



preliminary data

please do not use these data for publications

please contact Gelsomina Pappalardo if you want to
use some of these data or if you wish more
information



**Dispersion and evolution of the
Eyjafjallajökull ash plume over Europe:
vertically resolved measurements with the
European LIDAR network EARLINET**

Gelsomina Pappalardo

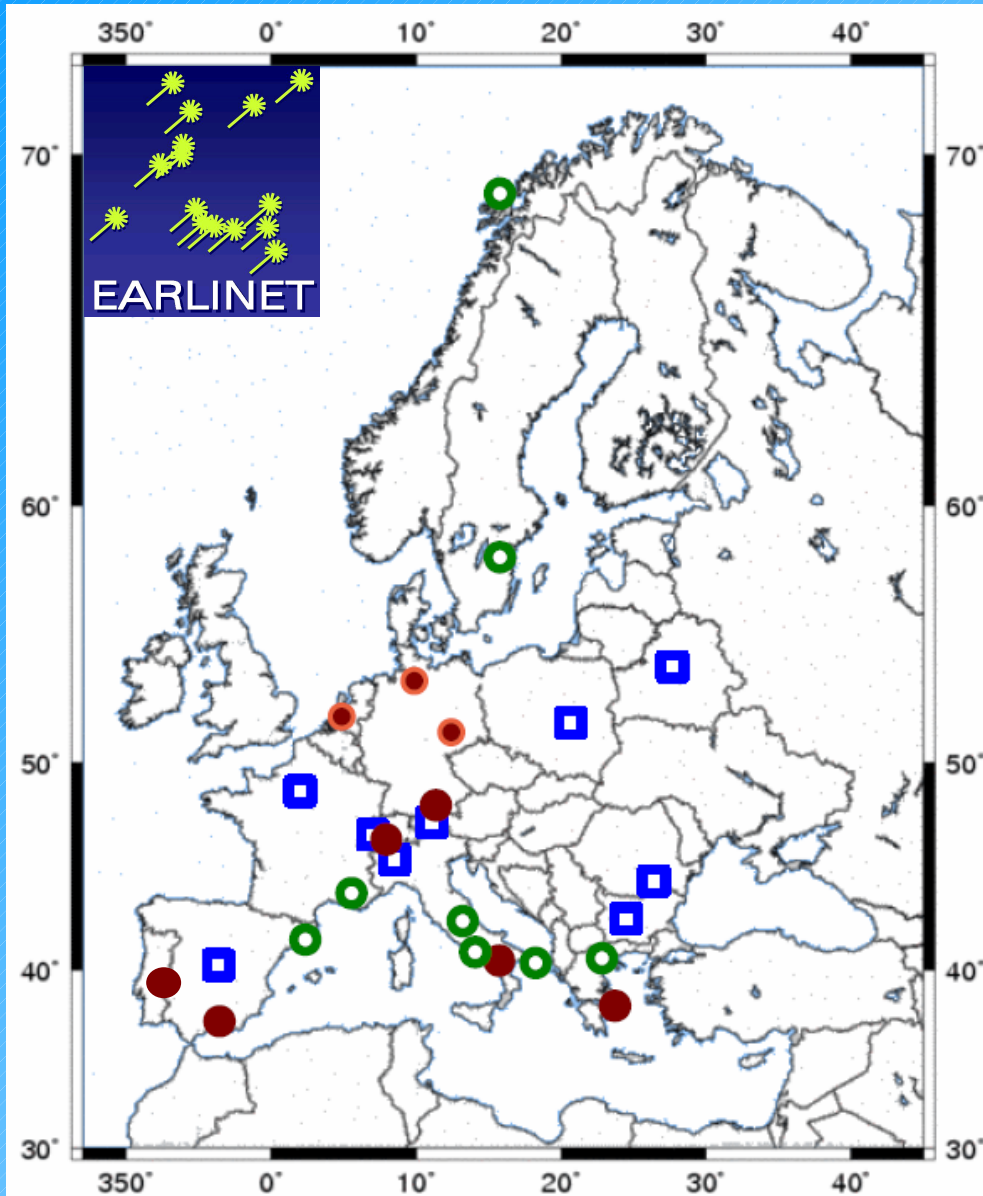
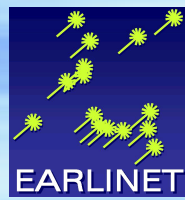
and the EARLINET team (presented by Ina Mattis)



- * What is EARLINET ?
- * 4 dimensional distribution of the ash plume over Europe
- * Sensitivity of lidars and ceilometers
- * Estimation of mass profiles from lidar measurements



European Aerosol Research Lidar NETwork EARLINET



- since 2000
- regular measurements 3 times a week
→ avoid biases
- additional measurements to study long-range transport + special events
- Quality assurance of systems and algorithms
- Standardized data format
- Access to data via centralized data base
- 25 lidar stations
 - round-the-clock observations (3)
 - extinction profiles (16 Raman lidars)
 - 9 multi-wavelength Raman lidars
 - $\beta(355, 532, 1064) + \alpha(355 + 532)$
 - wavelength dependence of α , β , S
 - differentiation of aerosol types
 - microphysical aerosol properties

