

BEYOND for atmospheric hazards monitoring and forecasting

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Atmospheric hazards in BEYOND

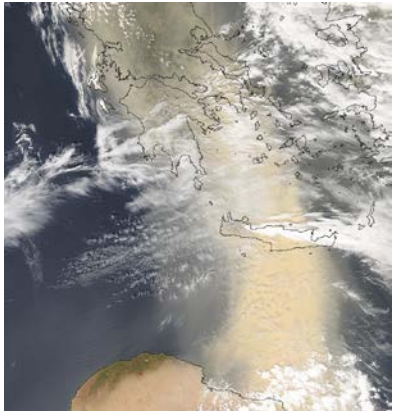


Examples of systematic atmospheric hazards over Greece

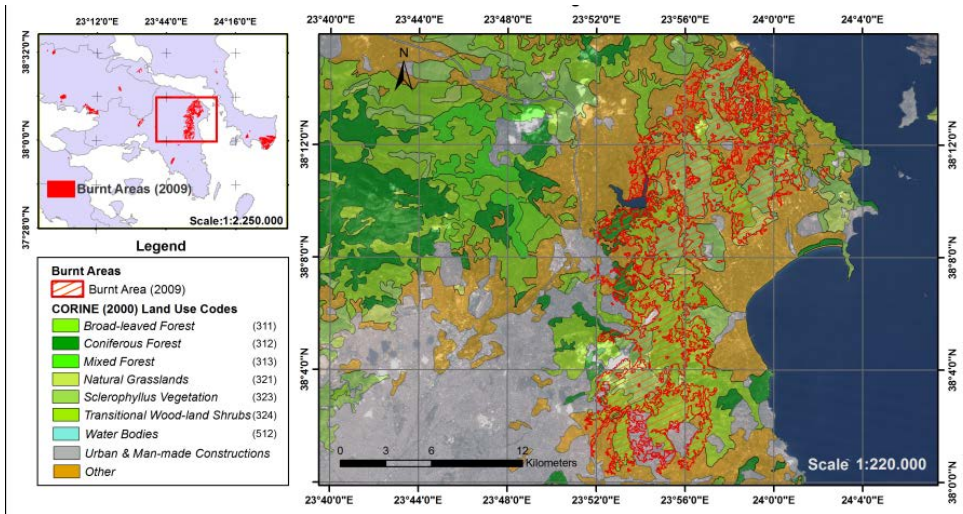
Forest Fire Smoke



Saharan Dust



Forest fire smoke dispersion

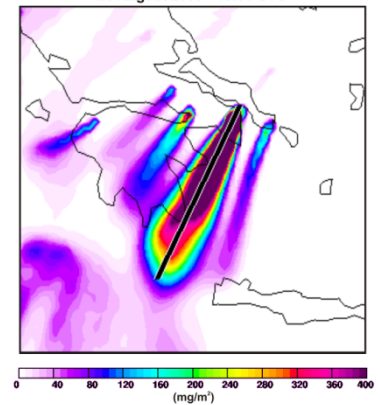


Remote sensing information:

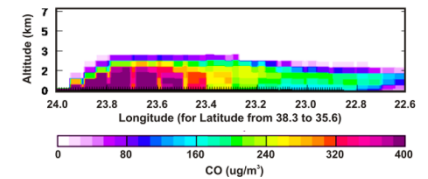
burnt area

+

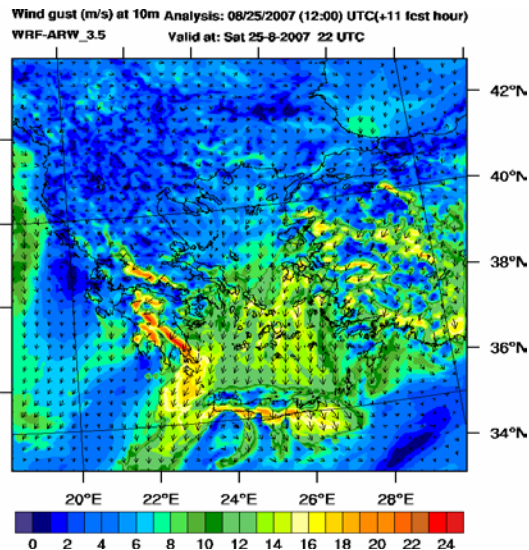
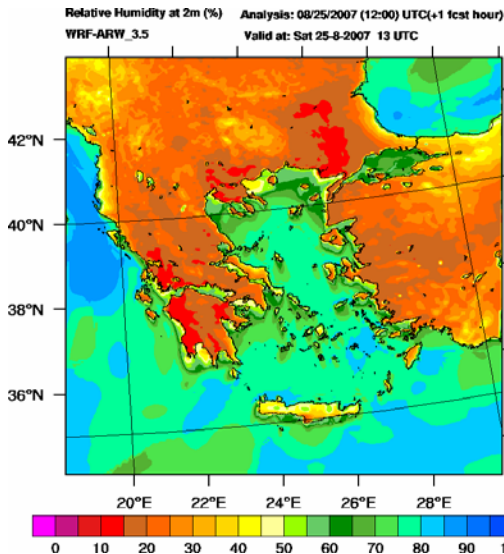
fuel type



