# BEYOND for atmospheric hazards monitoring and forecasting

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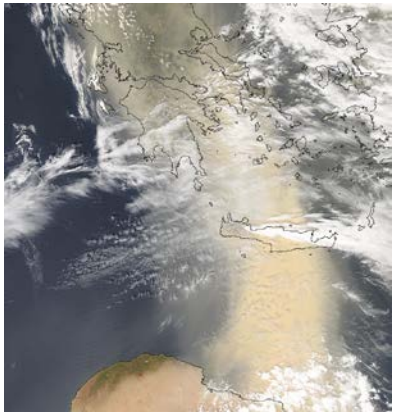
# Atmospheric hazards in BEYOND

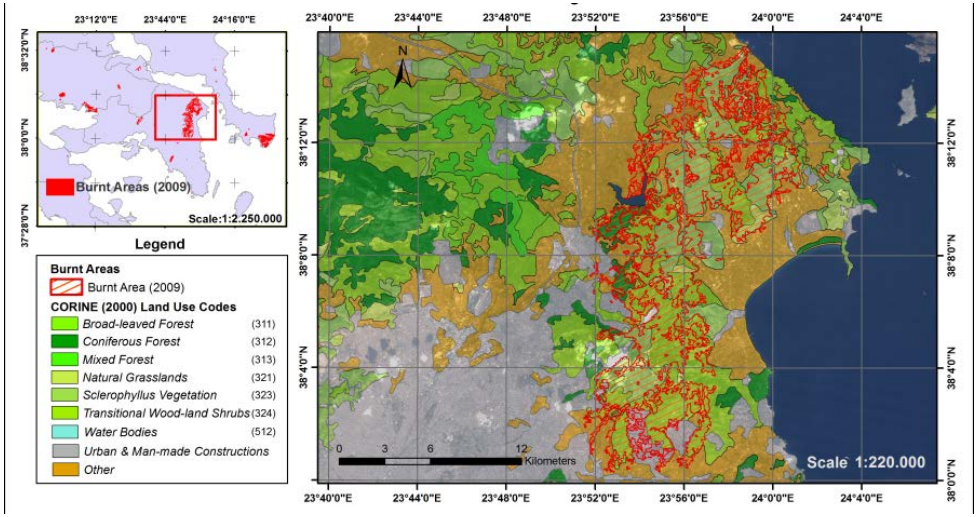
Examples of systematic atmospheric hazards over Greece

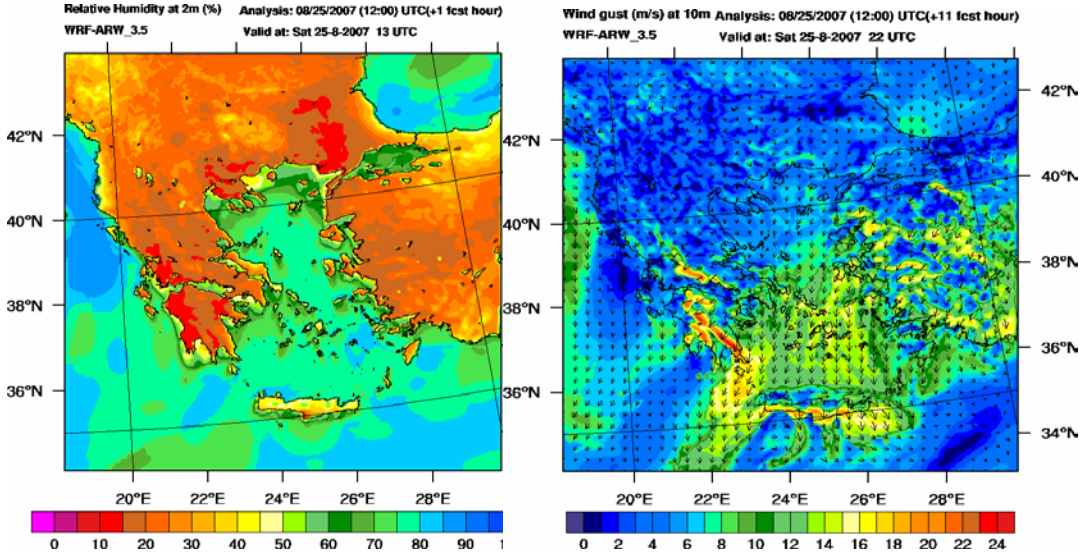
Forest Fire Smoke

Saharan Dust



# Forest fire smoke dispersion



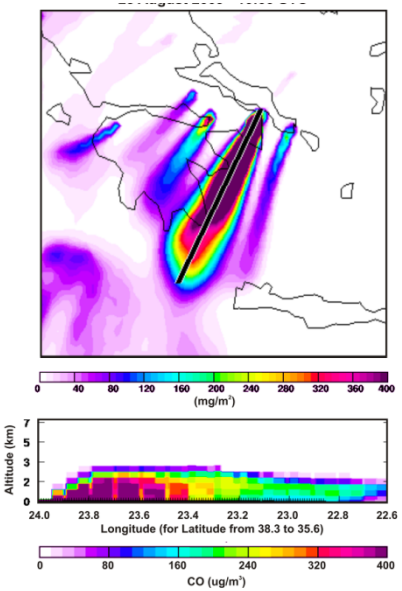

Remote sensing information:

