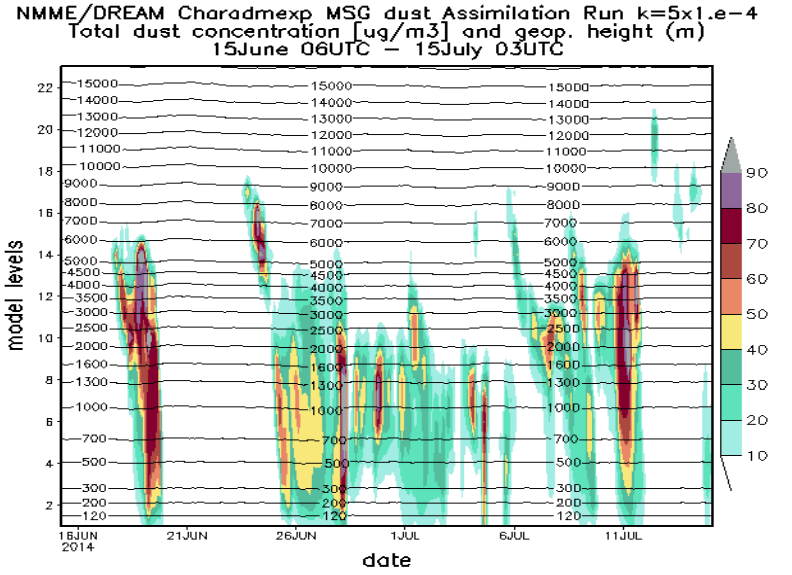
Assimilation Effects

- 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)

