



# Studies of aerosols in coastal areas

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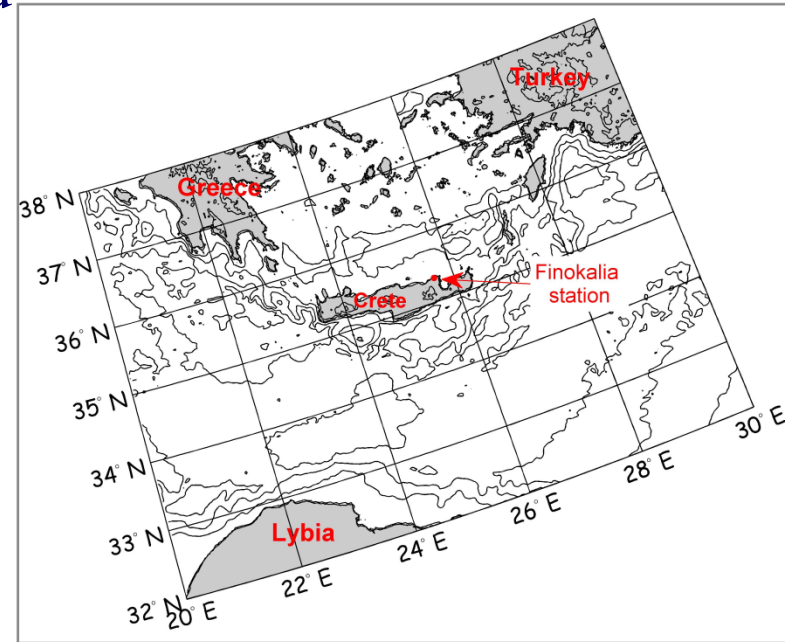
## Subject of the presentation

- Two case studies of the combined measurements made in two coastal zones
  - Crete in 2006 - Studies Of Aerosol Properties (SOAP)
  - Rozewie in 2009 on the Baltic - COastal Aerosol Studies (COAST)

Studies of aerosol optical properties measured  
using lidars and sun photometers

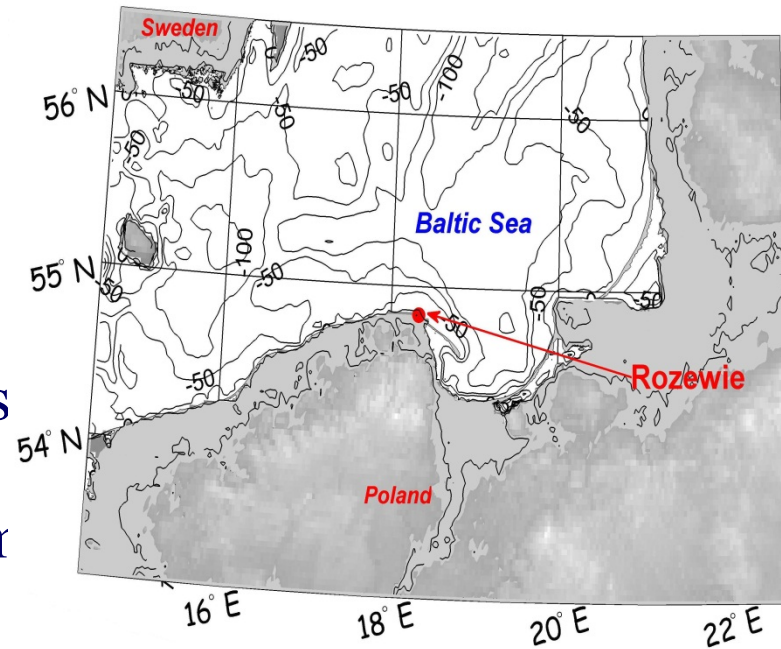
## SOAP campaign (ACCENT) 2006

- The campaign started on July 25 using the LB series lidar located at the Finokalia station ( $35^{\circ} 20'N$  and  $25^{\circ} 40'E$ ).
- The first Microtops measurements were made on 28 July at Gouves ( $35^{\circ} 19'N$  and  $25^{\circ} 17'E$ ).
- The campaign was completed on 10 August.



# COAST experiment 2009

- The COAST 2009 experiment took place in Rozewie ( $54^{\circ} 49'N$ ;  $18^{\circ} 20' E$ ) on the coast of the Baltic Sea.
- The ensemble of instruments included the LB series lidar and Microtops sun photometers. Additional sun photometer studies were made onboard r/v Oceania, which was anchored offshore from Rozewie.





## List of instruments

<b>Instrument</b>	<b>Parameters observed</b>	<b>Operated since</b>
Lidar LB 10 (532 nm)	Aerosol profiles	2009
Microtops II sunphotometers	AOD	2001
AE-31 / Magee aethelometer	black carbon concentration, aerosol absorption coefficients	2010
PMS laser particle counter CSASP-100	Coarse aerosol size distribution and concentration	1993
TSI Condensation Particle Counter	Fine mode aerosol concentration	2008
GILL acoustic anemometer	Wind speed pulsations	2007
TSI nephelometer	aerosol scattering and backscattering coefficient, Angstrom exponent	2010
Eppley Precision spectral Pyranometers	Solar radiation fluxes	1993
Kipp&Zonen net radiation meter	Upward and downward radiation fluxes	2000



## Raymetrics LB series lidar

- The LB series lidar is a backscatter lidar (532 nm); telescope diameter is 200 mm.
- System can be used to determine vertical profile of aerosol optical parameters, the temporal evolution of aerosols, clear air layering in the troposphere, boundary layer mixing height, cloud base height and cloud dynamic evolution.
- The vertical range of the system exceeds 12 km with a spatial resolution of 7.5 m.