+



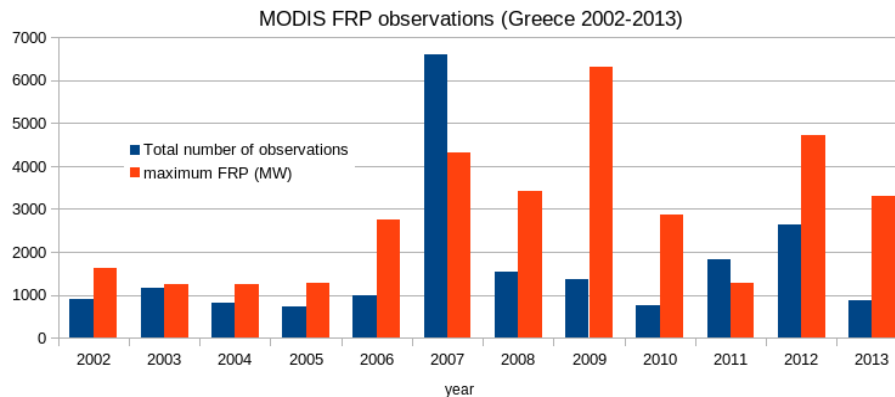
Modeling:
Meteorology



Forest fire smoke dispersion



A vital remote sensing parameter affecting the smoke emission but also the smoke injection height is the **Fire Radiative Power (FRP)**



Increased FRP values
observed after 2006

Forest fire smoke dispersion

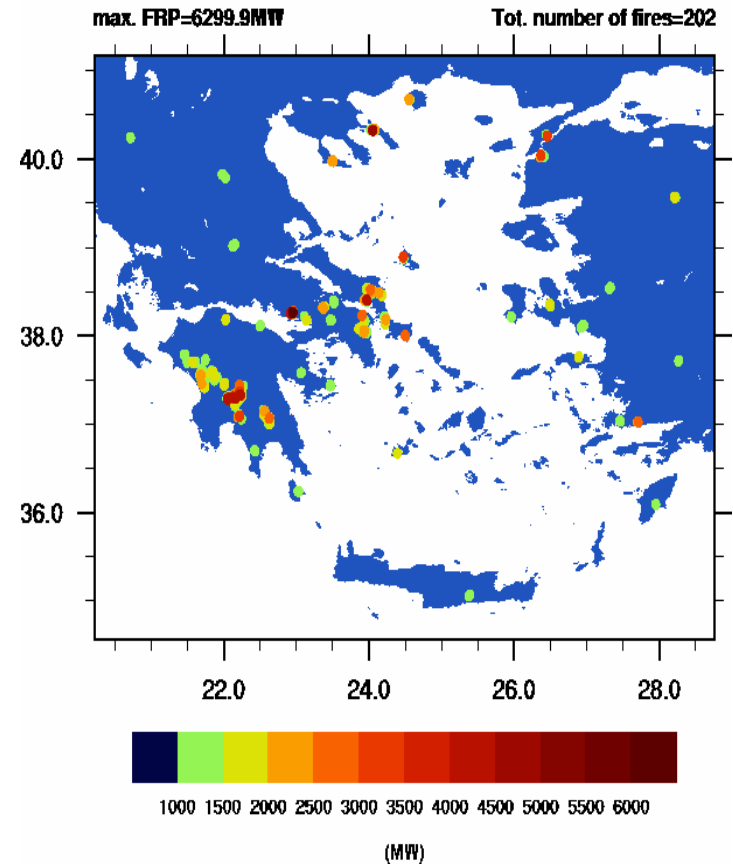
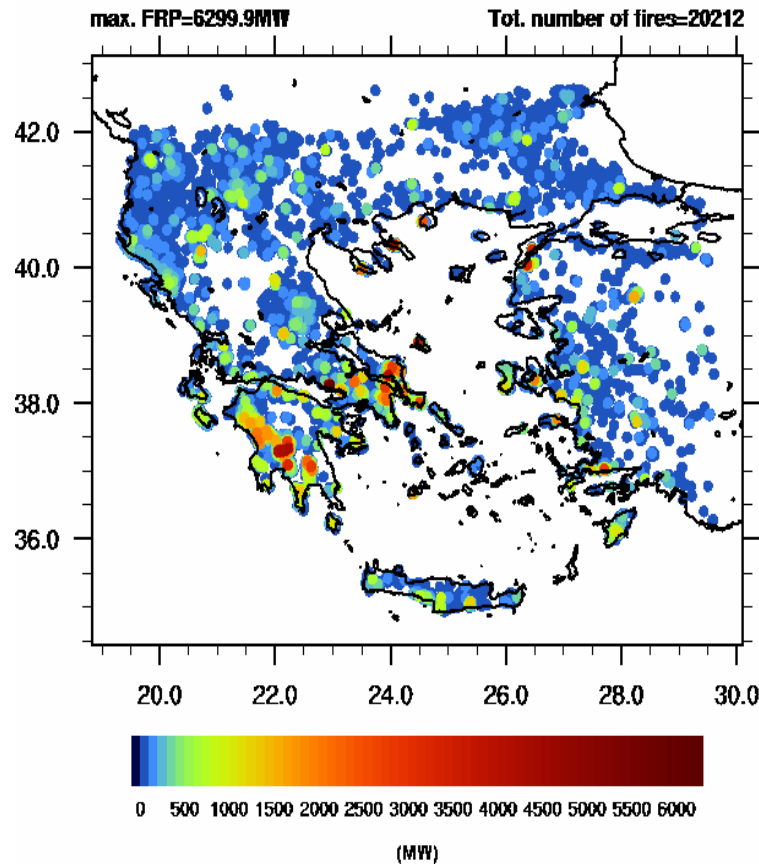