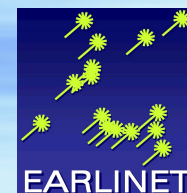
www.earlinet.org



- * What is EARLINET ?
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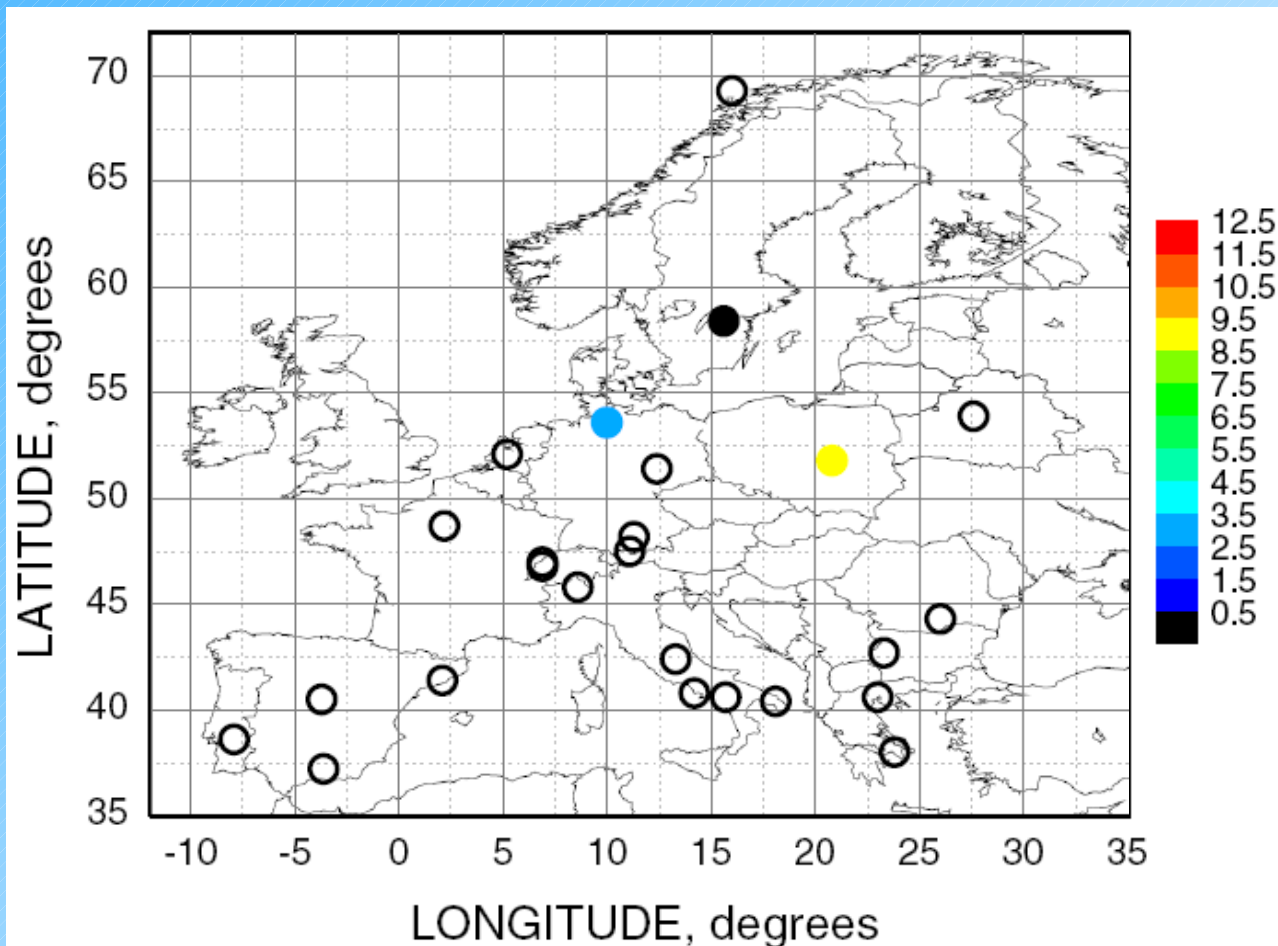
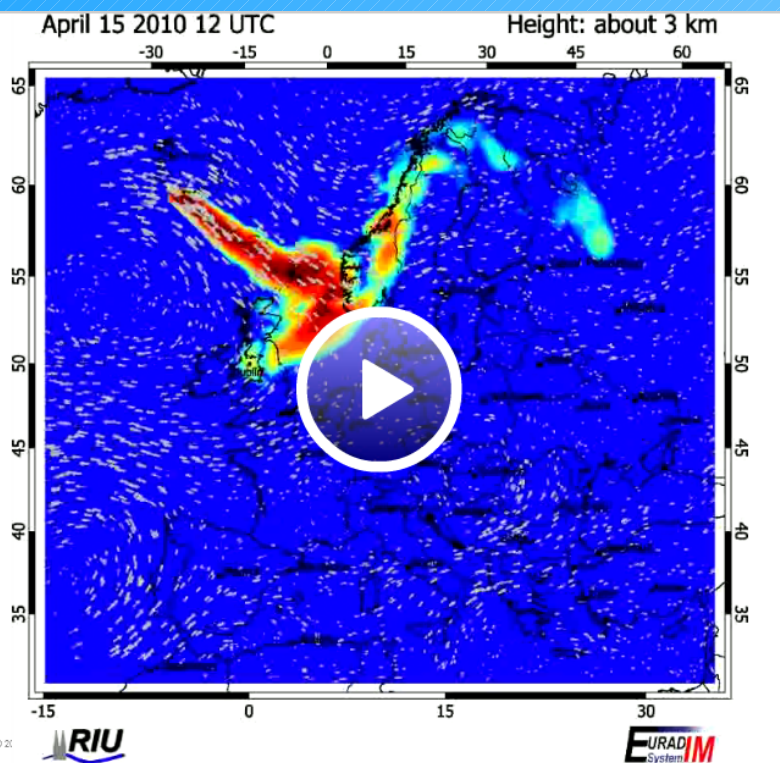
4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 15 12 UTC

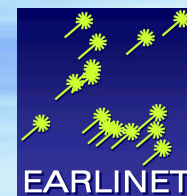
EURAD simulation



Preliminary data

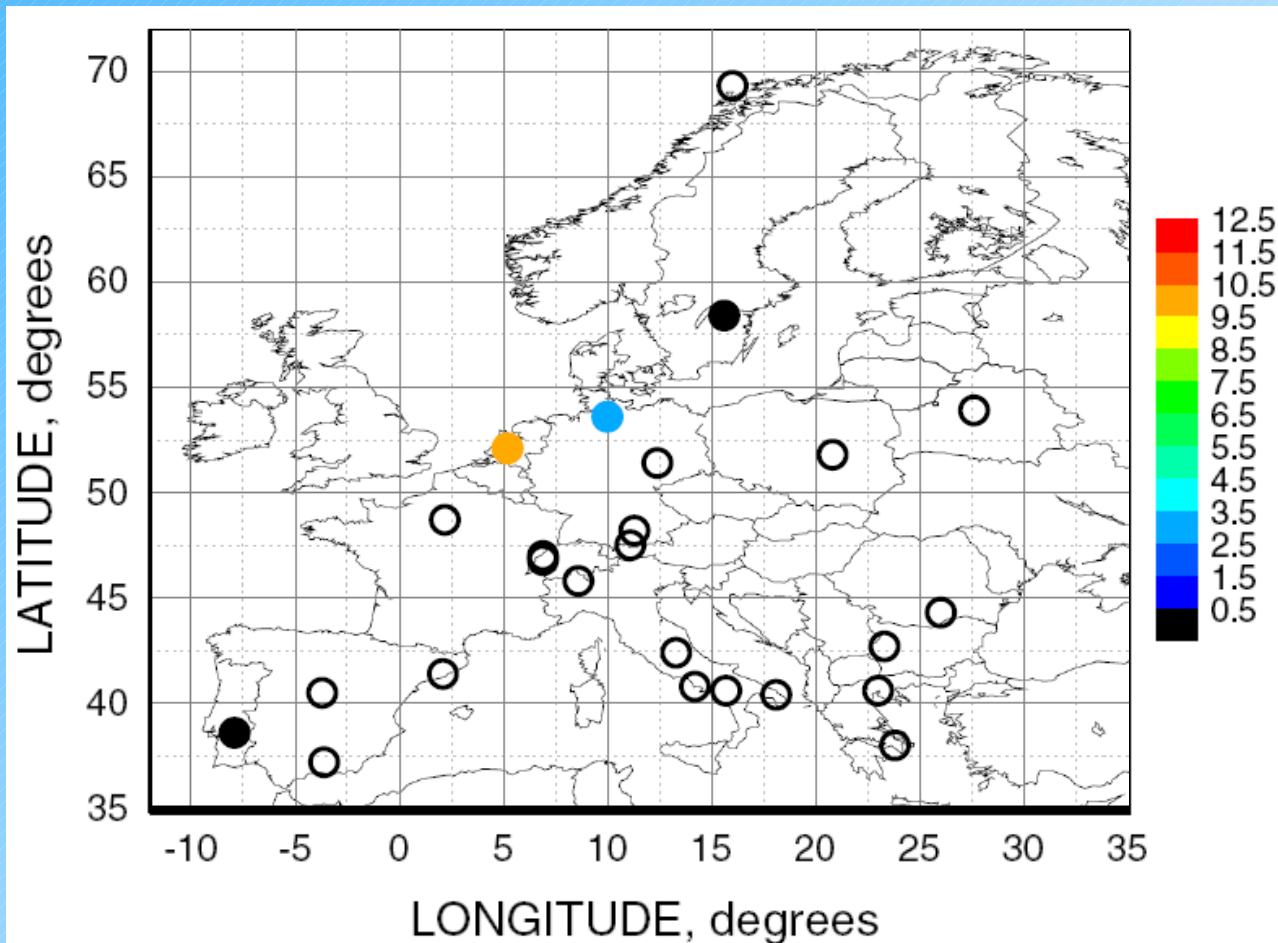
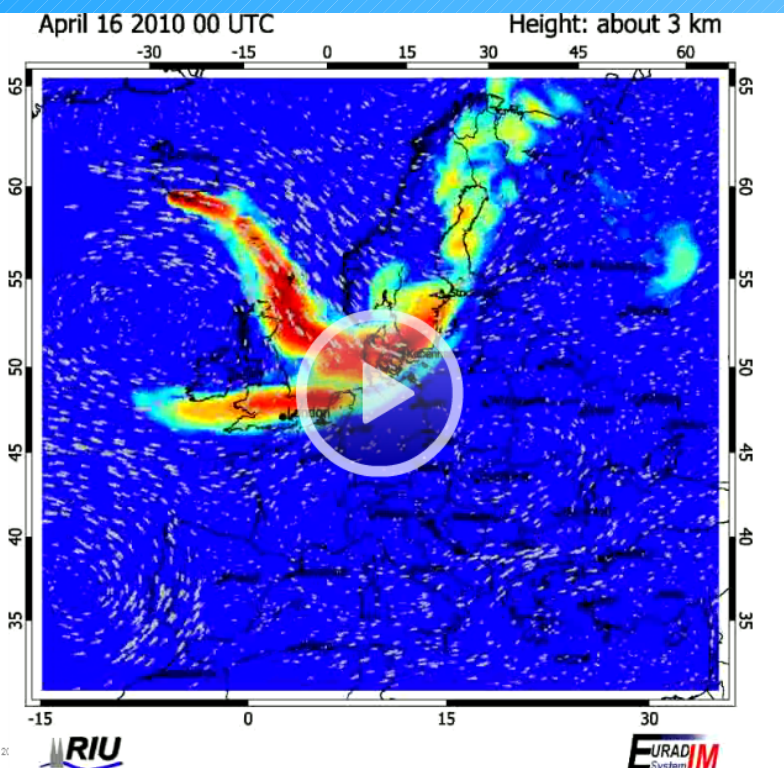