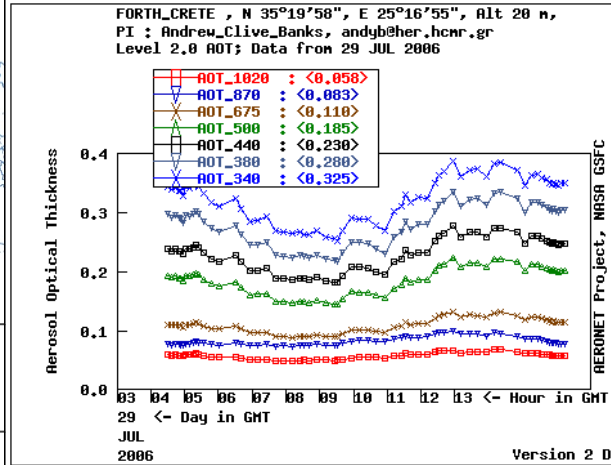
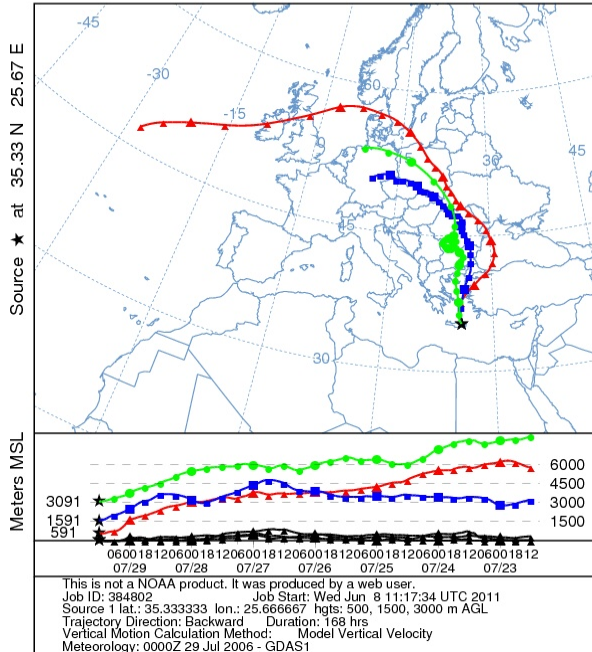
## Microtops II sunphotometer

Optical channels	340 $\pm$ 0.3 nm, 2 nm FWHM* 380 $\pm$ 0.4 nm, 4 nm FWHM 440 $\pm$ 1.5 nm, 10 nm FWHM 500 $\pm$ 1.5 nm, 10 nm FWHM 675 $\pm$ 1.5 nm, 10 nm FWHM
Resolution	0.01 W m <sup>-2</sup>
Dynamic range	>300000
Viewing angle	2.5°
Precision	1-2%
Non linearity	max. 0.002%

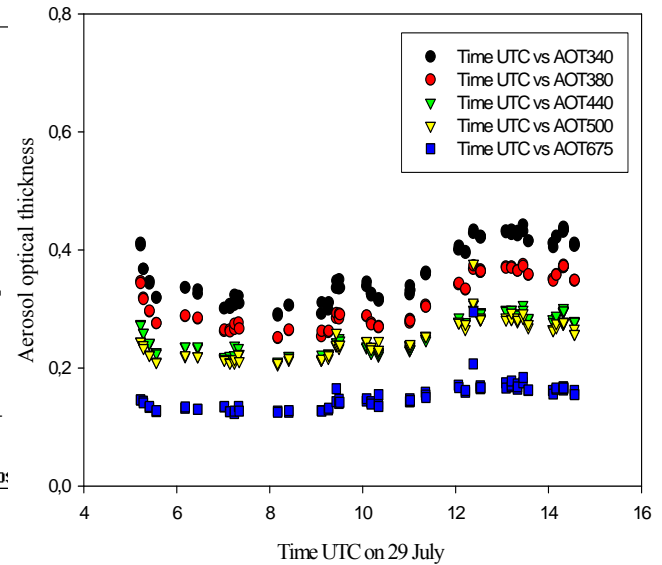


# AOD measured with CIMEL and Microtops II on 29 July 2006 in Crete

NOAA HYSPLIT MODEL  
 Backward trajectories ending at 1200 UTC 29 Jul 06  
 GDAS Meteorological Data