MODIS Fire Radiative Power (FRP) 2002-2013

FRP > 1000 MW
Significant atmospheric impact

MODIS FRP (MW) 2002-2013 (July & August)

MODIS FRP (MW) 2002-2013 (July & August)



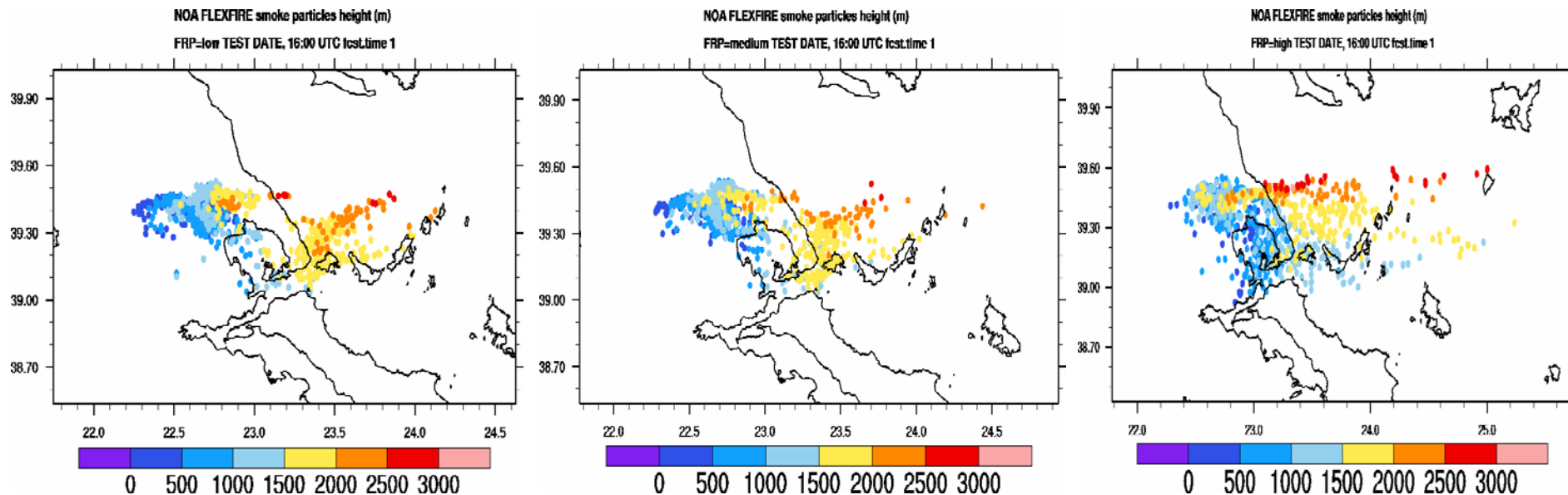
Forest fire smoke dispersion



Currently, we optimize the emission and injection height parameterizations.

Remote sensing information used includes FRP from MODIS and SEVIRI for injection heights and fuel type and relative humidity for emissions.

Example of **Plume Rise**, through sensitivity studies with the same WRF meteorological run, same fire hot spots and different FRP values