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 16 00 UTC

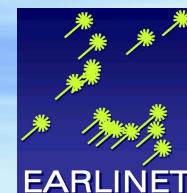


<http://www.eurad.uni-koeln.de/>

Preliminary data

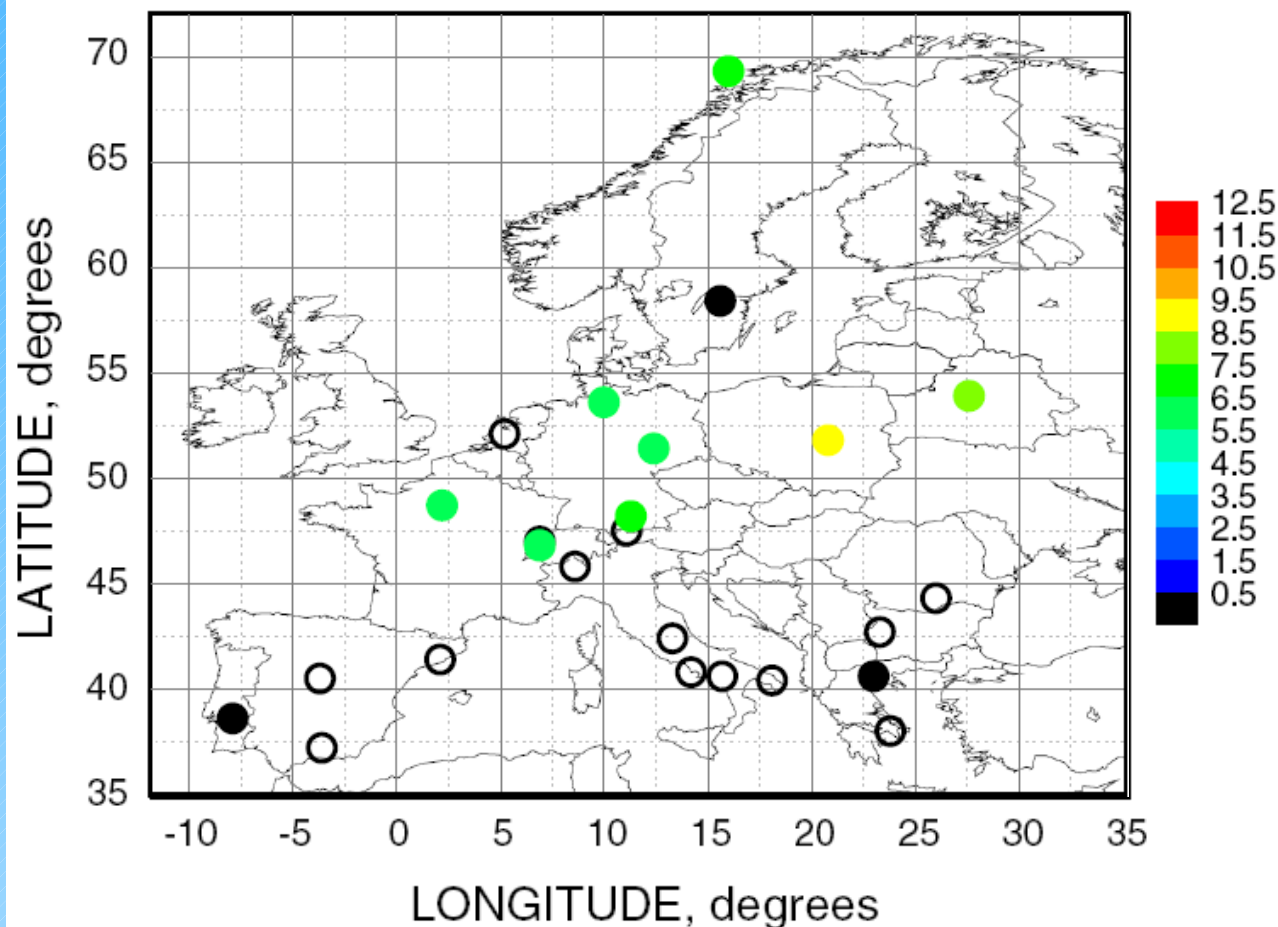
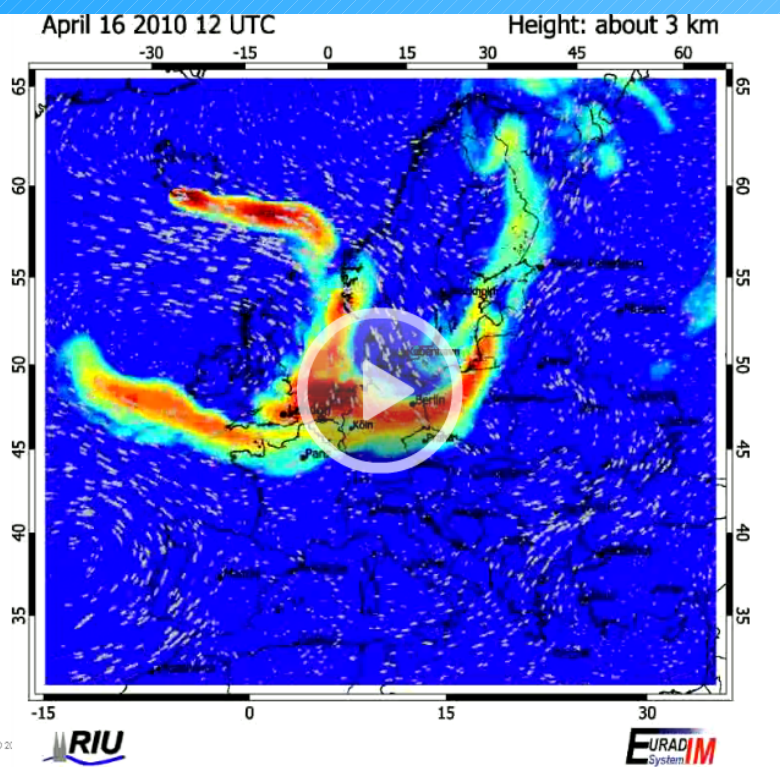


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

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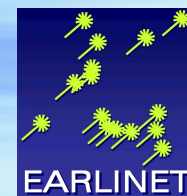