Microtops AOT on 29 July 2006



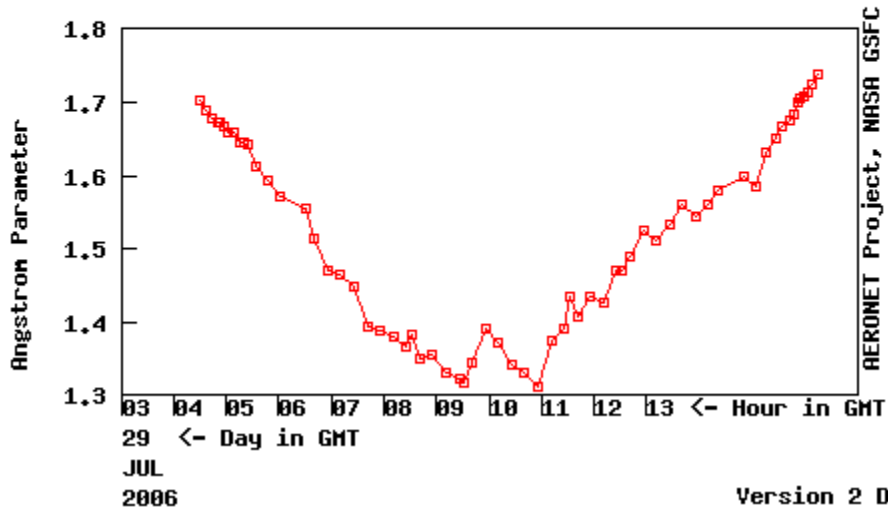




# Angstroem exponent and fine to coarse mode relation on 29 July 2006 in Crete

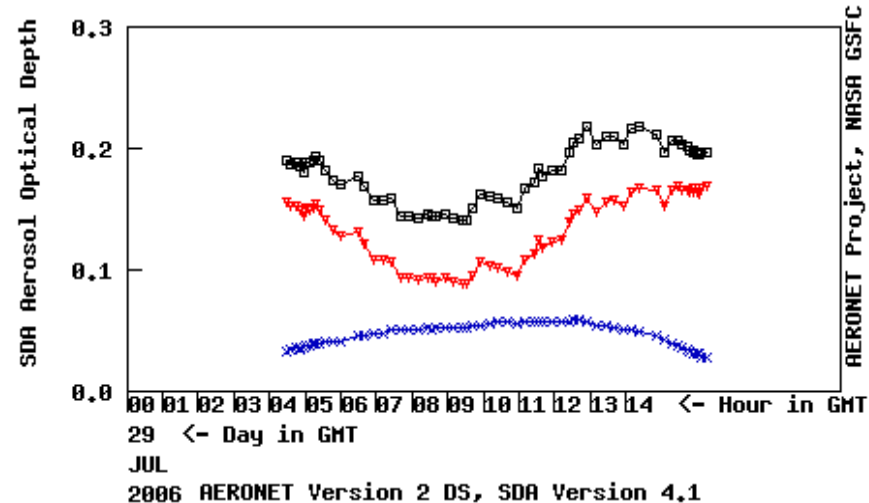
FORTH\_CRETE , N 35°19'58", E 25°16'55", Alt 20 m,  
PI : Andrew\_Clive\_Banks, andyb@her.hcmr.gr  
Angstrom from Level 2.0 AOT; Data from 29 JUL 2006

440-870nm : <1.528>



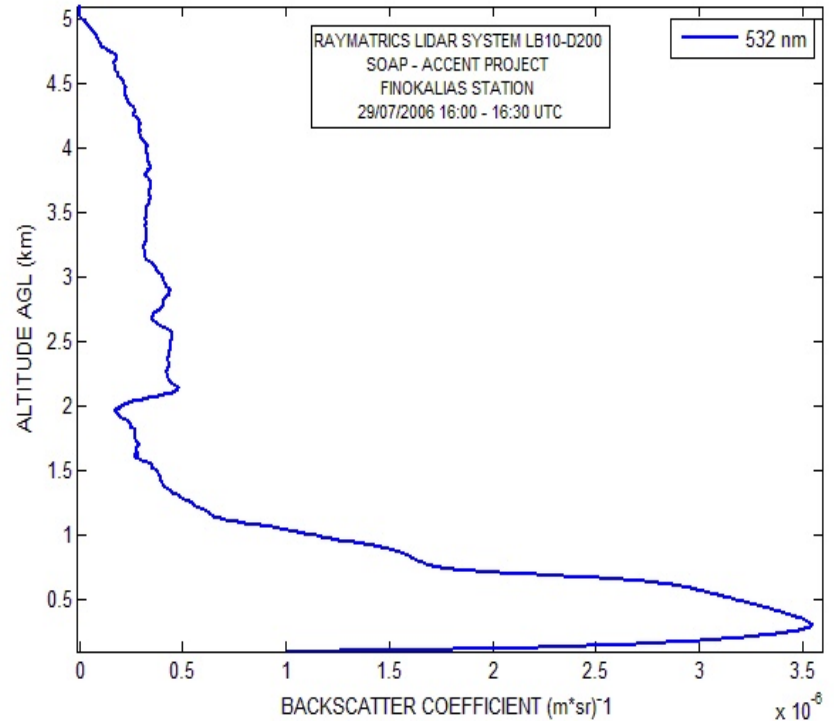
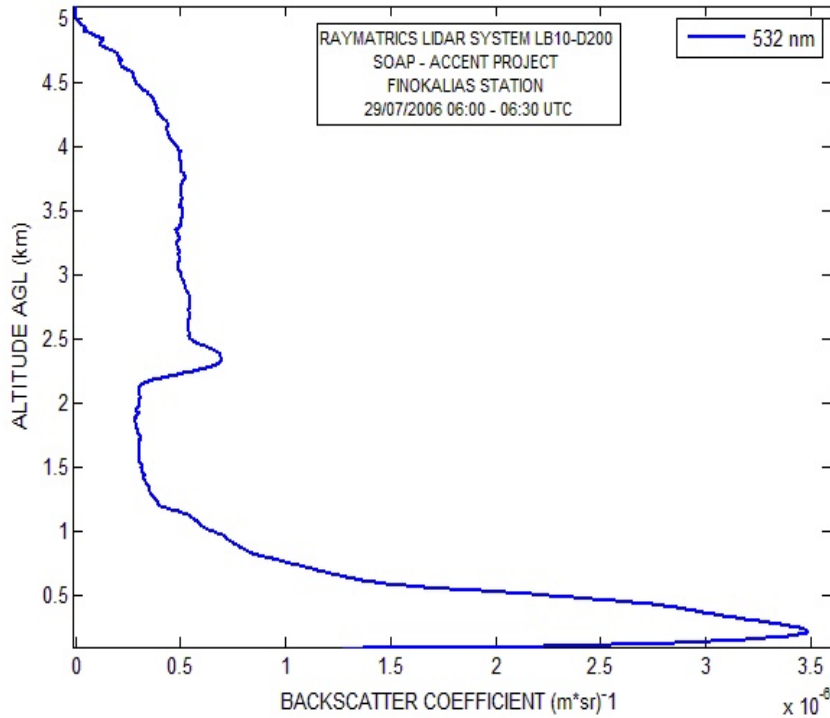
FORTH\_CRETE , N 35°19'57", E 25°16'56", Alt 20 m,  
PI : Andrew\_Clive\_Banks, andyb@her.hcmr.gr  
SDA AOD from Level 2.0 AOD; 29 JUL 2006