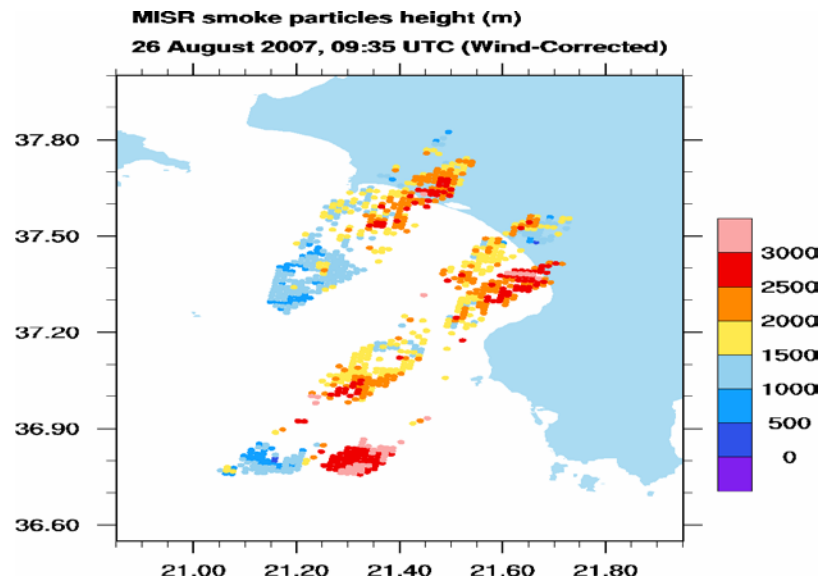


Forest fire smoke dispersion

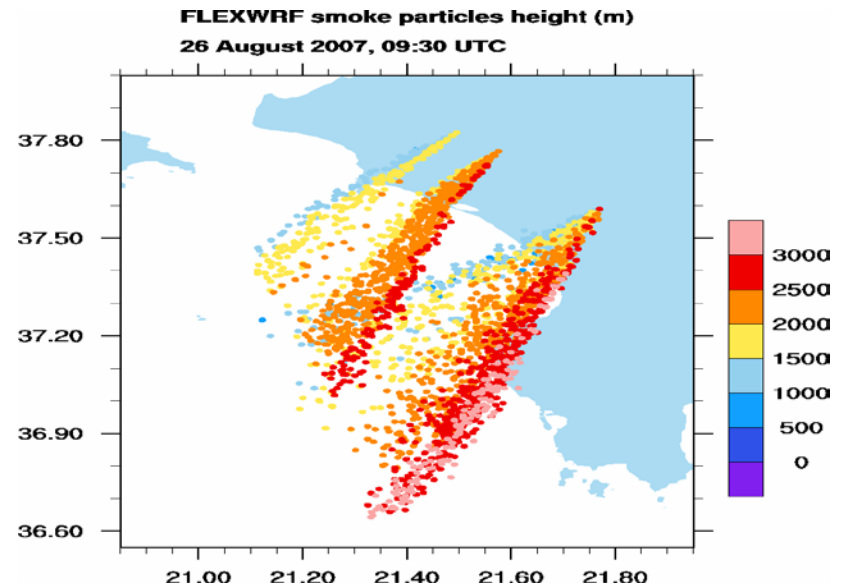


The optimization process is based on 3D remote sensing atmospheric retrievals for smoke plumes, provided by MISR or CALIPSO systems.

MISR smoke heights



FLEXPART smoke heights



Smoke particles elevate higher than 3km as the plumes move towards southwest while the northern plumes show weaker advection and reach lower altitudes.

Forest fire smoke dispersion



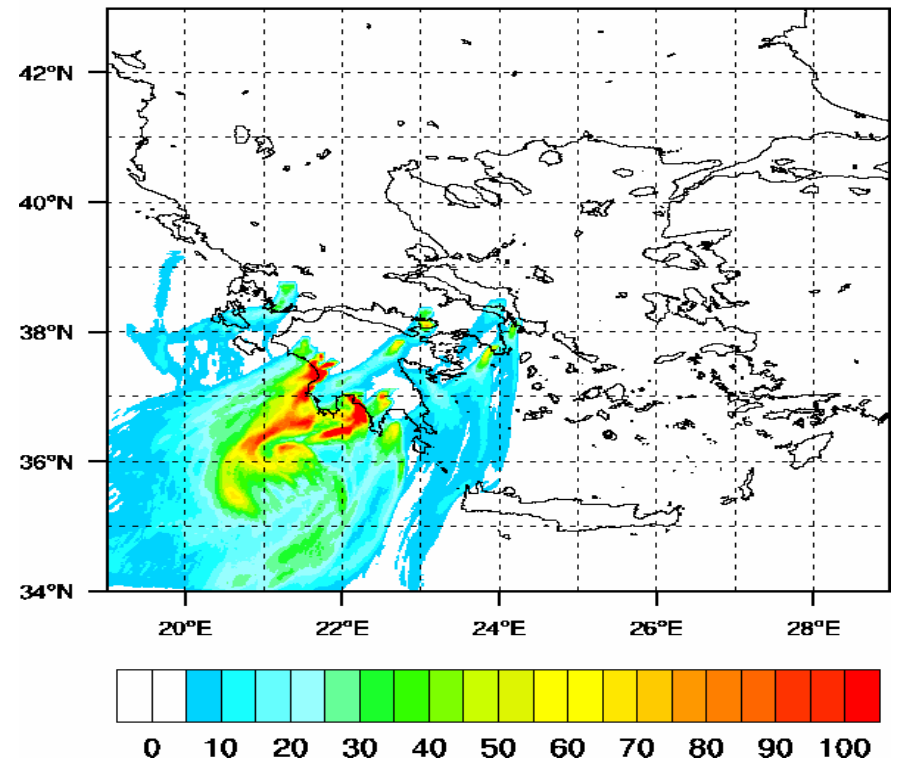
Wild fire smoke dispersion



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)

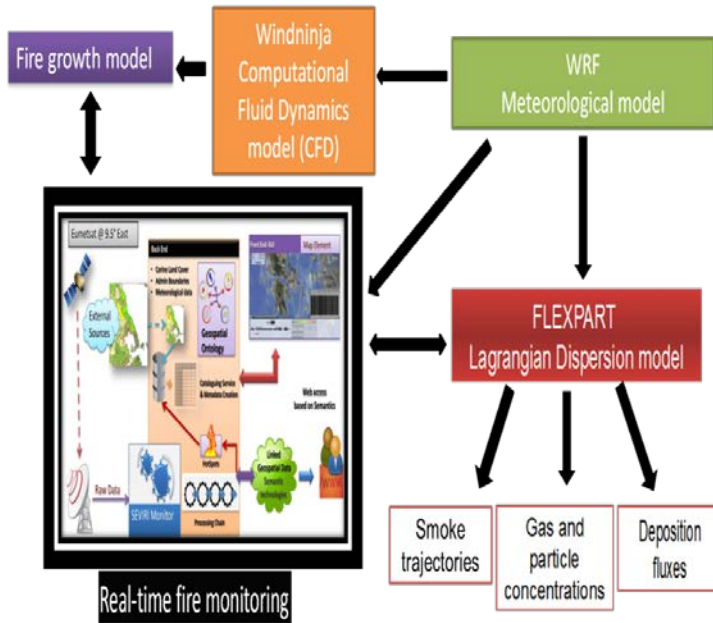


Dispersion of smoke, FLEXWRF 26
August 2007 09:00 UTC

Forest fire smoke dispersion



Earth Observation / Modeling synergies in BEYOND



ce-dispersion#calendar-application-panel-view

BEYOND Building a Centre of Excellence for EO-based monitoring of Natural Disasters