**burnt area**

+

**fuel type**

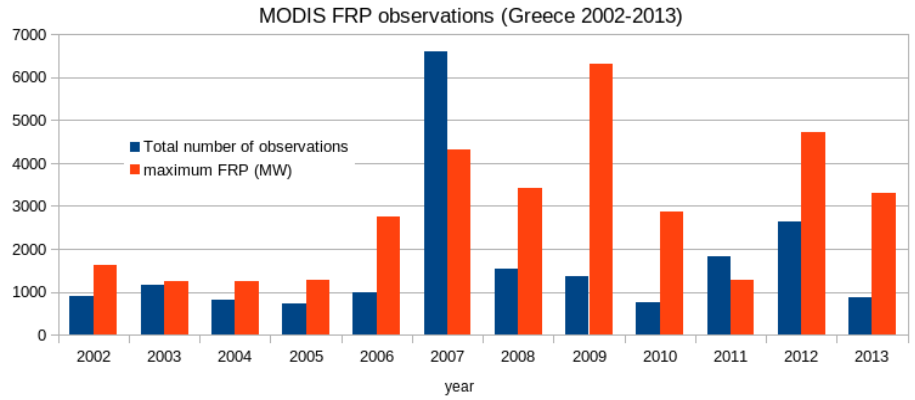
+




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)**

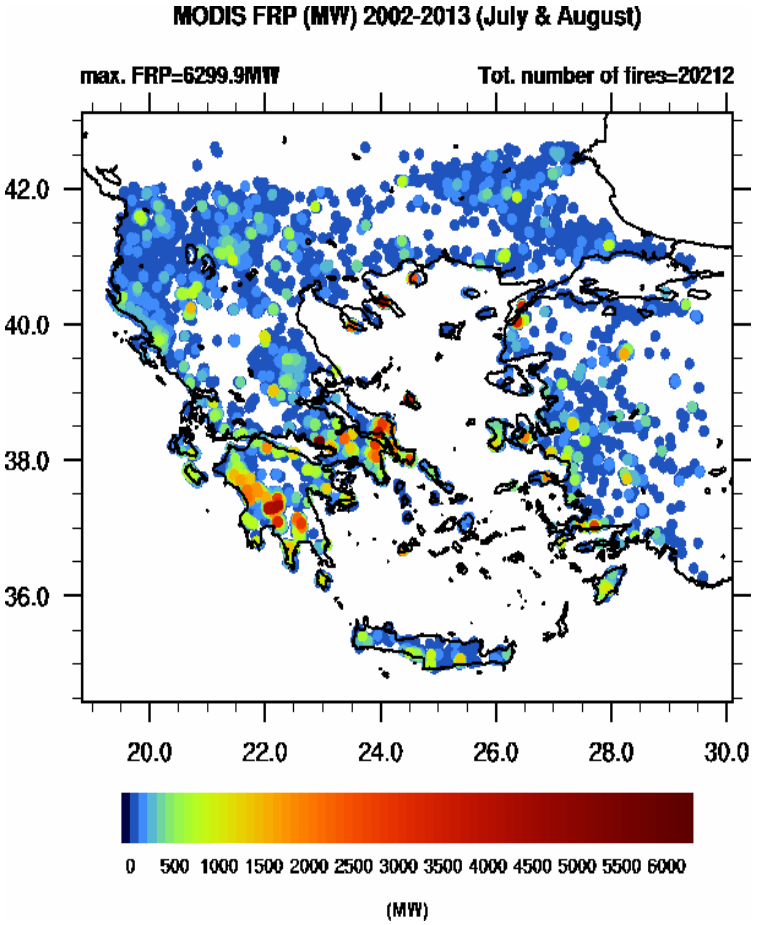


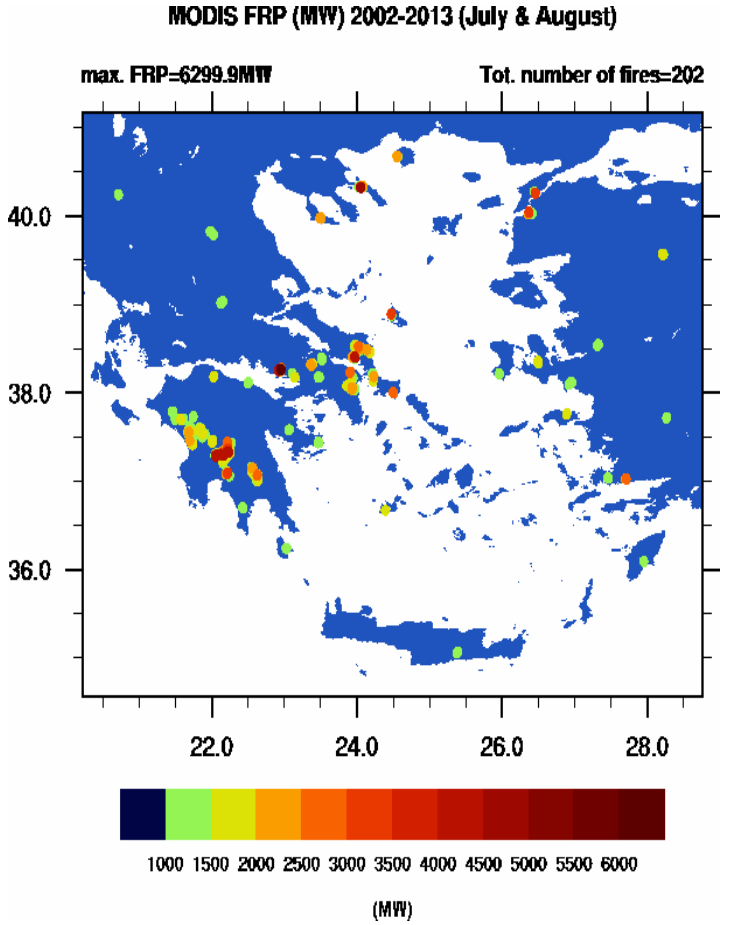

Increased FRP values observed after 2006

# Forest fire smoke dispersion

MODIS Fire Radiative Power (FRP) 2002-2013