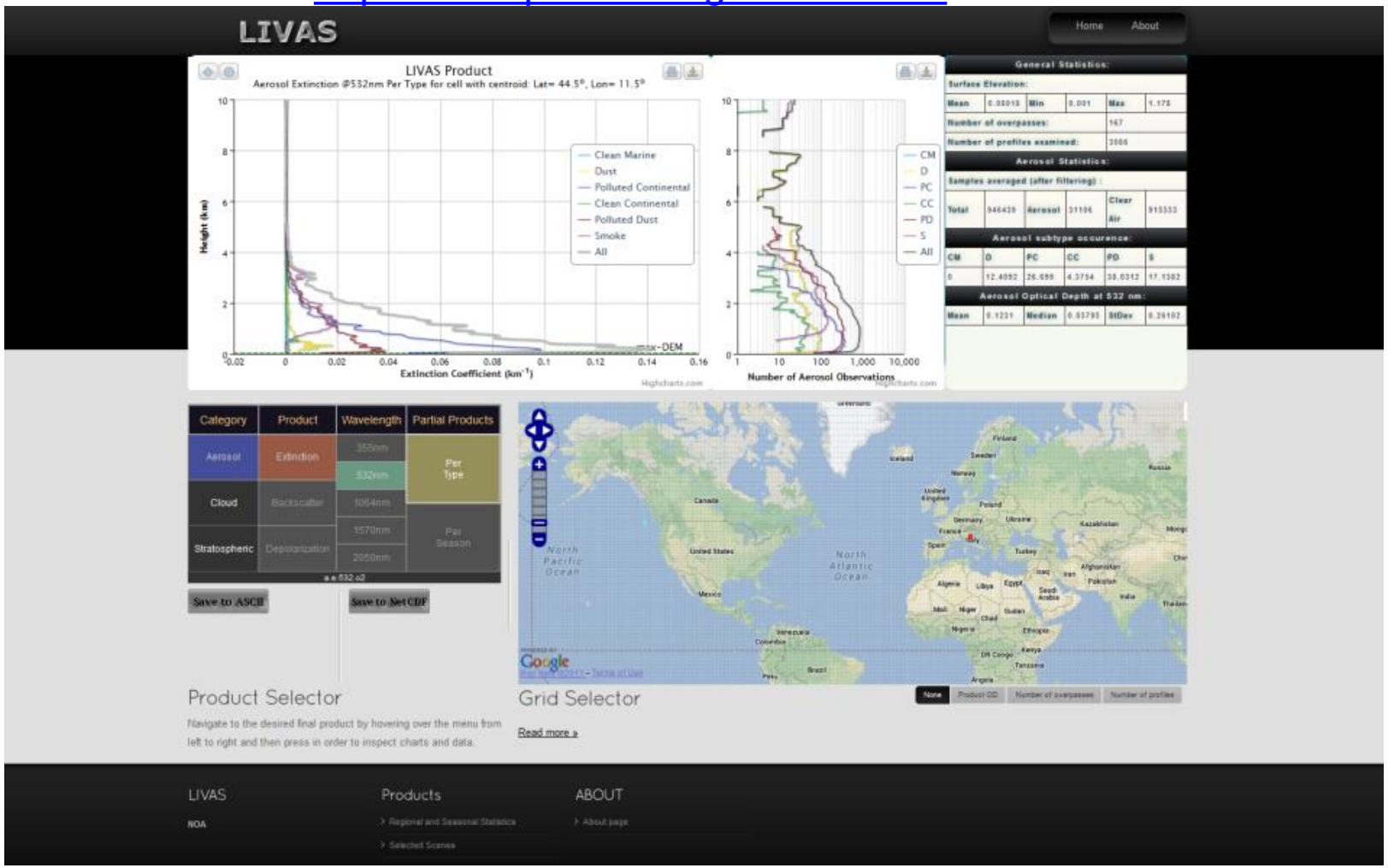
Aeolus and Livas

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

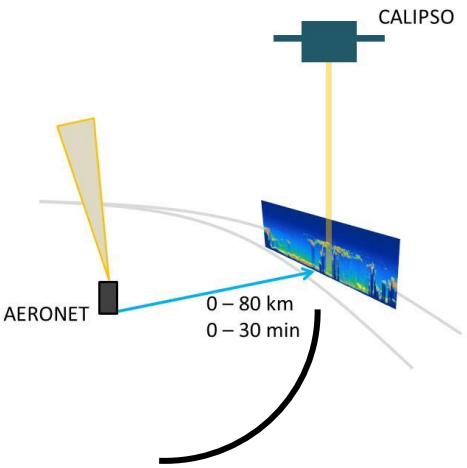
http://lidar.space.noa.gr:8080/livas/



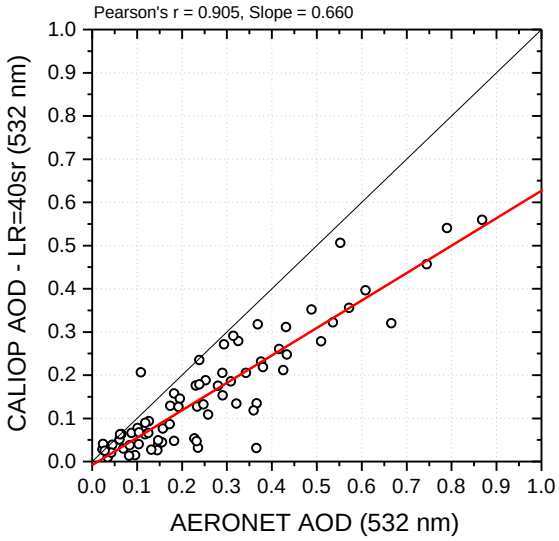
Amiridis et al., 2015, ACP

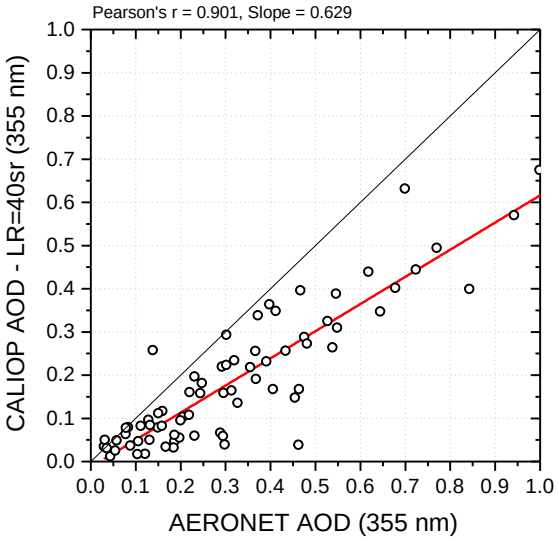