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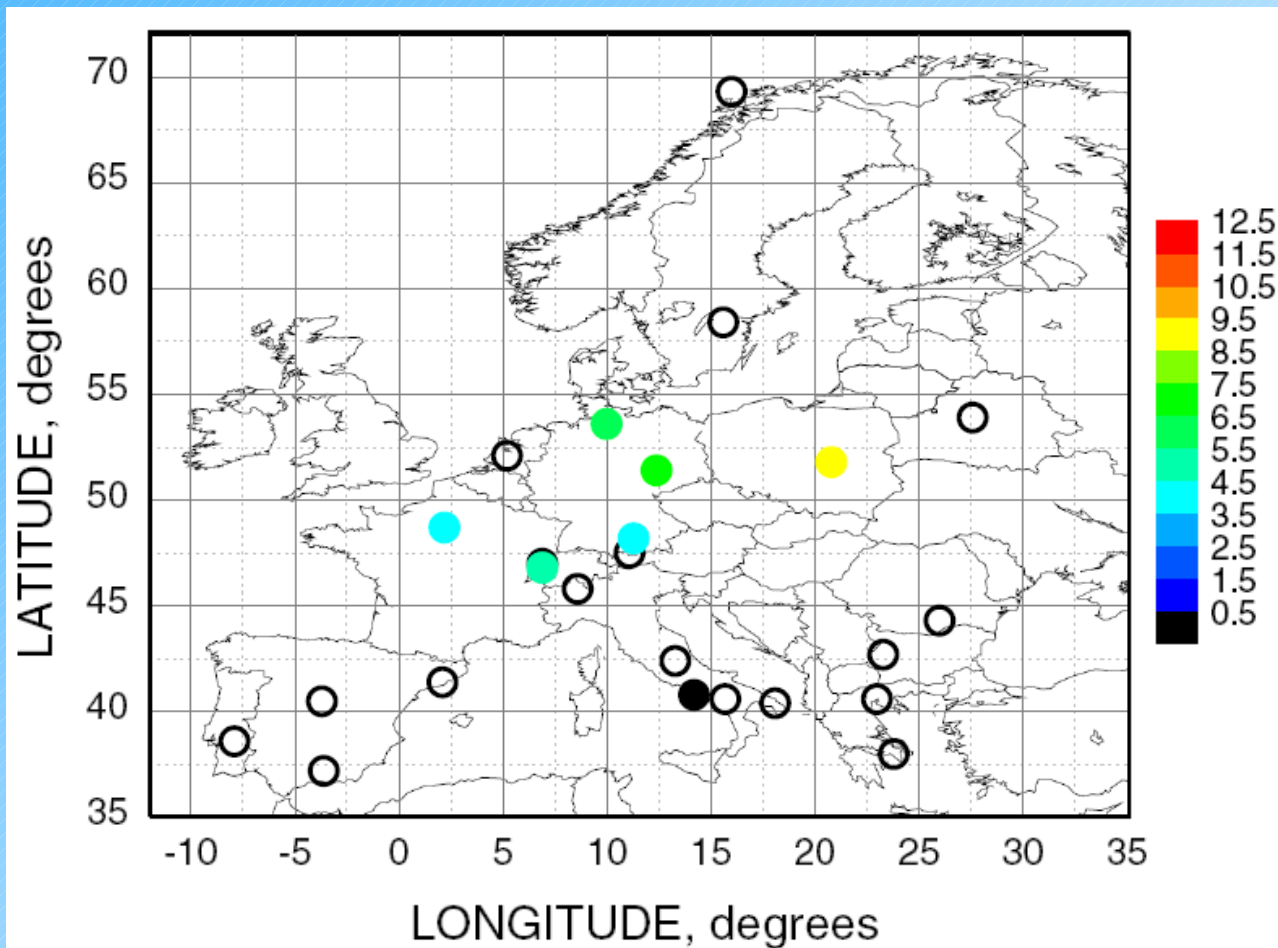
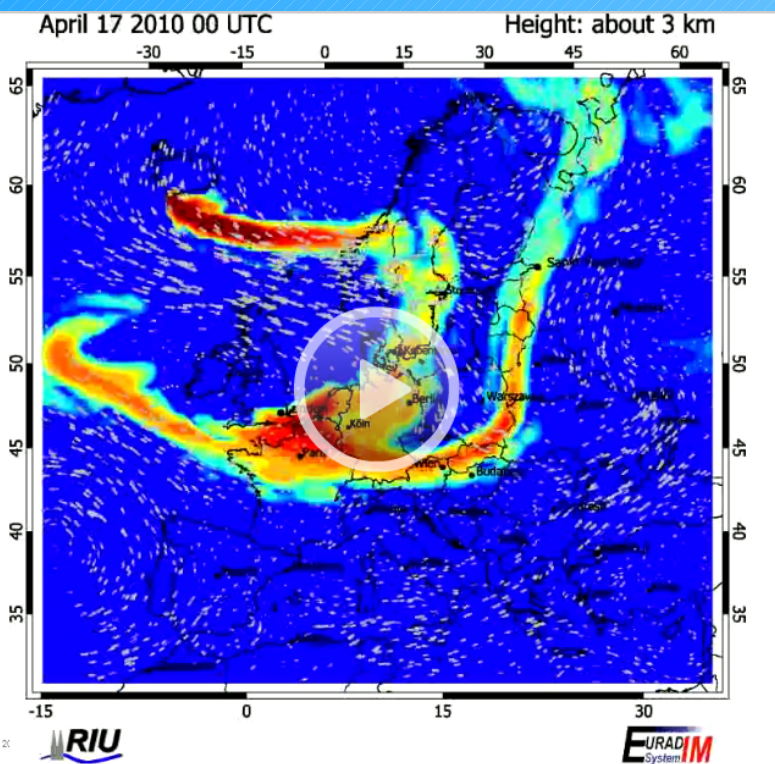


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

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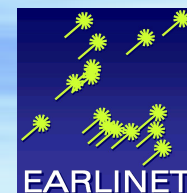


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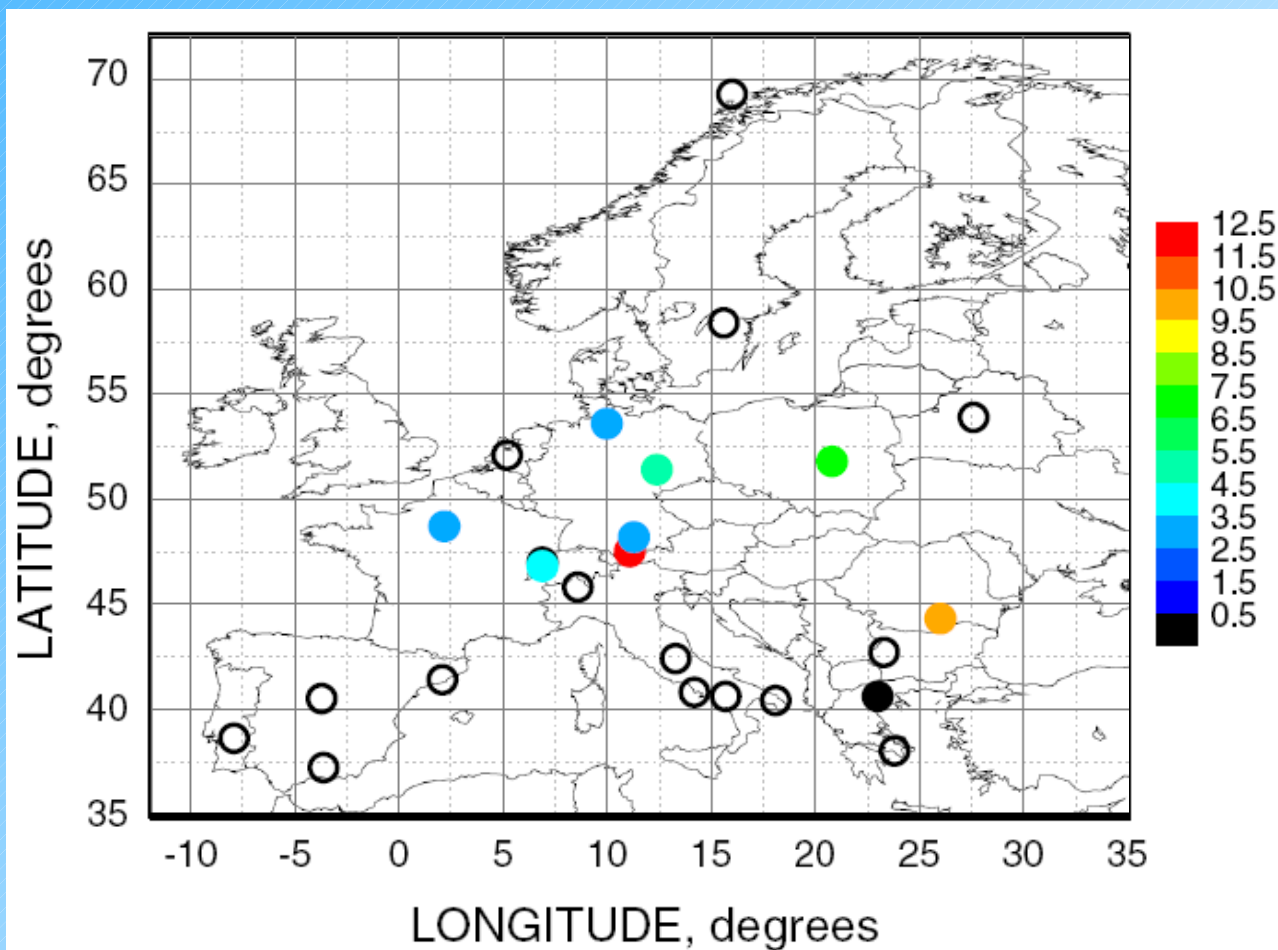
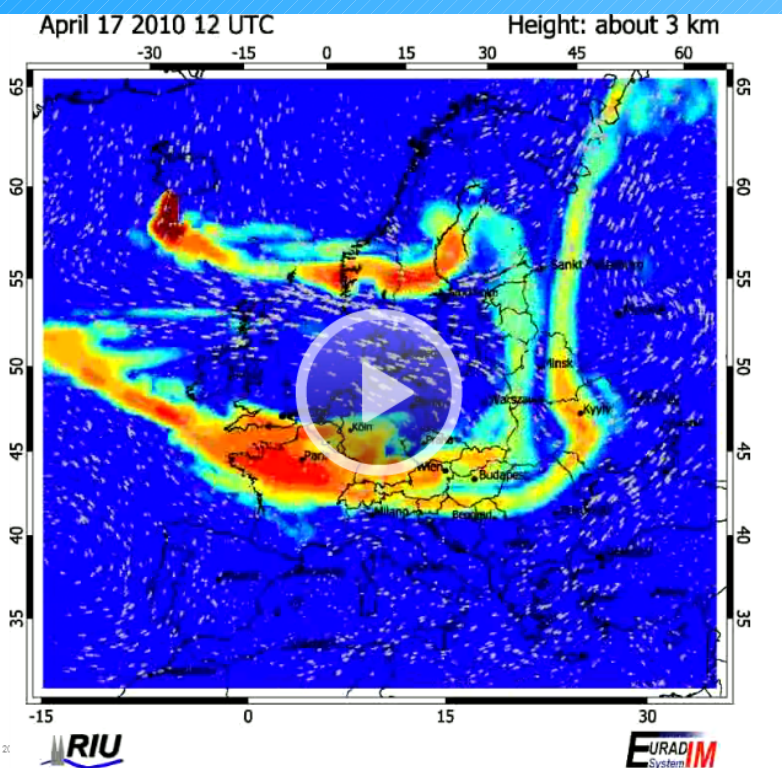