Total\_500nm : <0.181>  
Fine\_500nm : <0.134>  
Coarse\_500nm : <0.047>





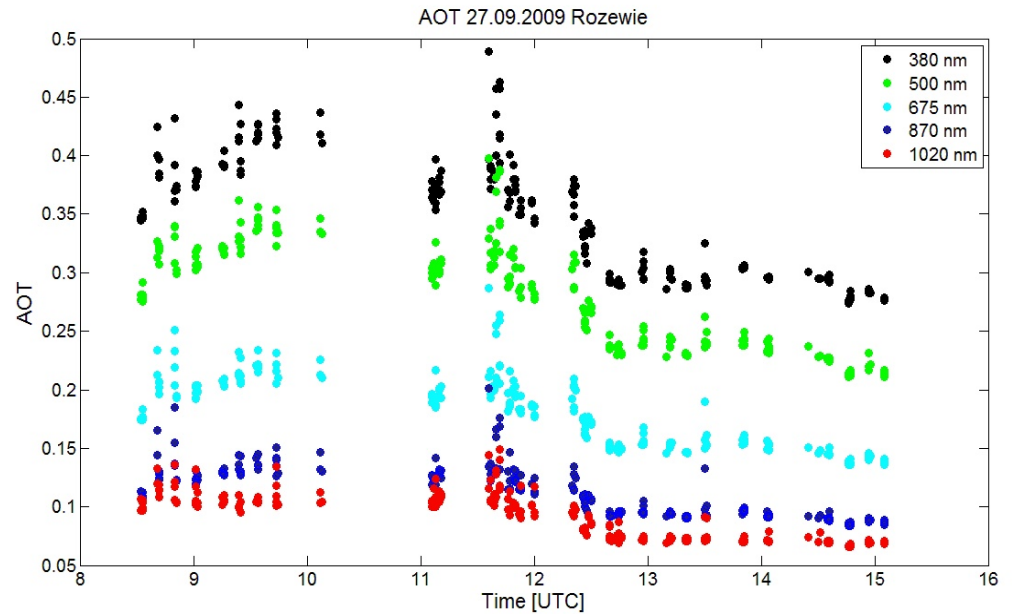
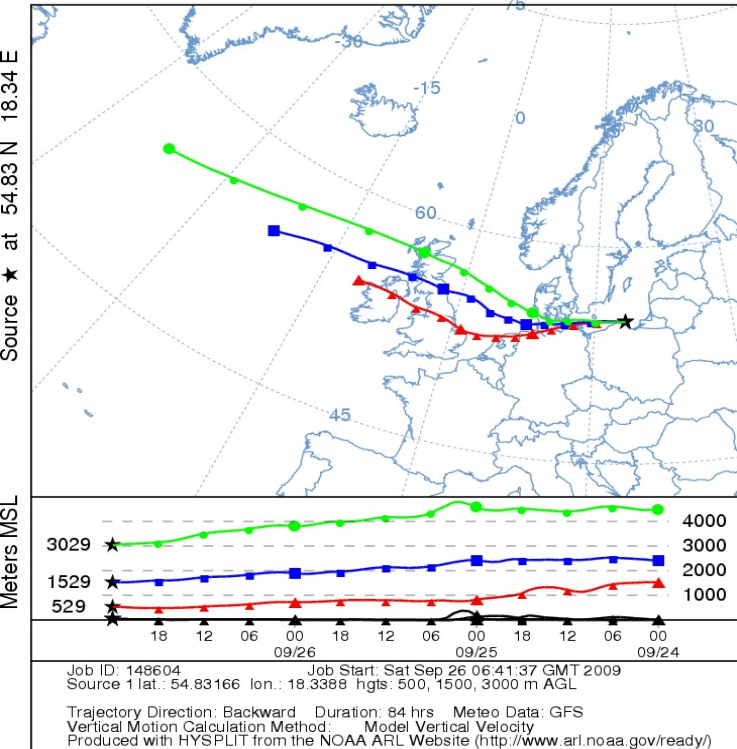
# Aerosol backscatter coefficient vs. altitude measured with lidar on 29 July 2006 in Crete