FRP > 1000 MW
Significant atmospheric impact

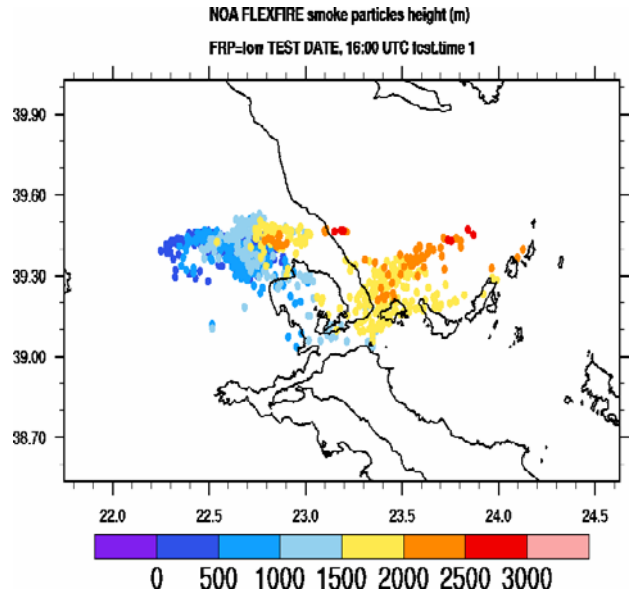


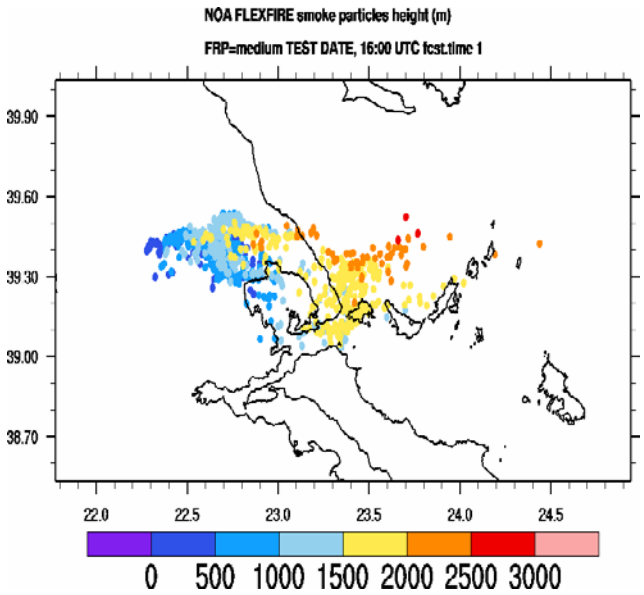



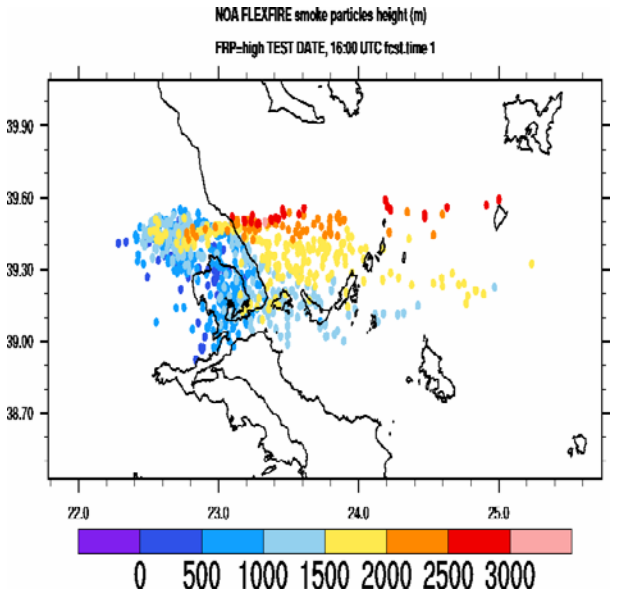
# Forest fire smoke dispersion

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



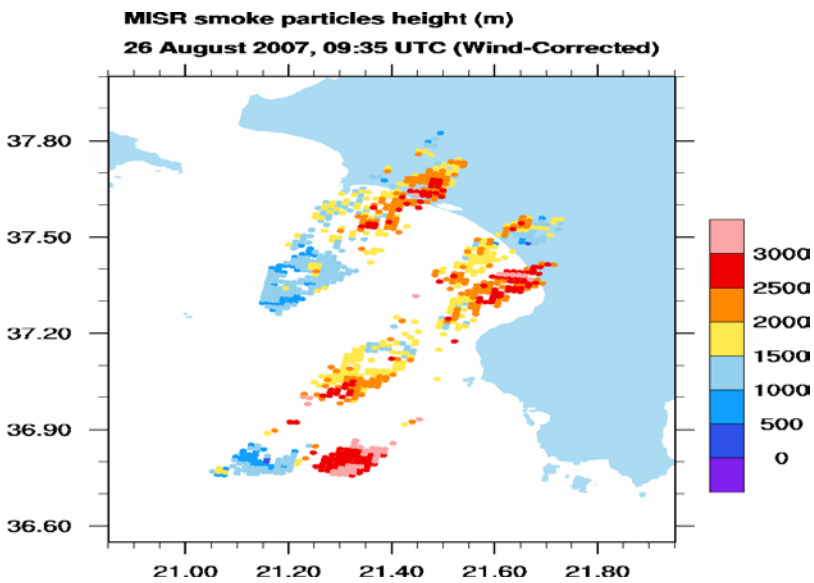