4-dimensional data set from EARLINET



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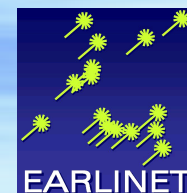


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Preliminary data

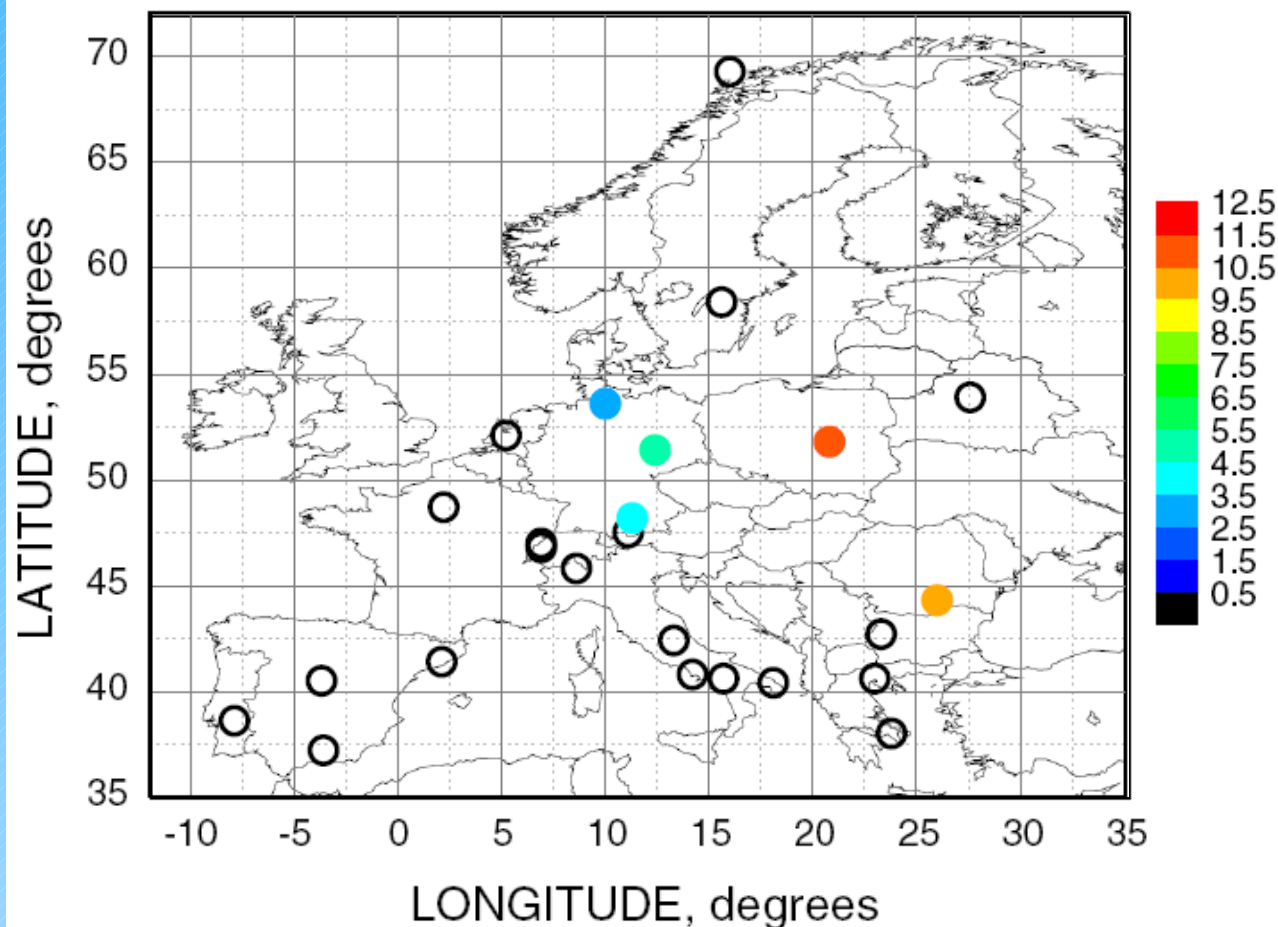
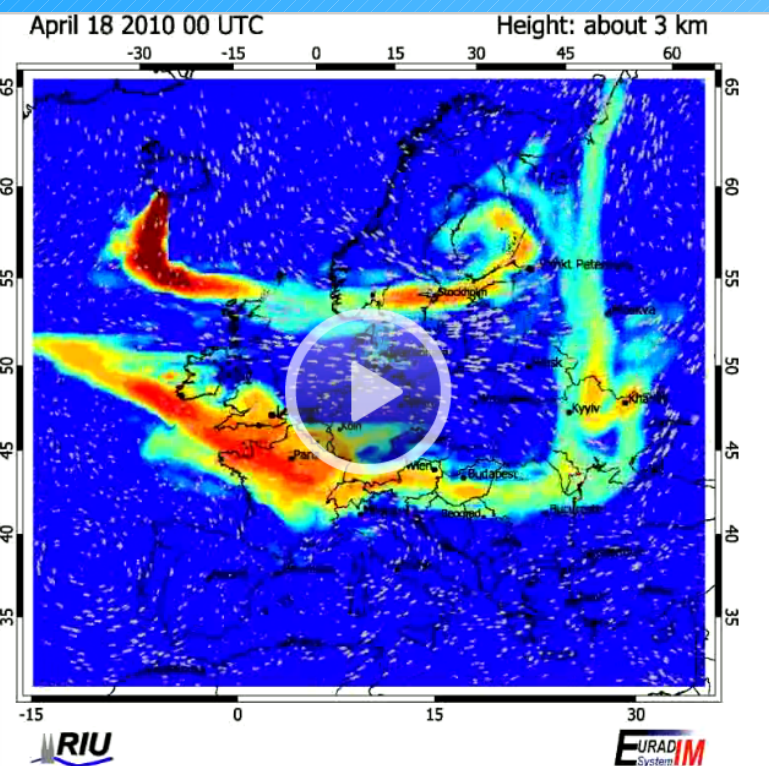