LIVAS dust product

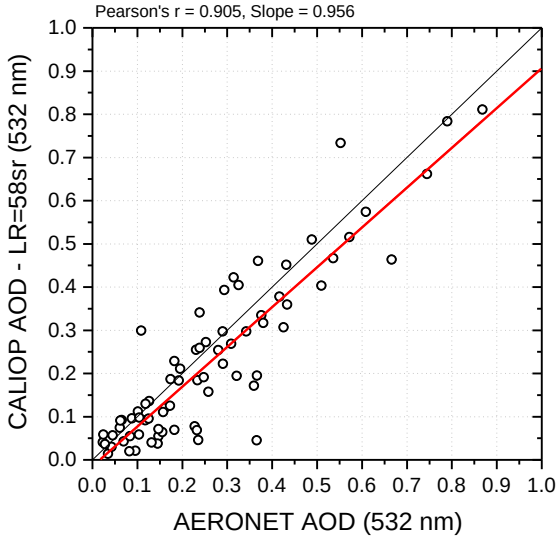
CALIPSO-AERONET Collocation

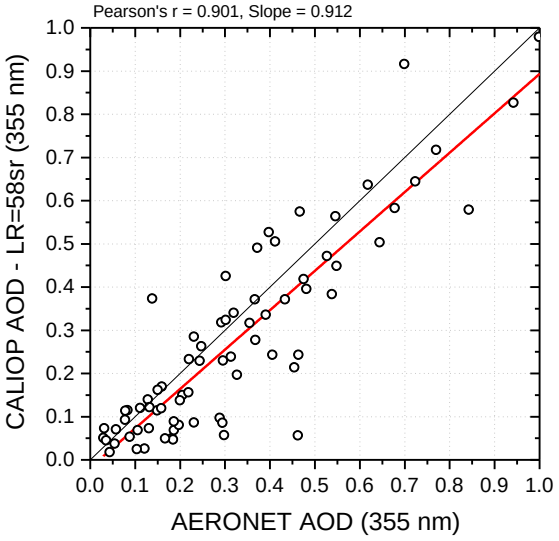


In pure Dust cases from CALIPSO typing



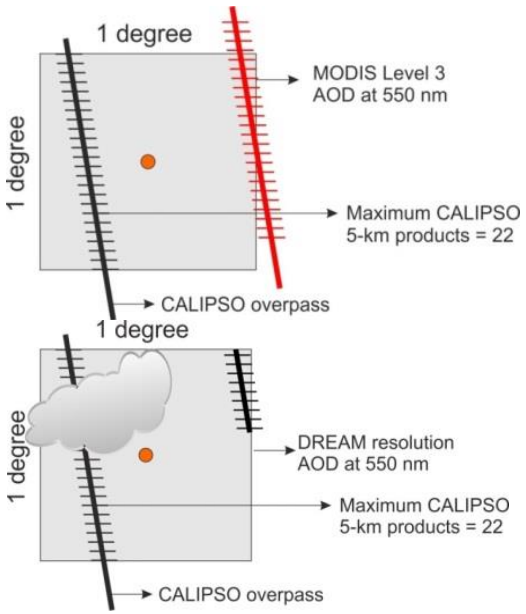




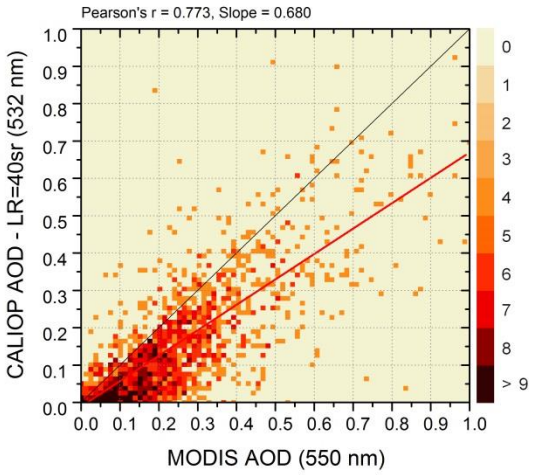