HOME PROJECT INFRASTRUCTURE PEOPLE PARTNERS OUTREACH ANNOUNCEMENTS MULTIMEDIA BEYOND SHARE EVENTS

NATURAL DISASTER SERVICES

FIRE SMOKE DISPERSION

Overview Calendar Application - Main Navigation Panel Calendar Application - Panel View

DATE: 17/08/2014, Forecast Base Time: 16:00 UTC | +15 | +30 | +45 | +60 forecast minutes (first min)

Navigation Buttons for Forecast Imagery Set - Navigate through Forecast Records:

Set of Images for Fire Smoke Dispersion Forecast:

NOA FLEXPART valid:17-08-2014 1515 UTC (ug m³)

NOA FLEXPART valid:17-08-2014 1530 UTC (ug m³)

NOA FLEXPART valid:17-08-2014 1545 UTC (ug m³)

NOA FLEXPART valid:17-08-2014 1700 UTC (ug m³)

1 50 100 200 400 600 800 900 1400 2000 3000

1 50 100 200 400 600 800 900 1400 2000 3000

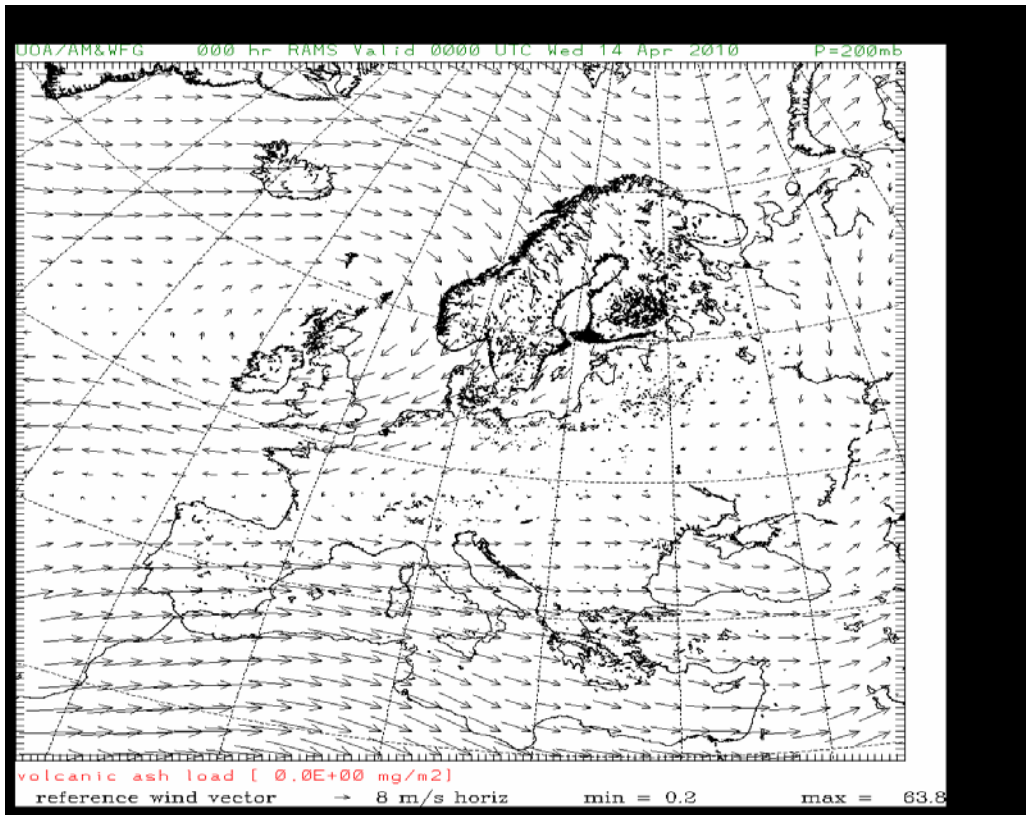
1 50 100 200 400 600 800 900 1400 2000 3000

1 50 100 200 400 600 800 900 1400 2000 3000

Geomaplica Solo...