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 18 00 UTC

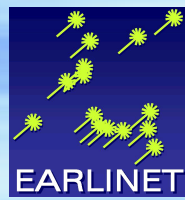


<http://www.eurad.uni-koeln.de/>

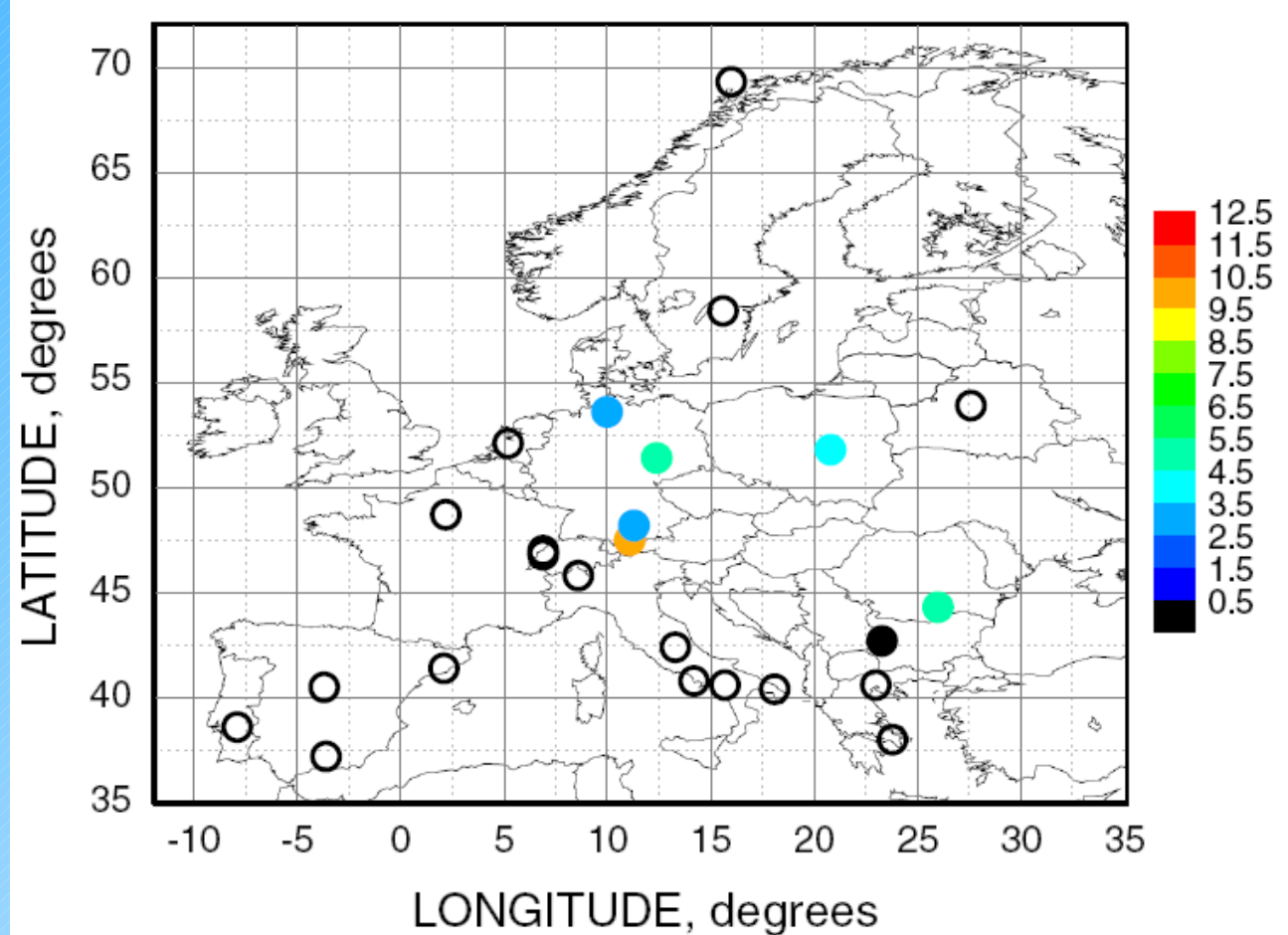
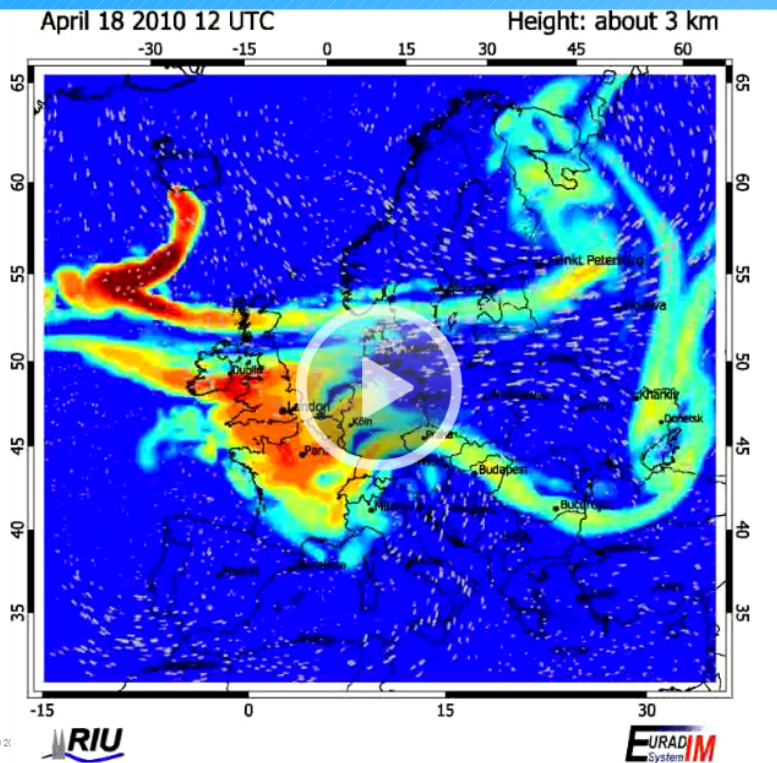
Preliminary data