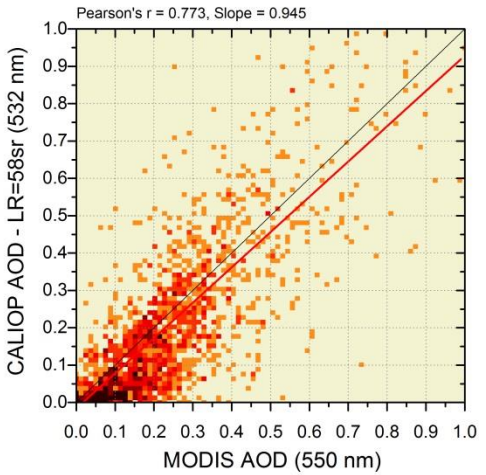
Amiridis et al., 2013, ACP

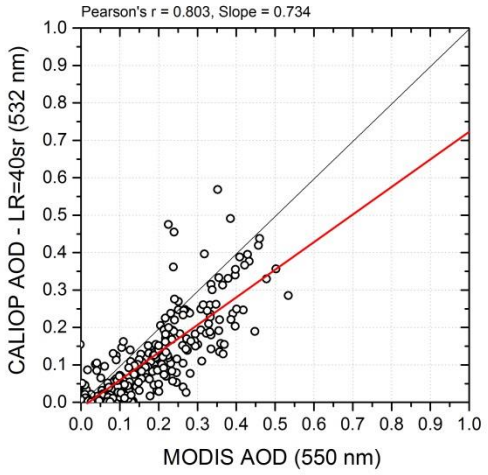
CALIPSO-MODIS Collocation

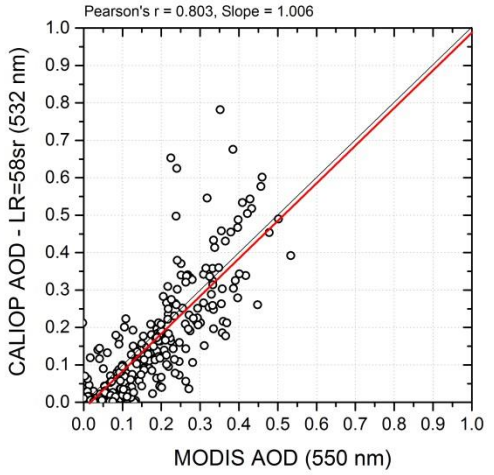


Red overpasses rejected



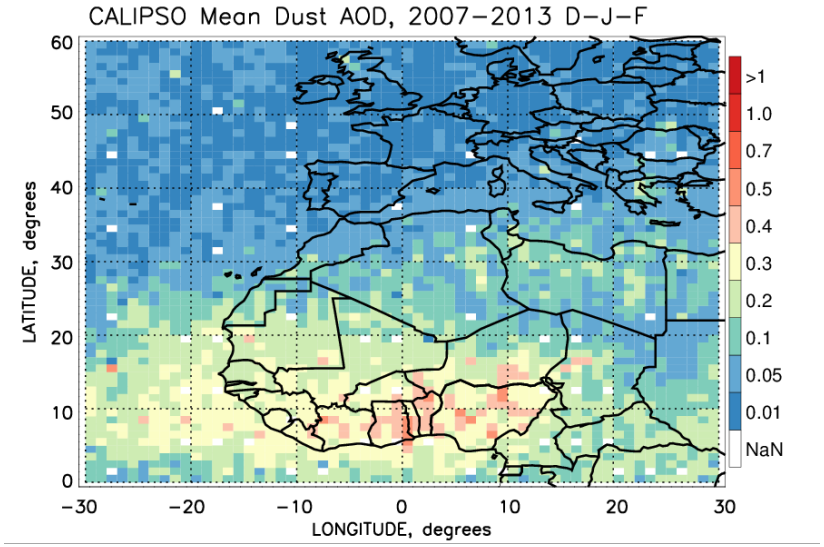


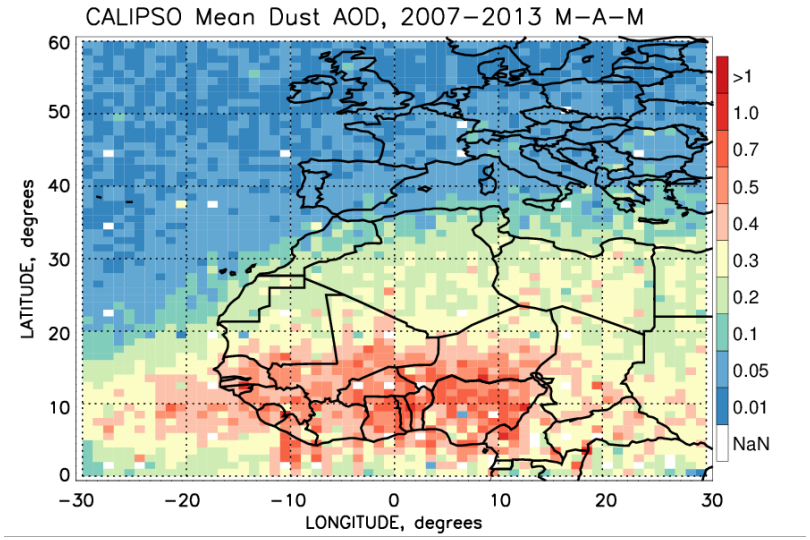