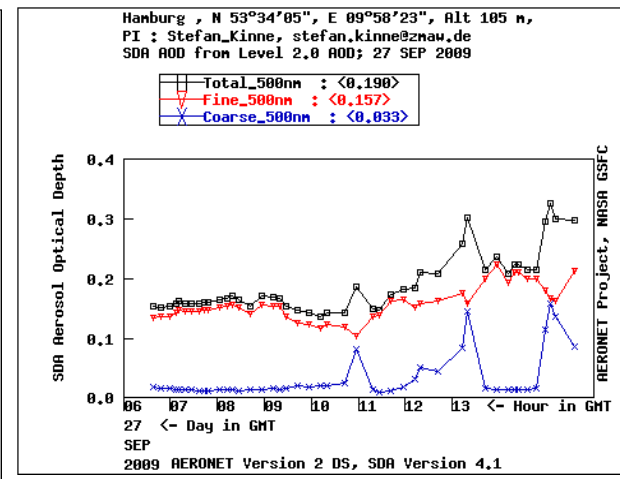
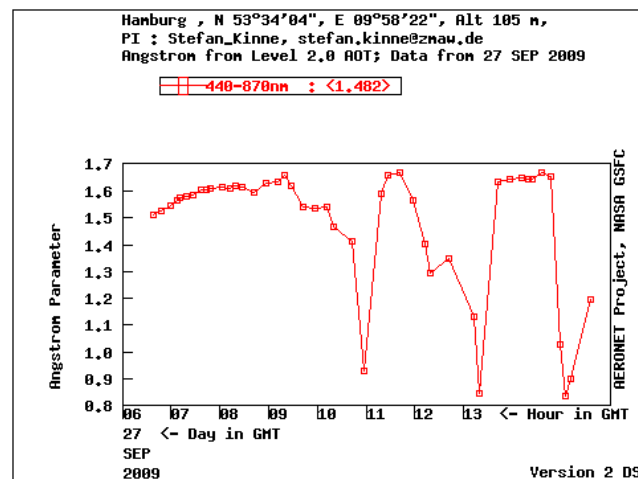
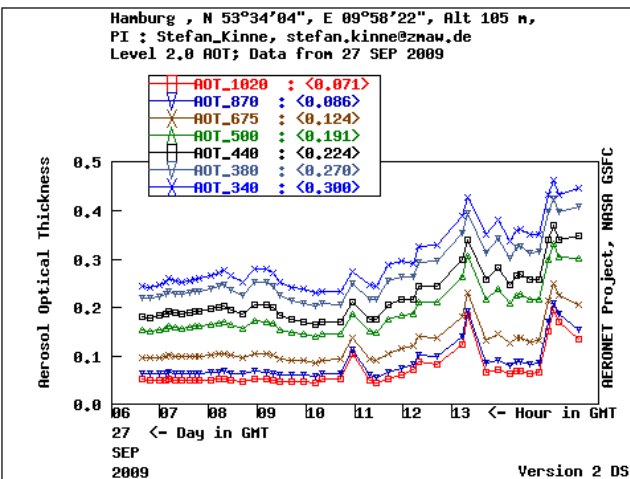
# AOD measured with Microtops II on 27 September 2009 in Rozewie

NOAA HYSPLIT MODEL  
Backward trajectories ending at 0000 UTC 27 Sep 09  
00 UTC 26 Sep GFS Forecast Initialization



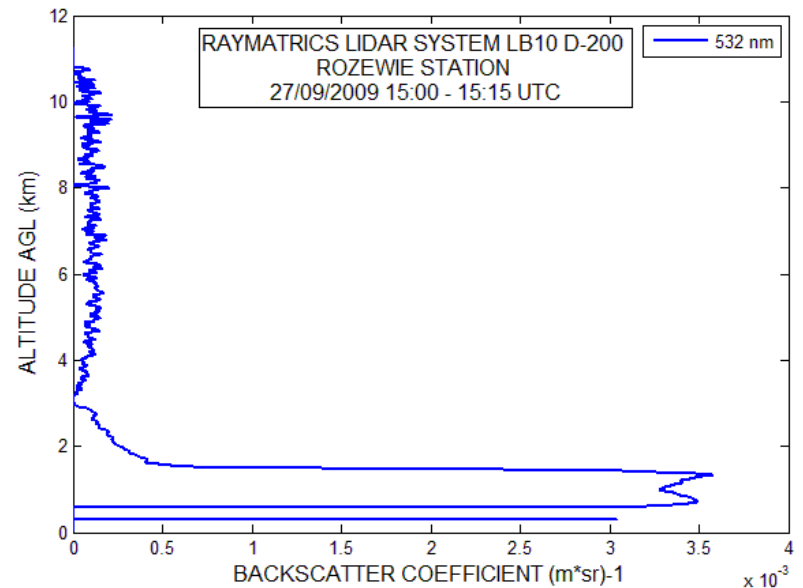
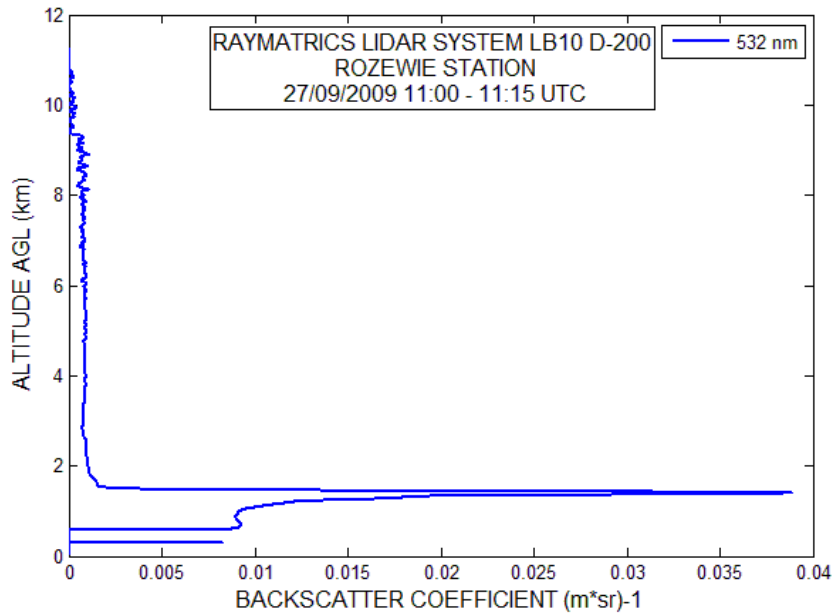