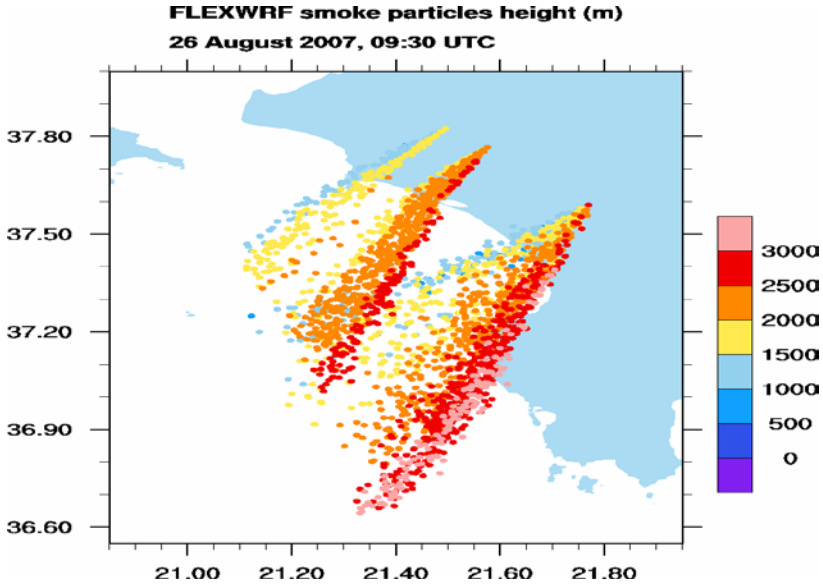
# Forest fire smoke dispersion

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

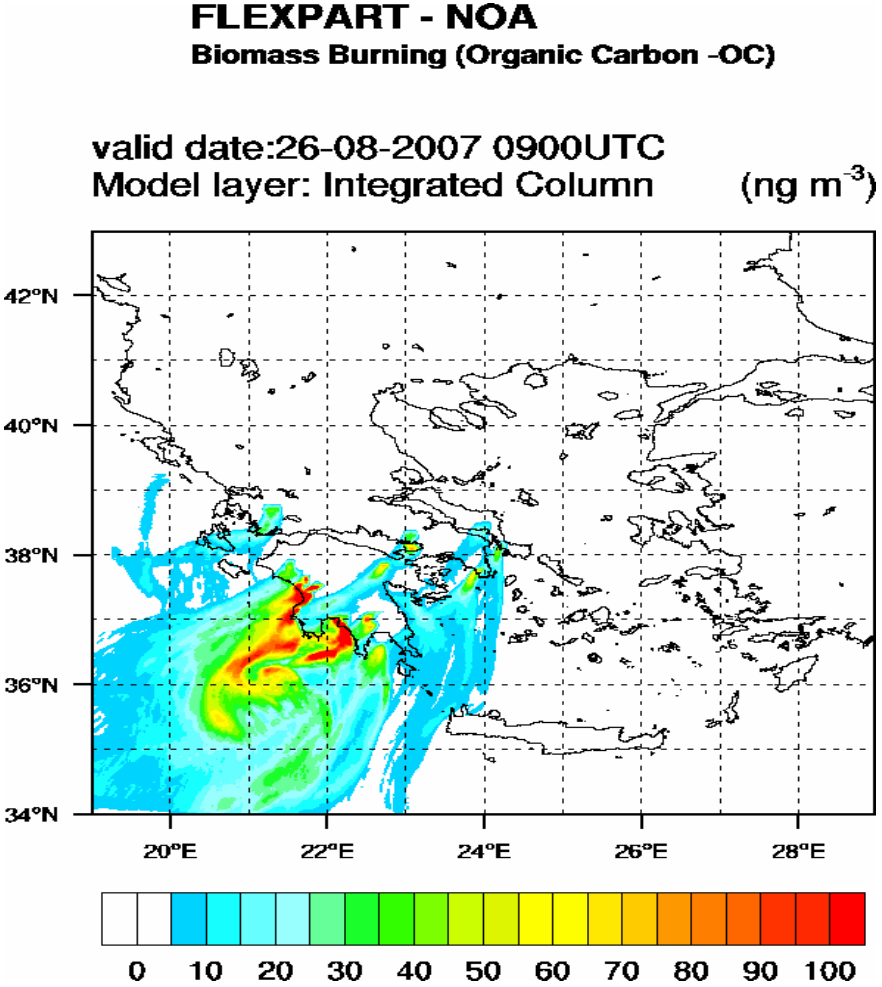



Smoke particles elevate higher than 3km as the plumes move towards southwest while the northern plumes show weaker advection and reach lower altitudes.