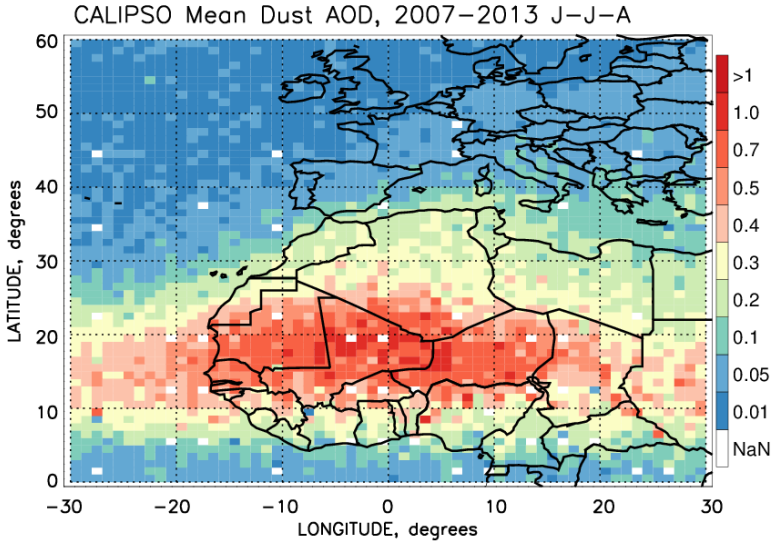


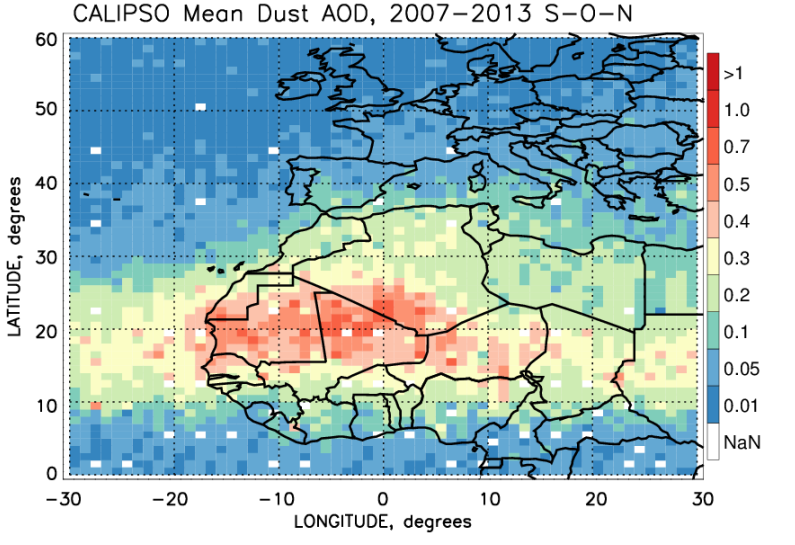
Amiridis et al., 2013, ACP

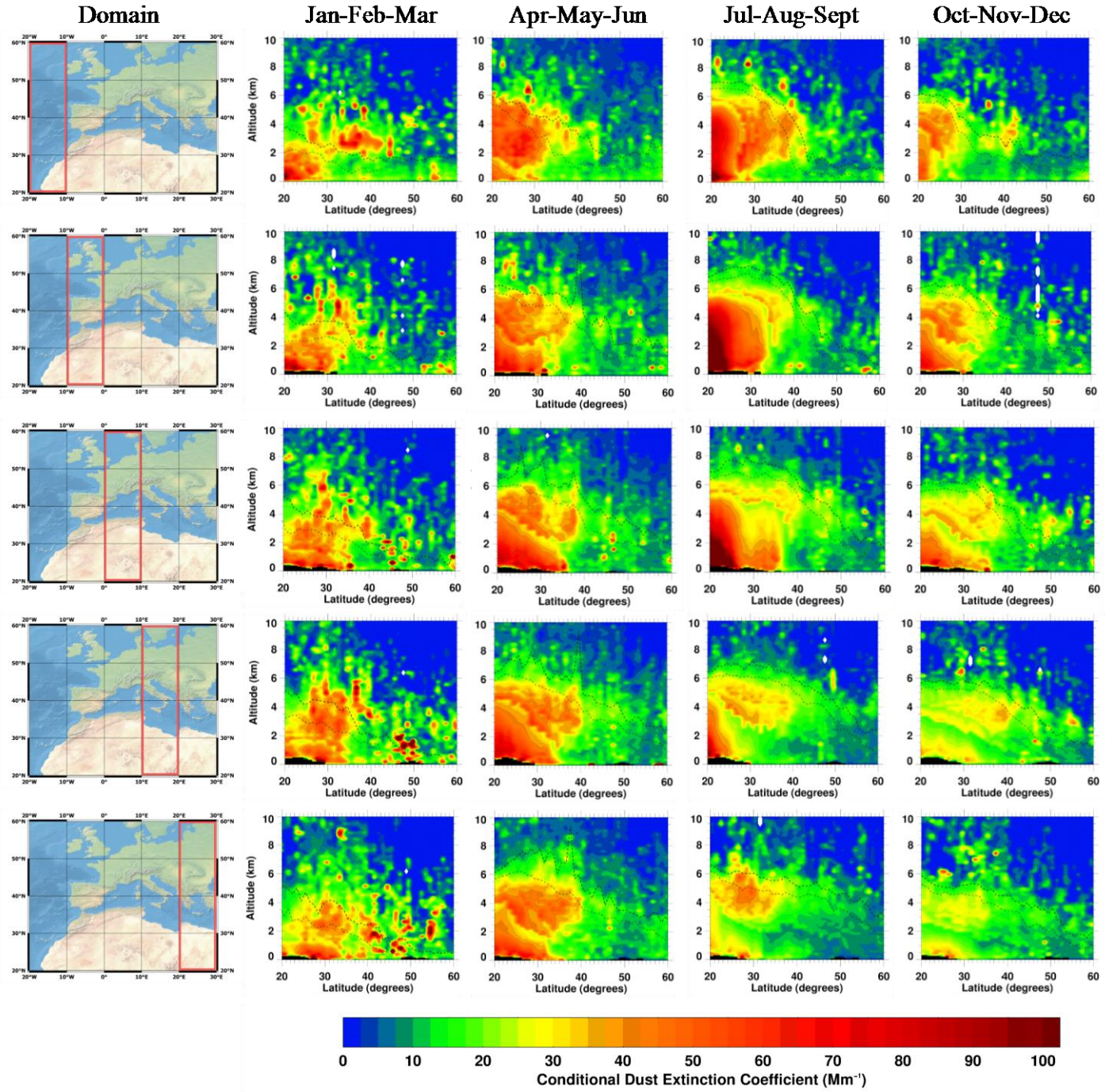

BE OND
Building a Centre of Excellence
for EO-based monitoring of Natural Disasters
IAASARS


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