# AOD measured with CIMEL on 27 September 2009 in Hamburg





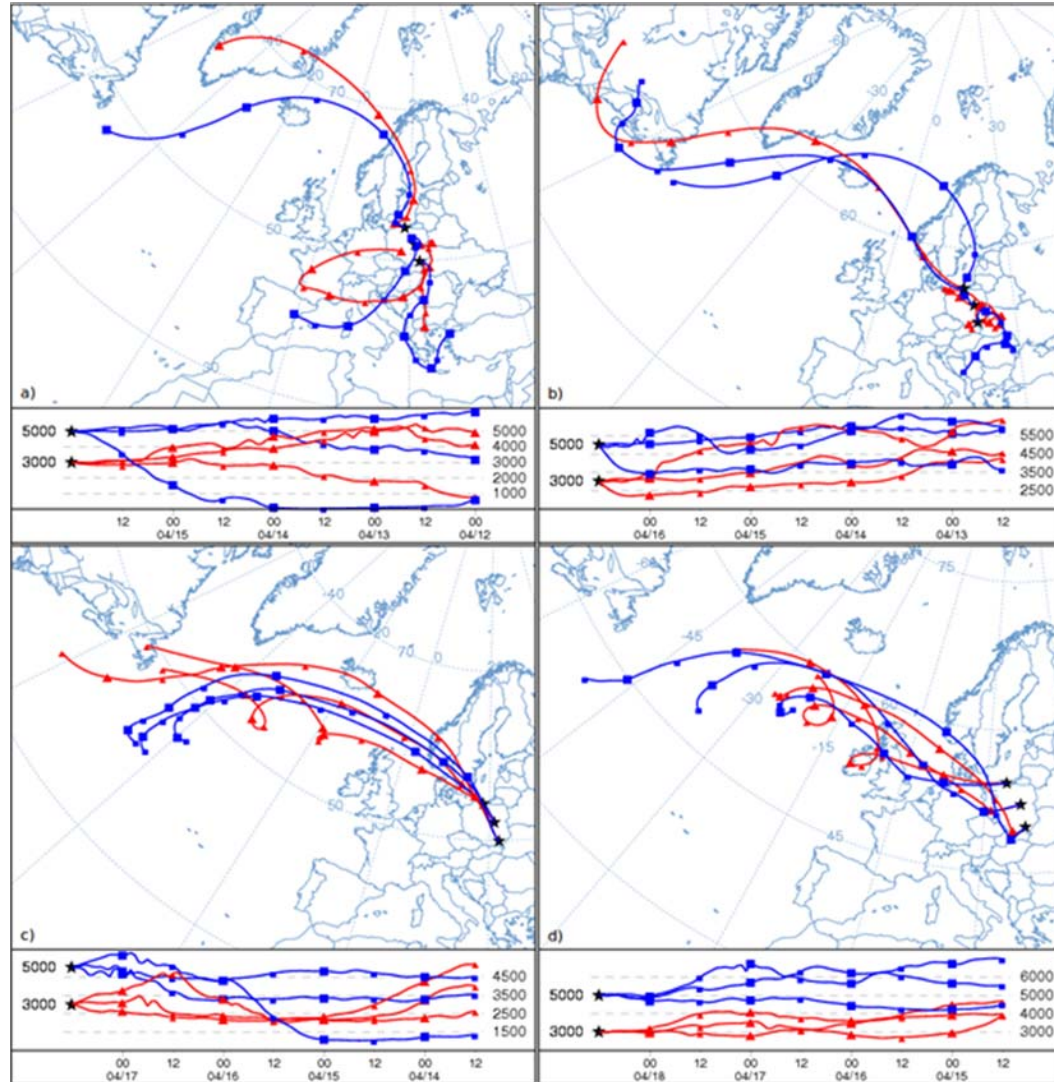
# Aerosol backscatter coefficient vs. altitude measured in Rozewie on 27 September 2009