# Forest fire smoke dispersion

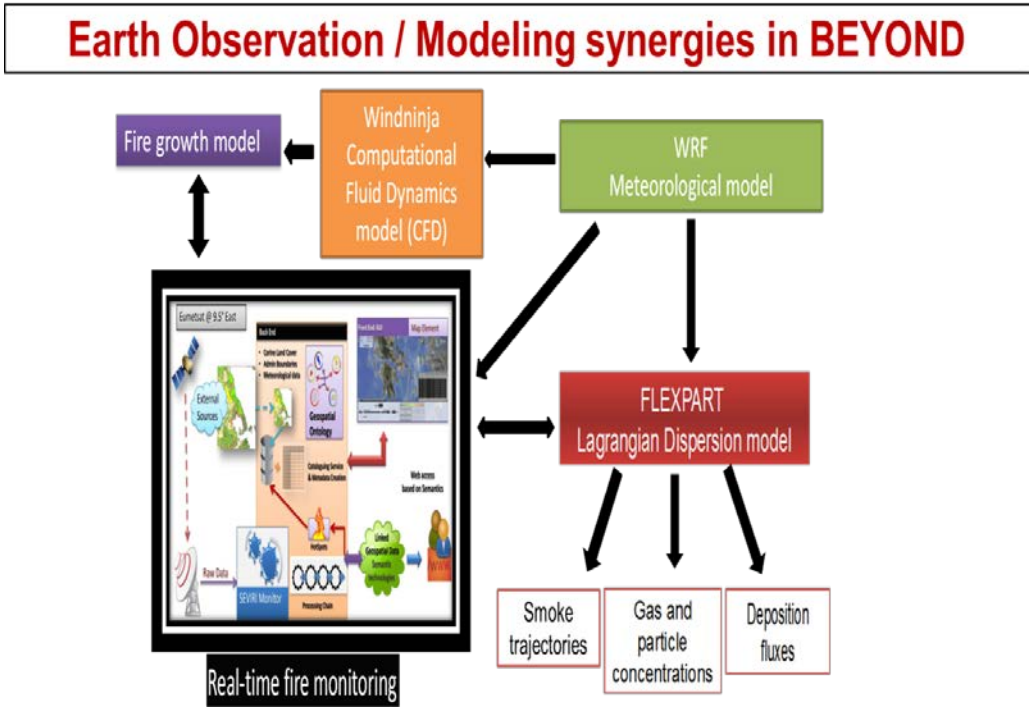
Wild fire smoke dispersion

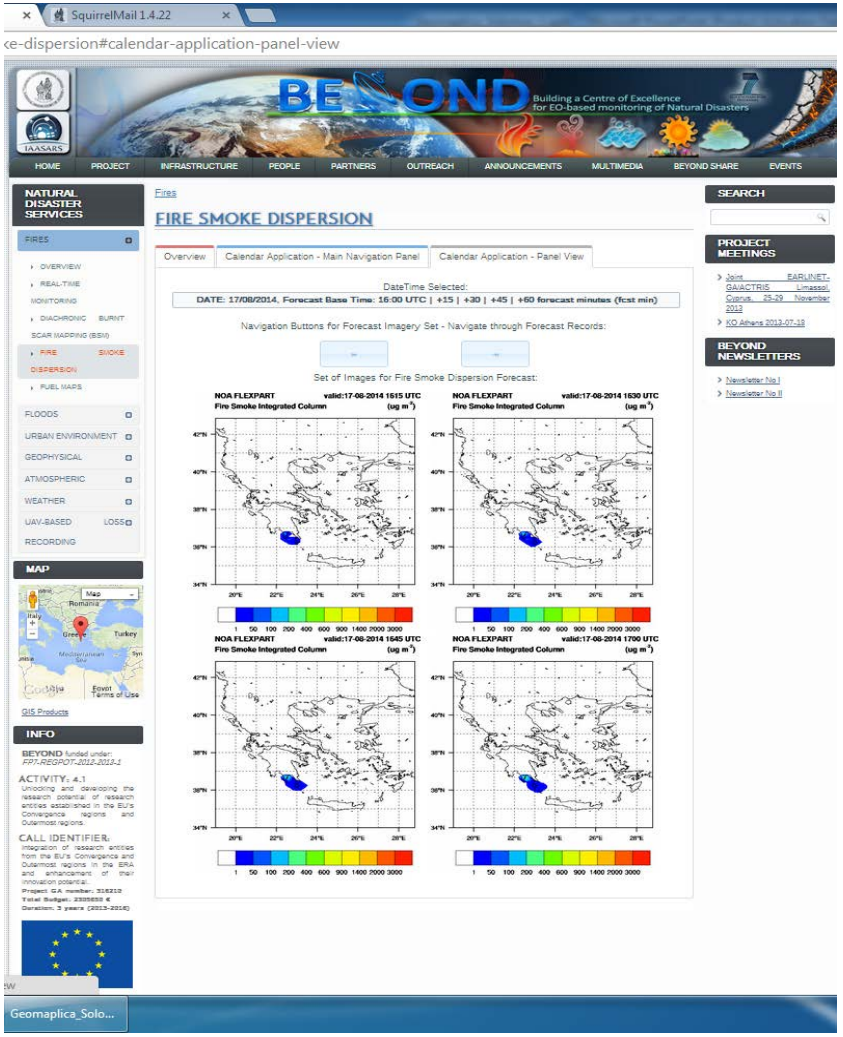
Dispersion of smoke, MODIS 26 August 2007 09:30 UTC