4-dimensional data set from EARLINET



Layer top height of the volcanic plume:
April 18 12 UTC

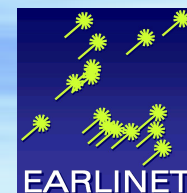


<http://www.eurad.uni-koeln.de/>

Preliminary data

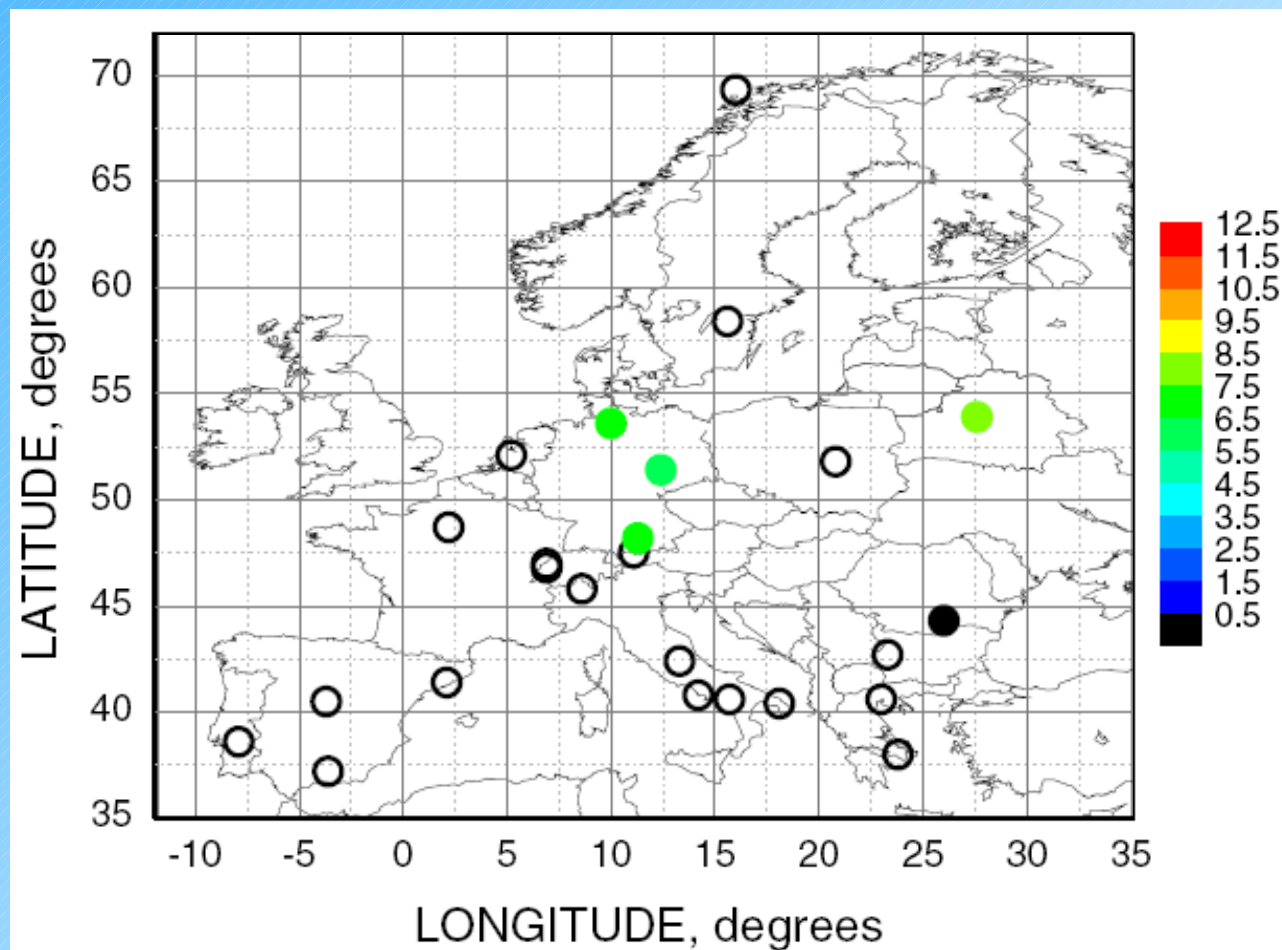
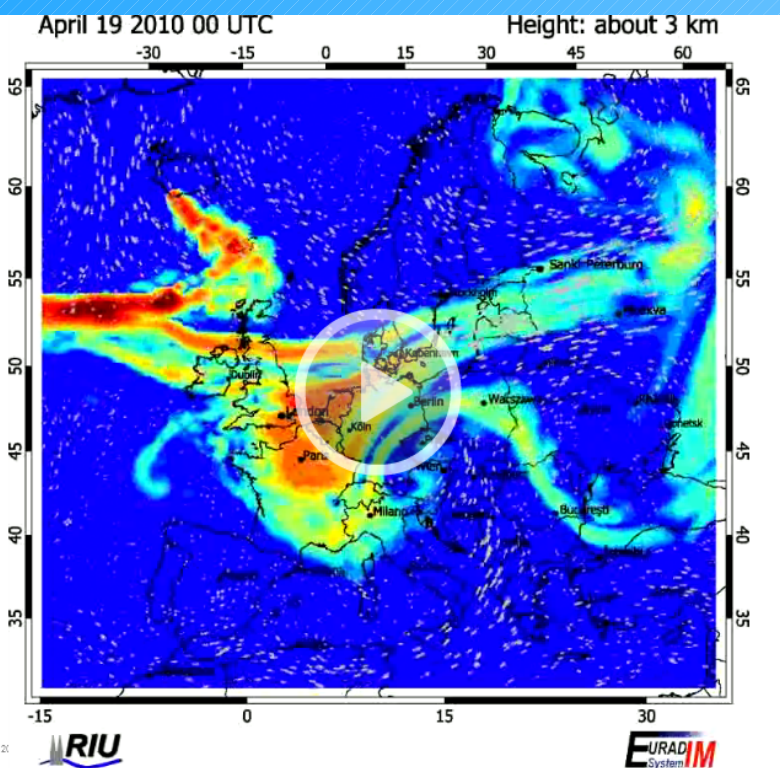


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

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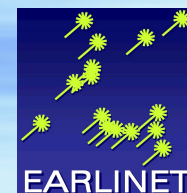


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Preliminary data

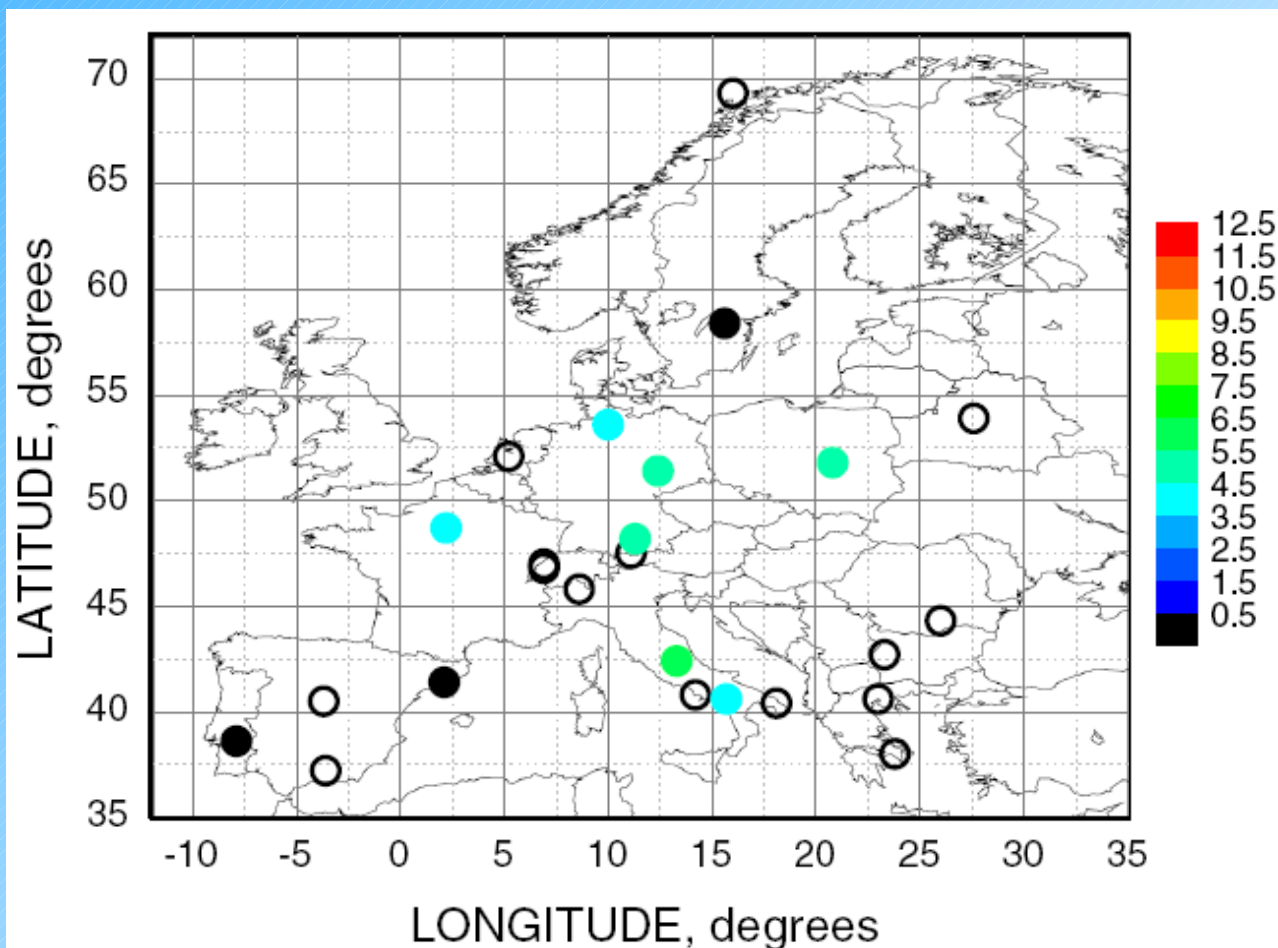
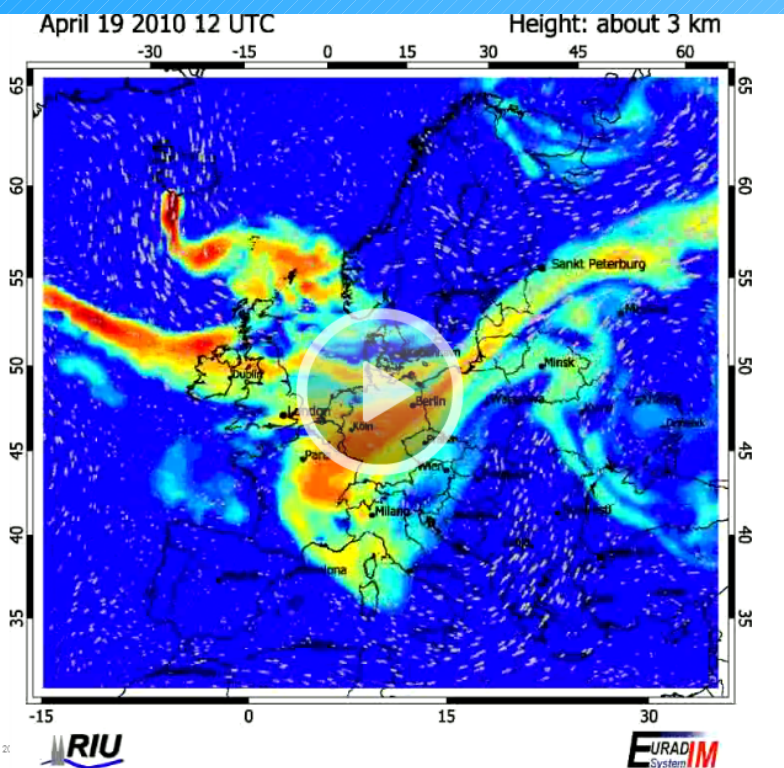