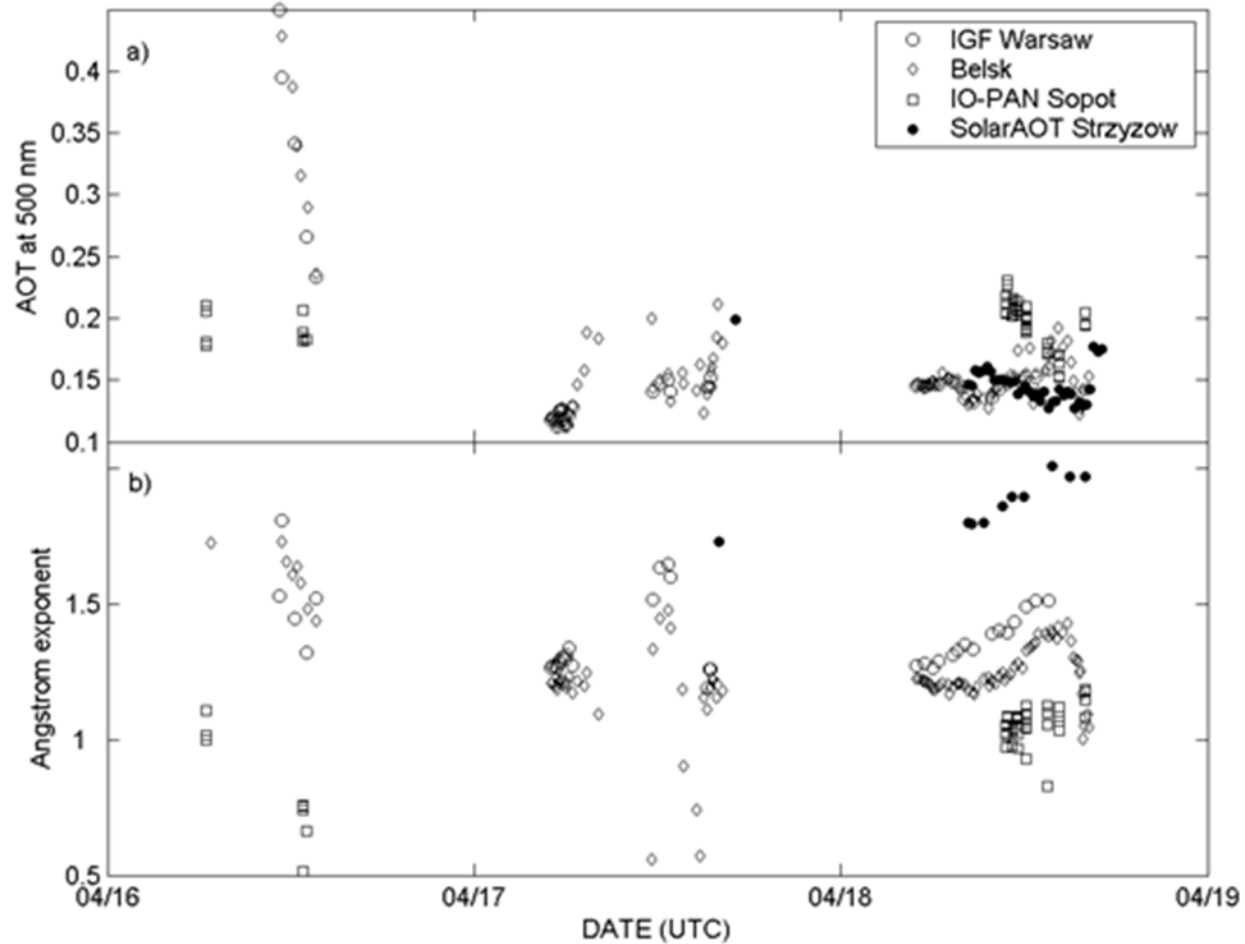
# Poland-AOD



# Volcano event 2010



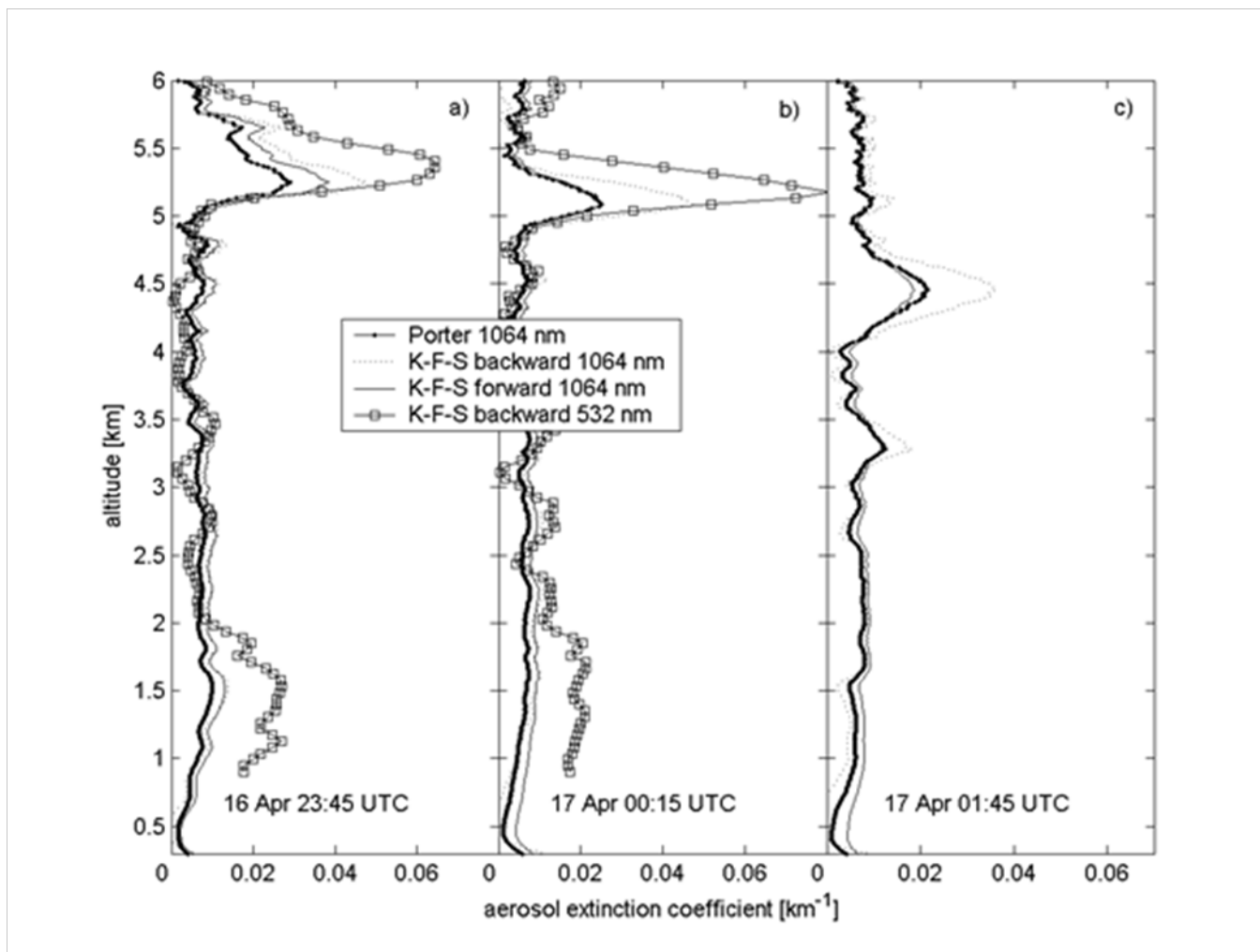
# Aerosol features in April 2010



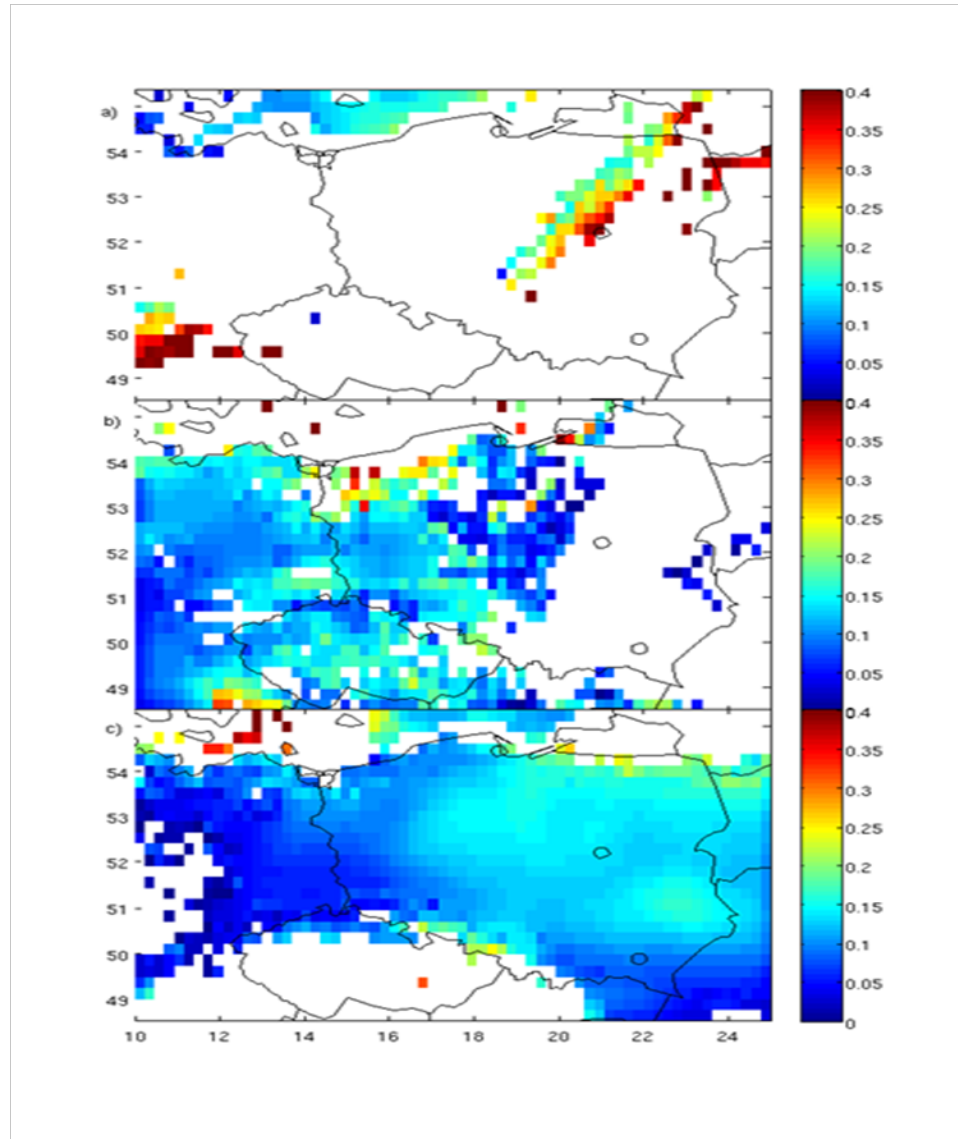




# Aerosol extinction coefficient from the CHM-15K ceilometer signals at 1064 nm and the 510M lidar at 532 nm



# AOD from MODIS at 550 nm





## Some conclusions

- Joint measurements using lidars and sun photometers provide complete information on both the total AOD as well as the vertical structure of aerosol optical properties.
- In order to detect the dynamics of potential aerosol composition changes it is necessary to use data from different stations.
- The combination of such information with air mass back-trajectories and data collected at stations located on the route of air masses provides comprehensive picture of aerosol variations in the study area both vertically and horizontally.



# Acknowledgements

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