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

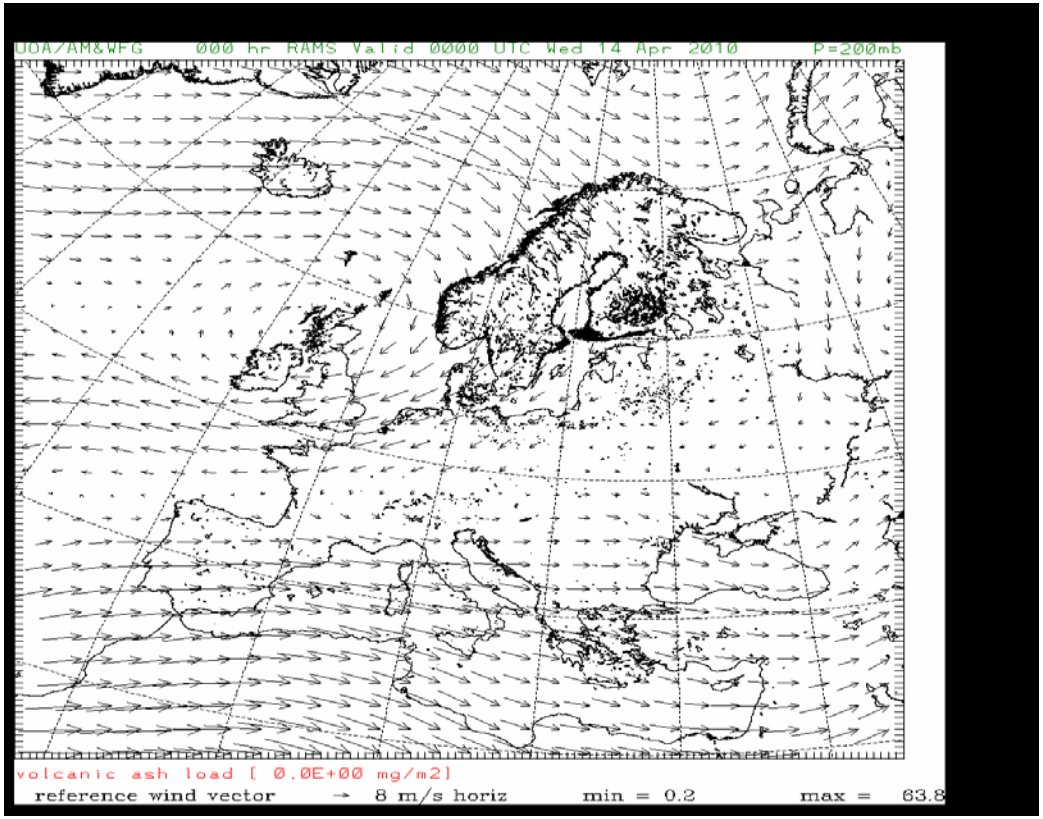
# Forest fire smoke dispersion




**Wildfire smoke forecast is operational in BEYOND since July 2014**

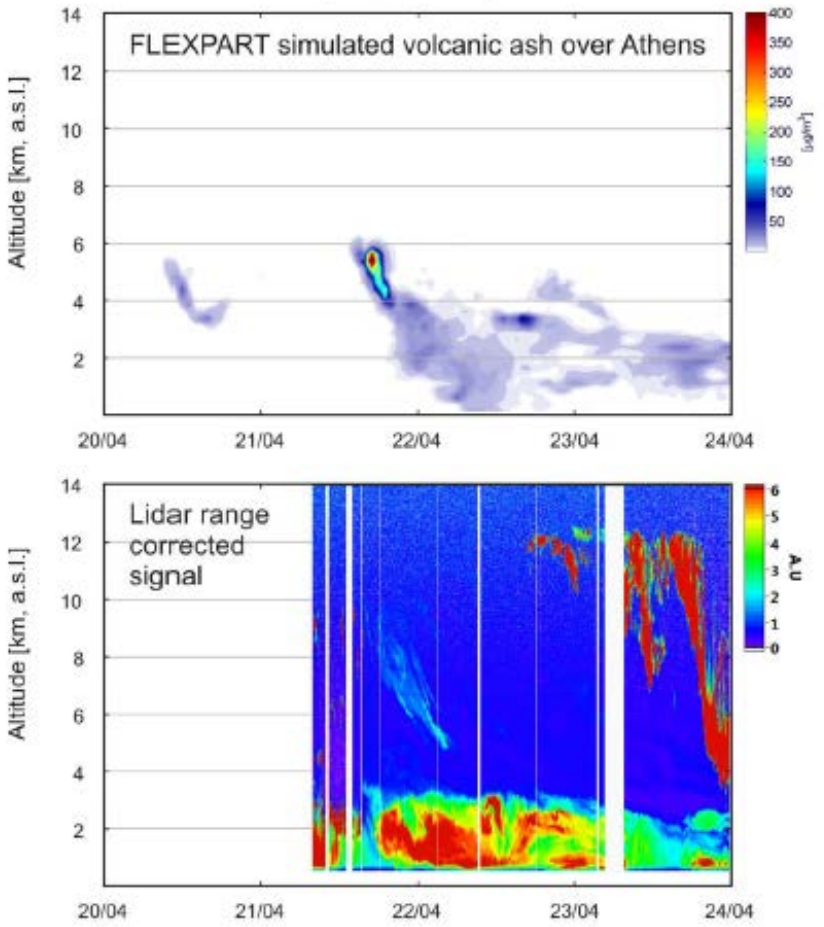
# Volcanic ash dispersion




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

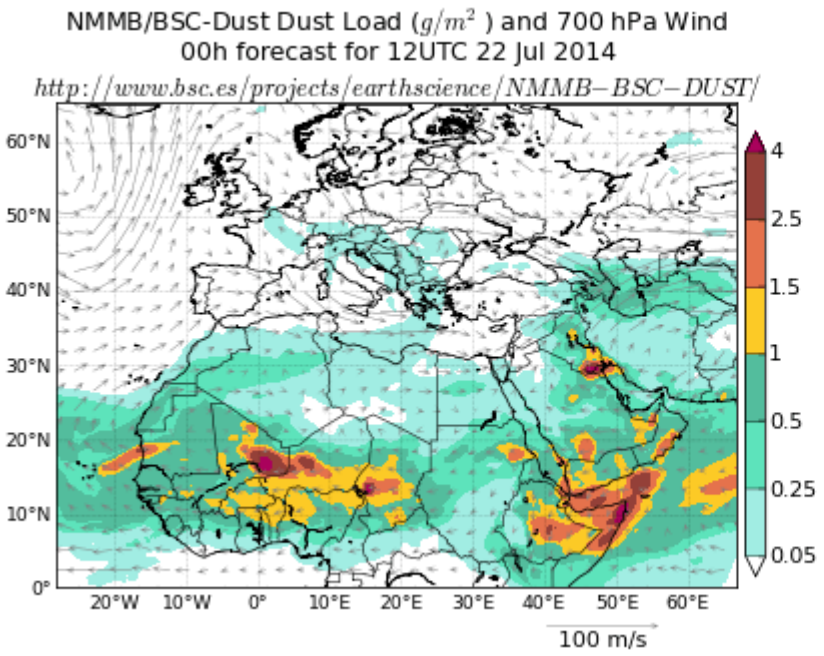
# Development of an advanced lidar station in BEYOND