Domain
Jan-Feb-Mar
Apr-May-Jun
Jul-Aug-Sept
Oct-Nov-Dec
Altitude (km)
Latitude (degrees)
0
10
20
30
40
50
60
70
80
90
100
Conditional Dust Extinction Coefficient (Mm⁻¹)

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

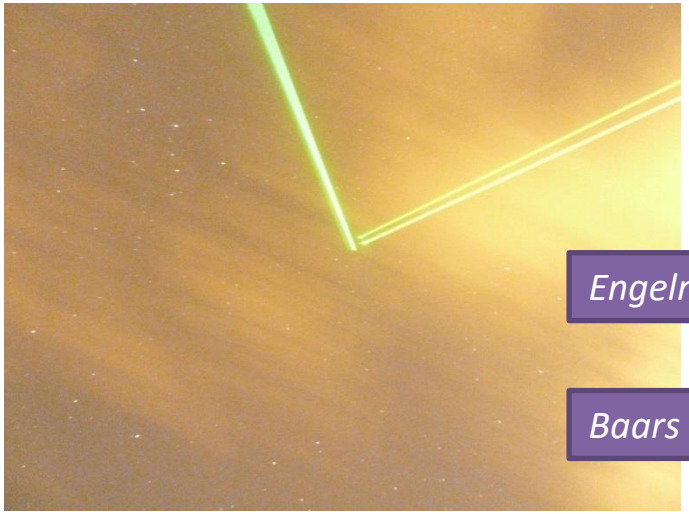
EARLINET

To EarthCARE

ADM-Aeolus??

PollyXT Lidar System

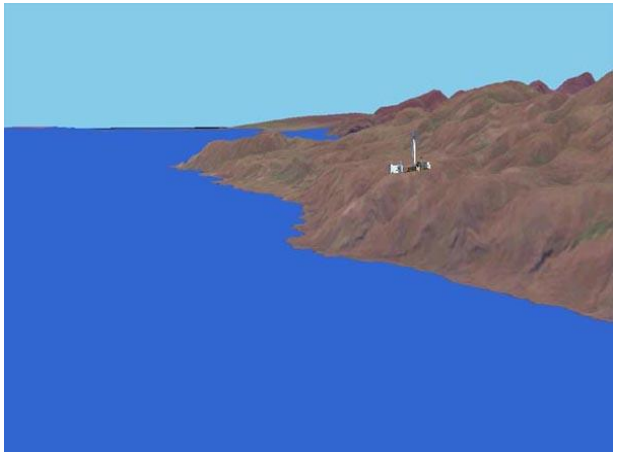
In BEYOND, we developed a sophisticated multi-wavelength backscatter/Raman/depolarization lidar in collaboration with TROPOS Institute in Leipzig, Germany, the so-called **PollyXT lidar**