Wildfire smoke forecast is operational in BEYOND since July 2014

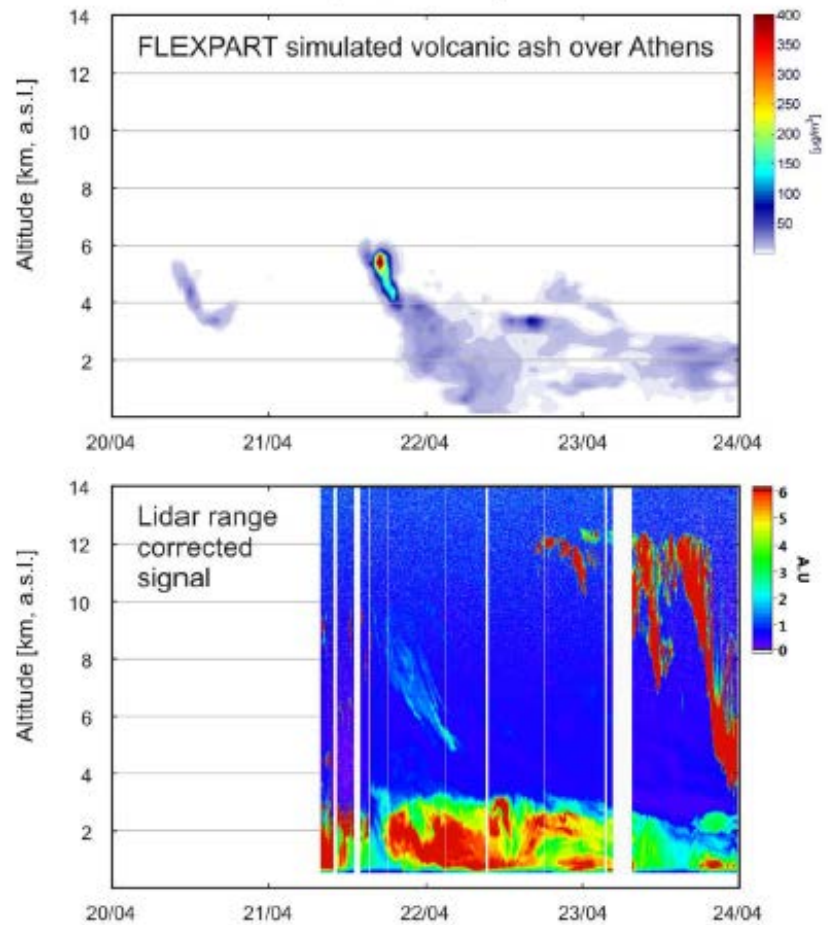
Volcanic ash dispersion



Simulation of Icelandic eruption in 2010

Volcanic ash dispersion

Verification using ground-based lidars



NOA infrastructure for service validation – evaluation purposes



NOA infrastructure for ground-based remote sensing of the atmosphere

Before BEYOND:

- NOA operated the Atmospheric Remote Sensing Station (ARSS) since 2008



Development of an advanced lidar station in BEYOND



The contribution of BEYOND:

- Development and operation of the POLLY lidar
- Operation of the mobile lidar infrastructure EMORAL



Experimental campaigns for service evaluation: Charadmexp

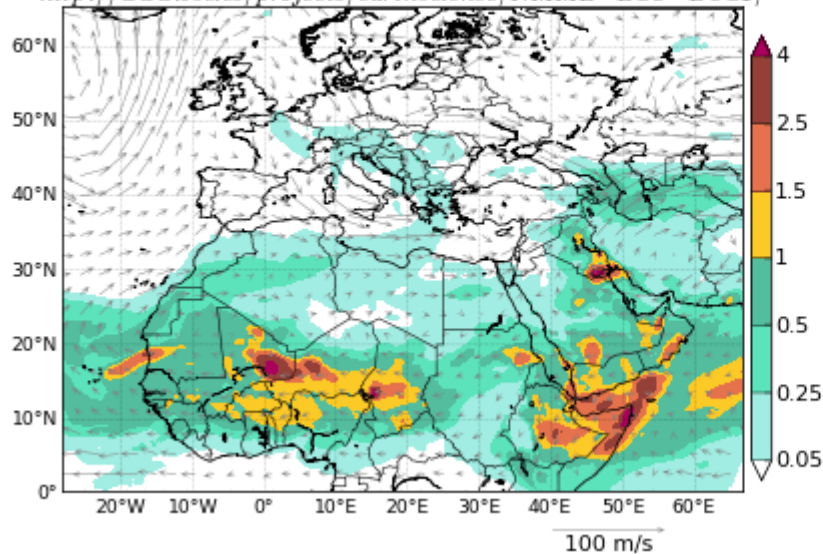


Saharan dust service of BEYOND in collaboration with BSC



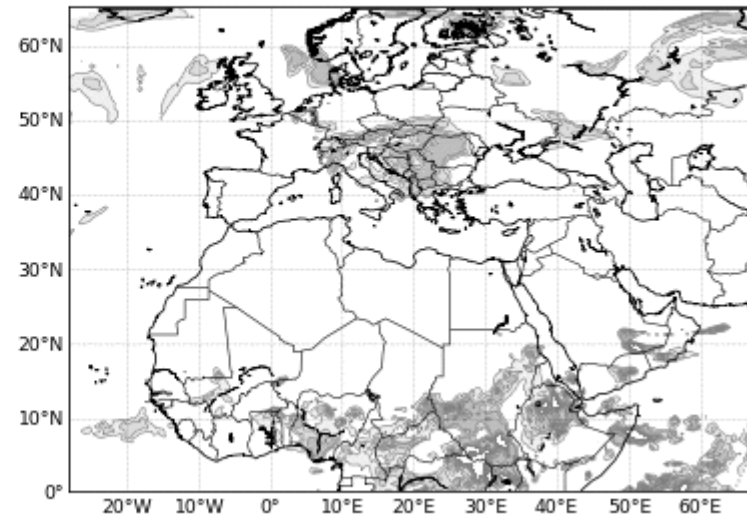
NMMB/BSC-Dust Dust Load (g/m^2) and 700 hPa Wind
00h forecast for 12UTC 22 Jul 2014