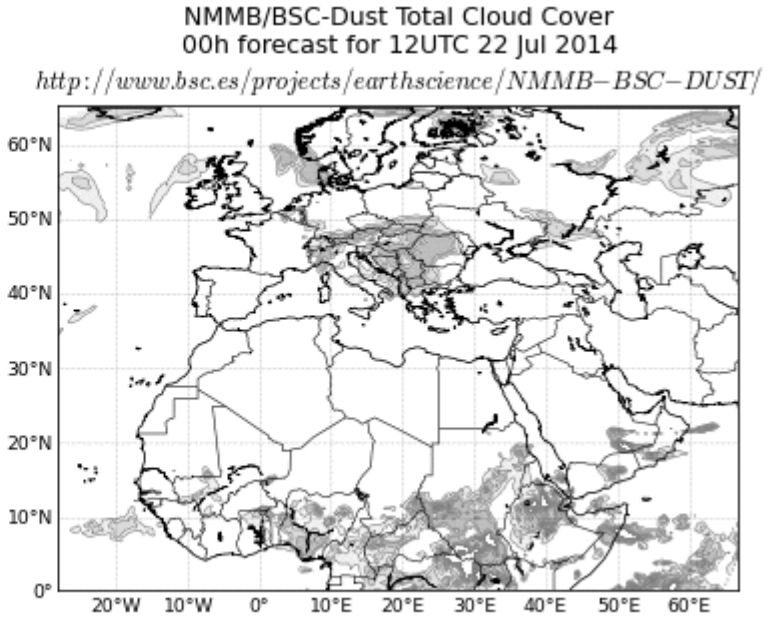
*The contribution of BEYOND:*

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

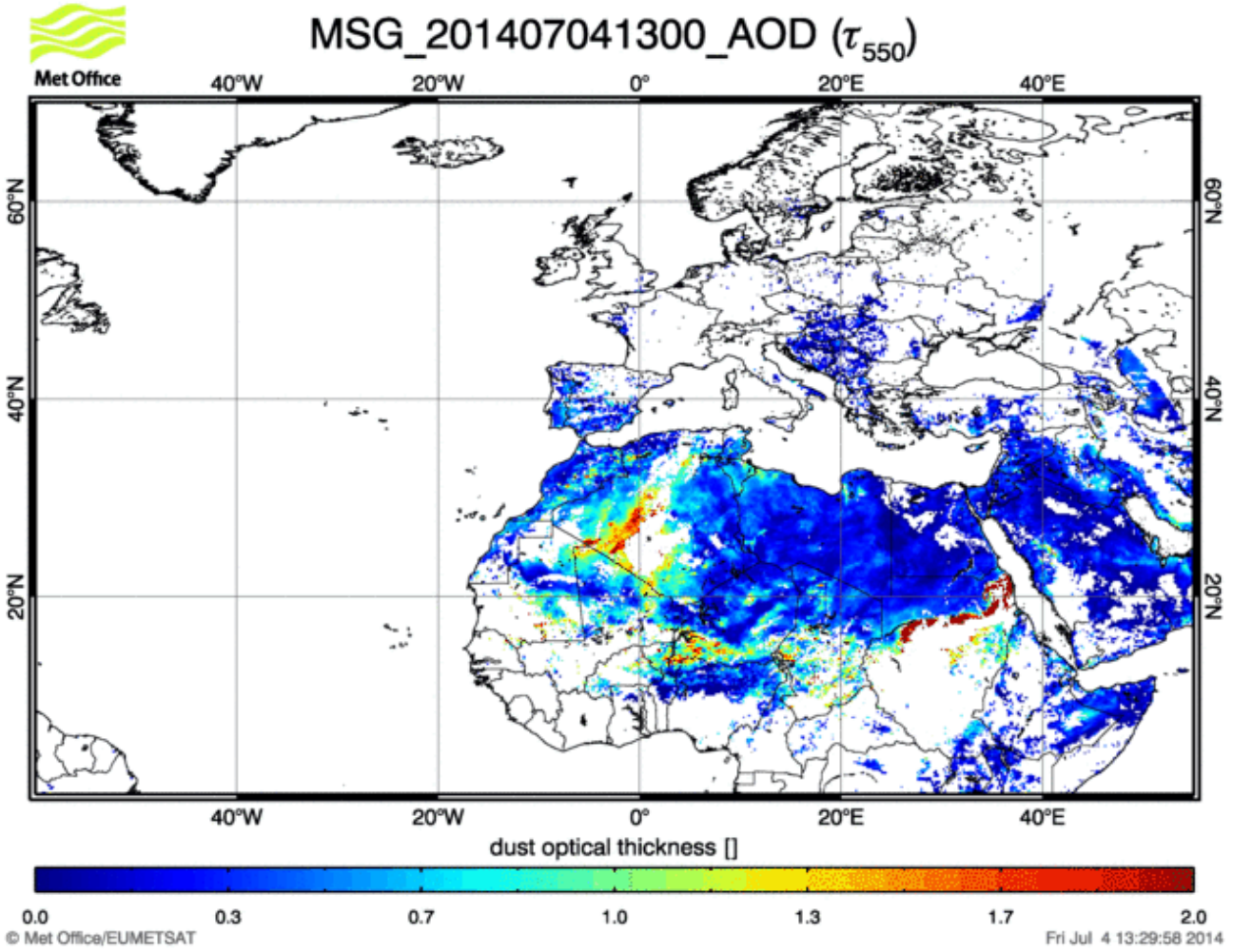
# Experimental campaigns for service evaluation: Charadmexp