Engelmann et al., 2016, AMT

Baars et al., 2016, ACP

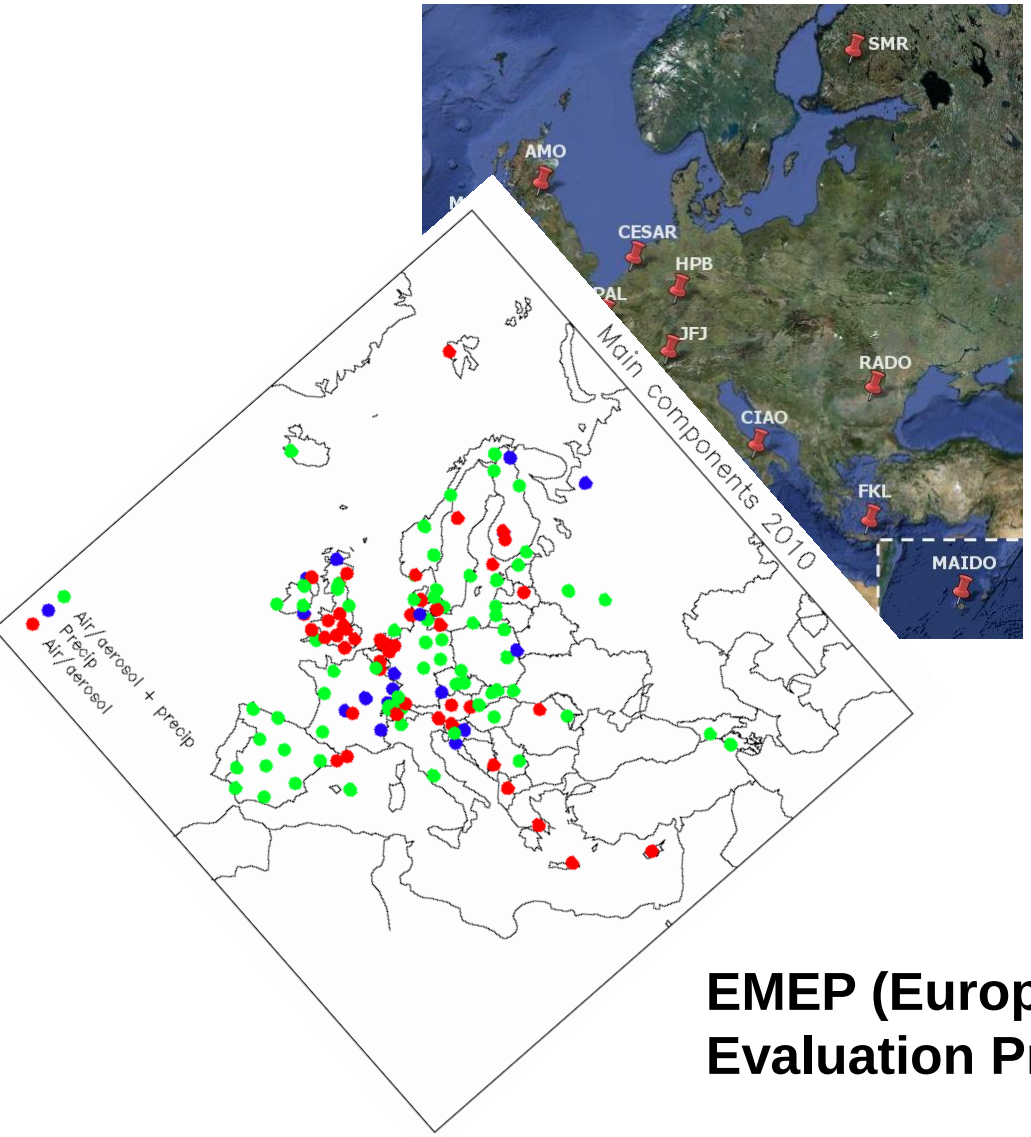
Finokalia station



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


Thermo Environmental Instruments Inc.
PILS
PFEIFFER VACUUM
Magee Scientific
Aethalometer™

Finokalia station



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

Conclusions

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).