<http://www.bsc.es/projects/earthscience/NMMB-BSC-DUST/>

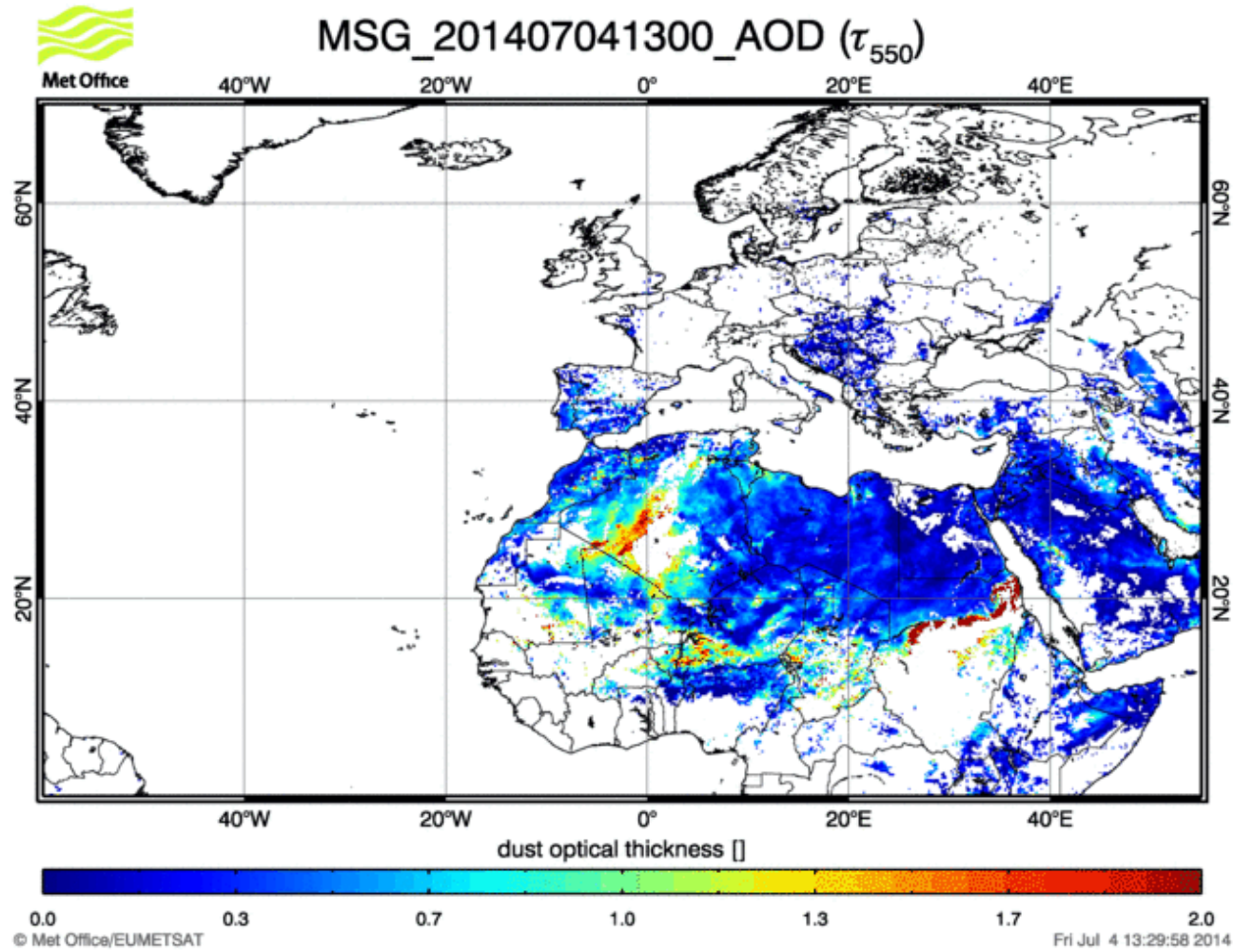


NMMB/BSC-Dust Total Cloud Cover
00h forecast for 12UTC 22 Jul 2014

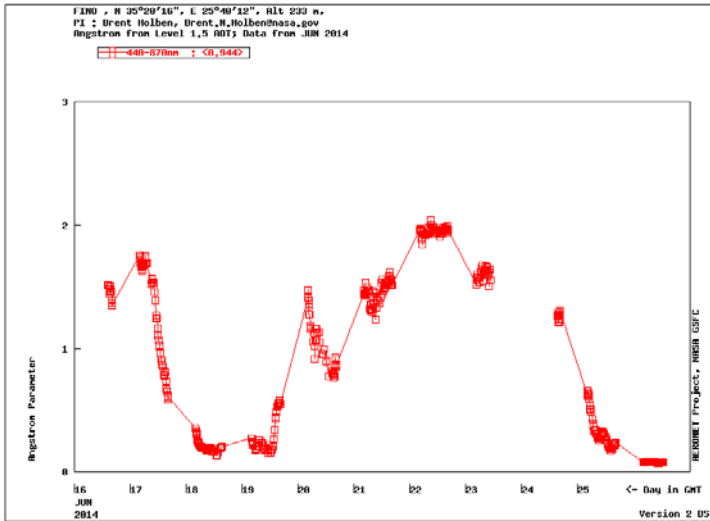
<http://www.bsc.es/projects/earthscience/NMMB-BSC-DUST/>