# Saharan dust service of BEYOND in collaboration with BSC

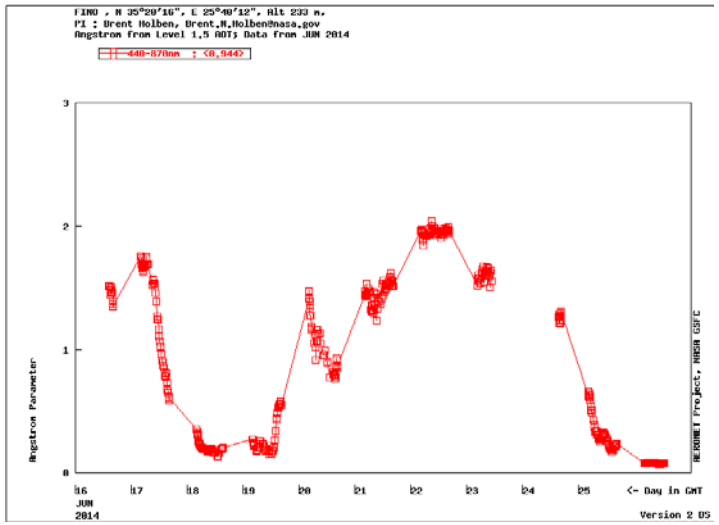


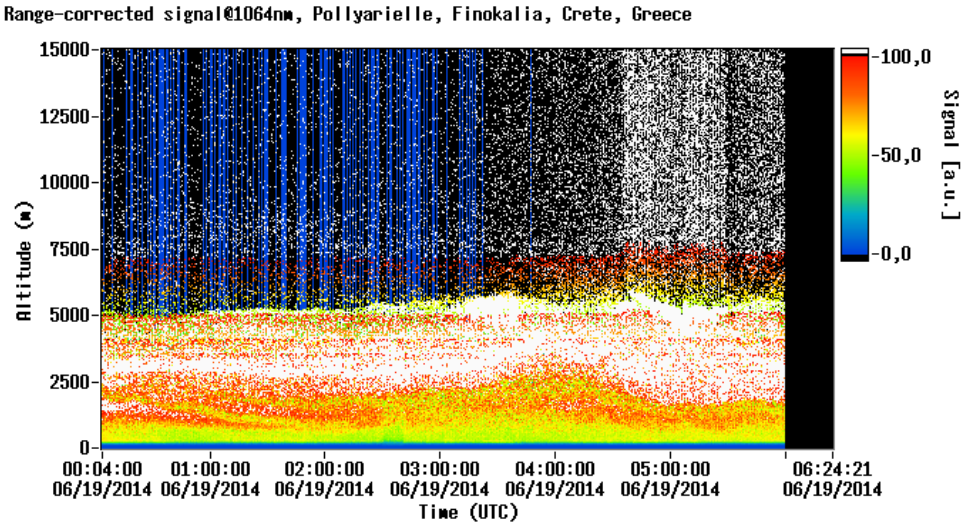



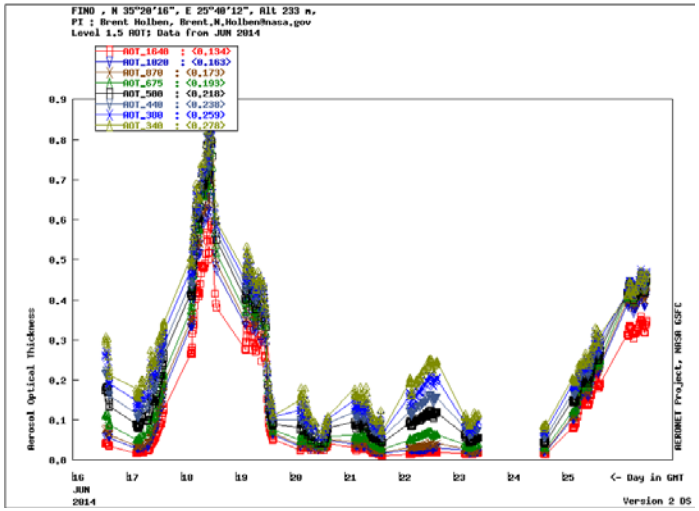
# Saharan dust SEVIRI retrieval of BEYOND in collaboration with UKMO

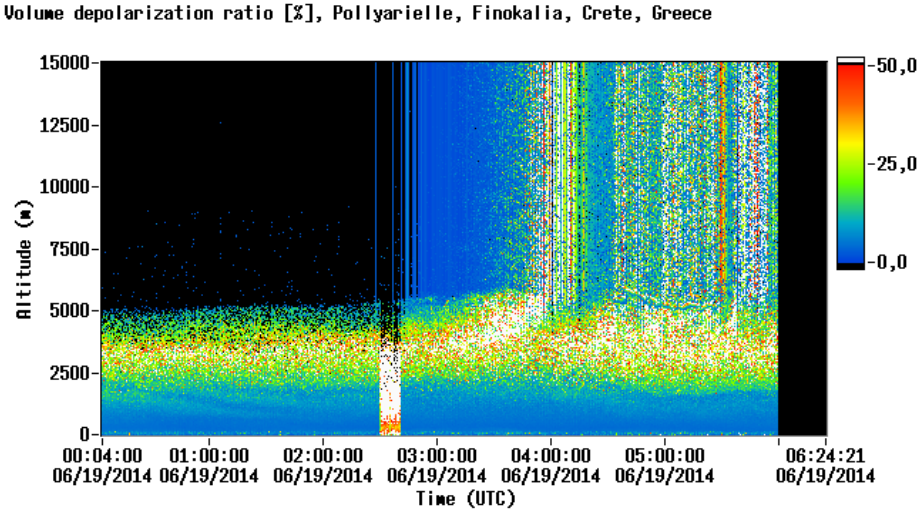


# Ground-based measurements for BEYOND service validation/optimization



# 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