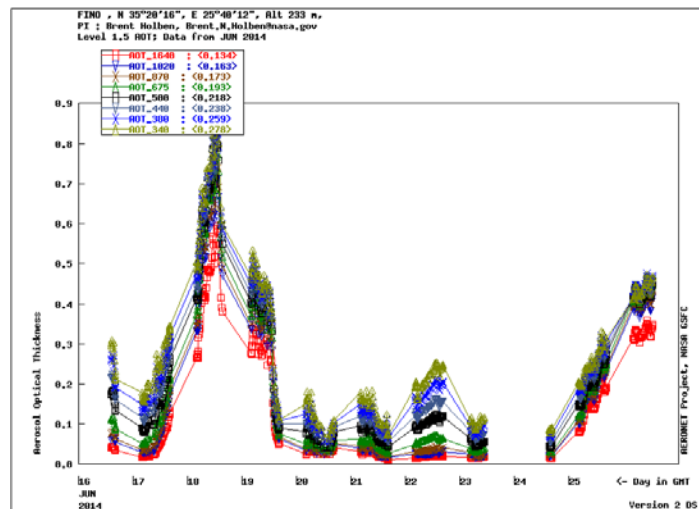
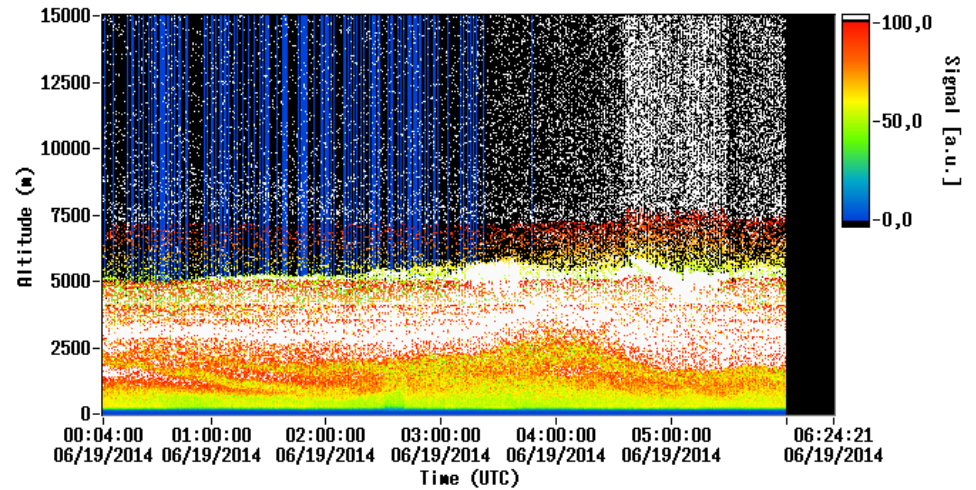
Saharan dust SEVIRI retrieval of BEYOND in collaboration with UKMO



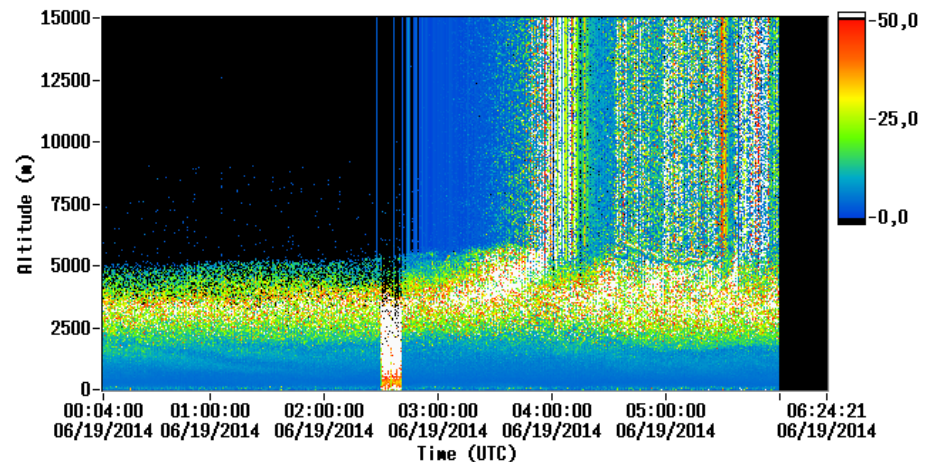
Ground-based measurements for BEYOND service validation/optimization



Range-corrected signal@1064nm, Pollyarielle, Finokalia, Crete, Greece



Volume depolarization ratio [%], Pollyarielle, Finokalia, Crete, Greece



Concluding remarks



- BEYOND aims to deliver real-time services for atmospheric hazards including Saharan dust forecasts, fire smoke dispersion and volcanic ash
- We are working on the direction of optimizing BEYOND models, services and satellite products for the provision of accurate atmospheric projections
- This will be achieved by high-quality ground-based infrastructure, currently developed under BEYOND
- Starting from 2015, BEYOND will operate advanced ground-based networks for cal/val related activities.
- The well-known LIVAS climatology already provided by BEYOND will be optimized by the ground-based retrievals as well