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

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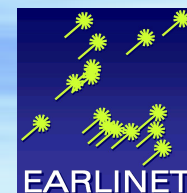


<http://www.eurad.uni-koeln.de/>

Preliminary data

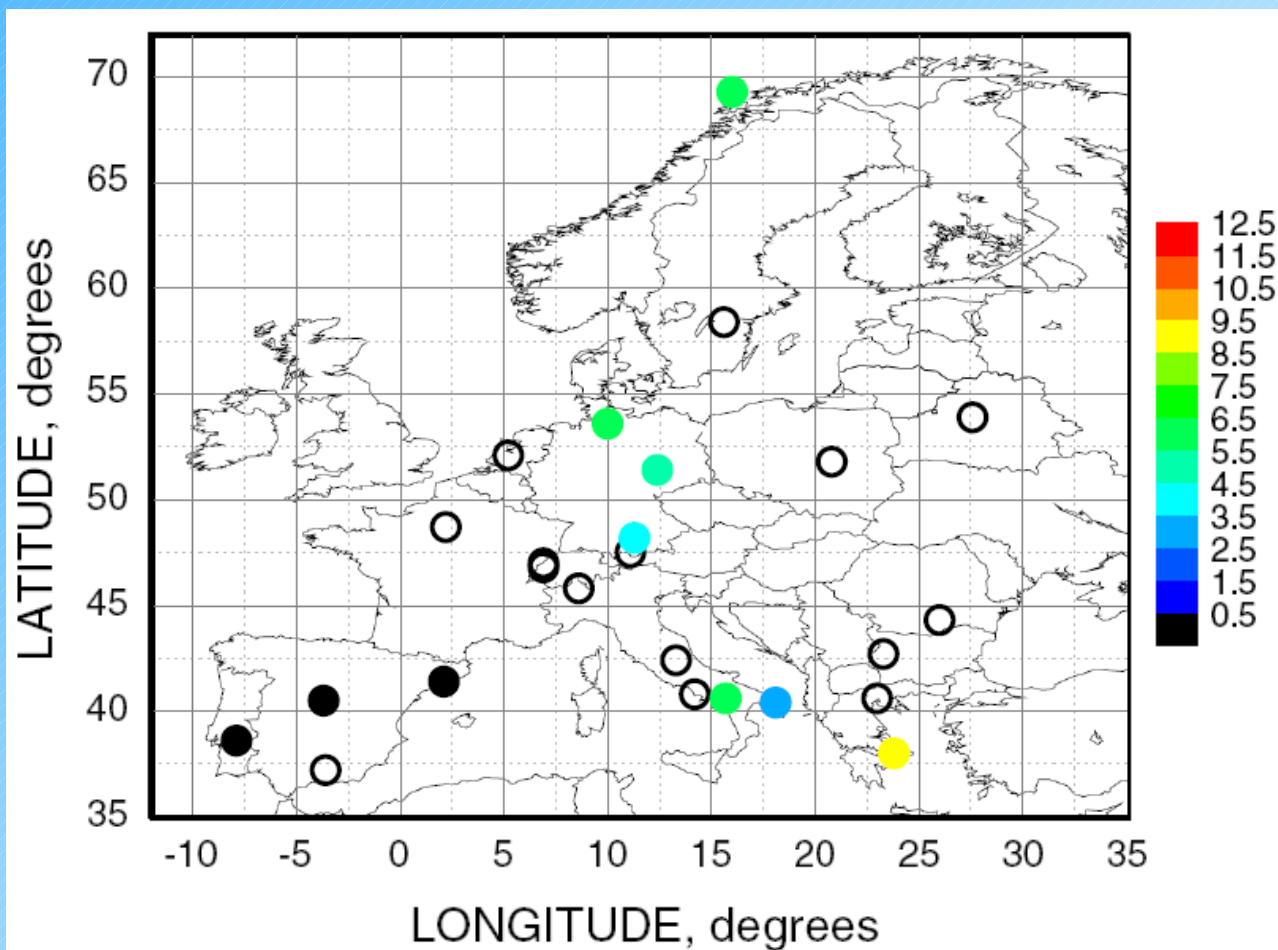
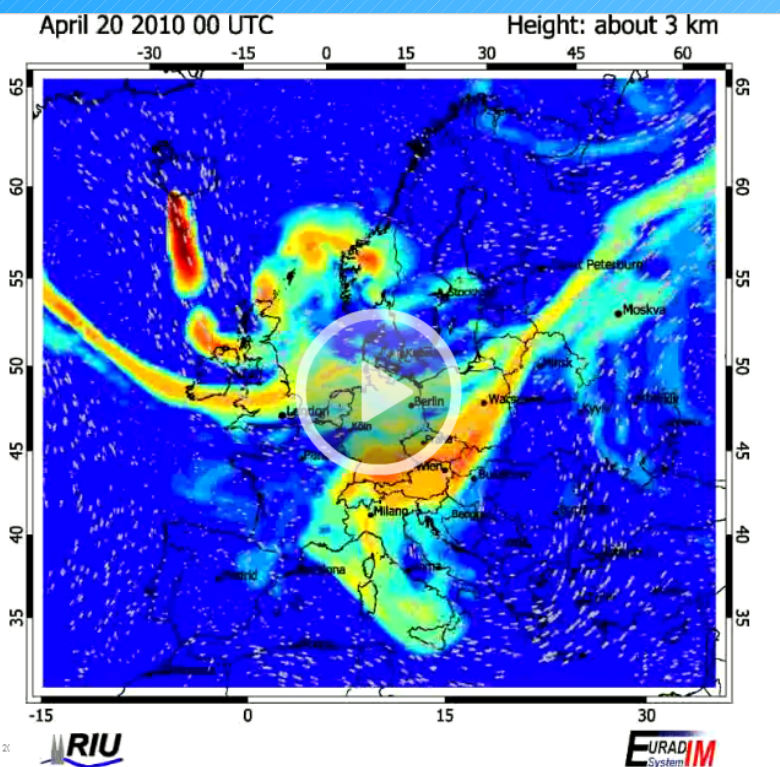


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 20 00 UTC

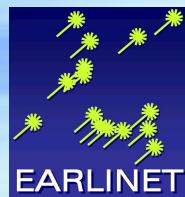


<http://www.eurad.uni-koeln.de/>

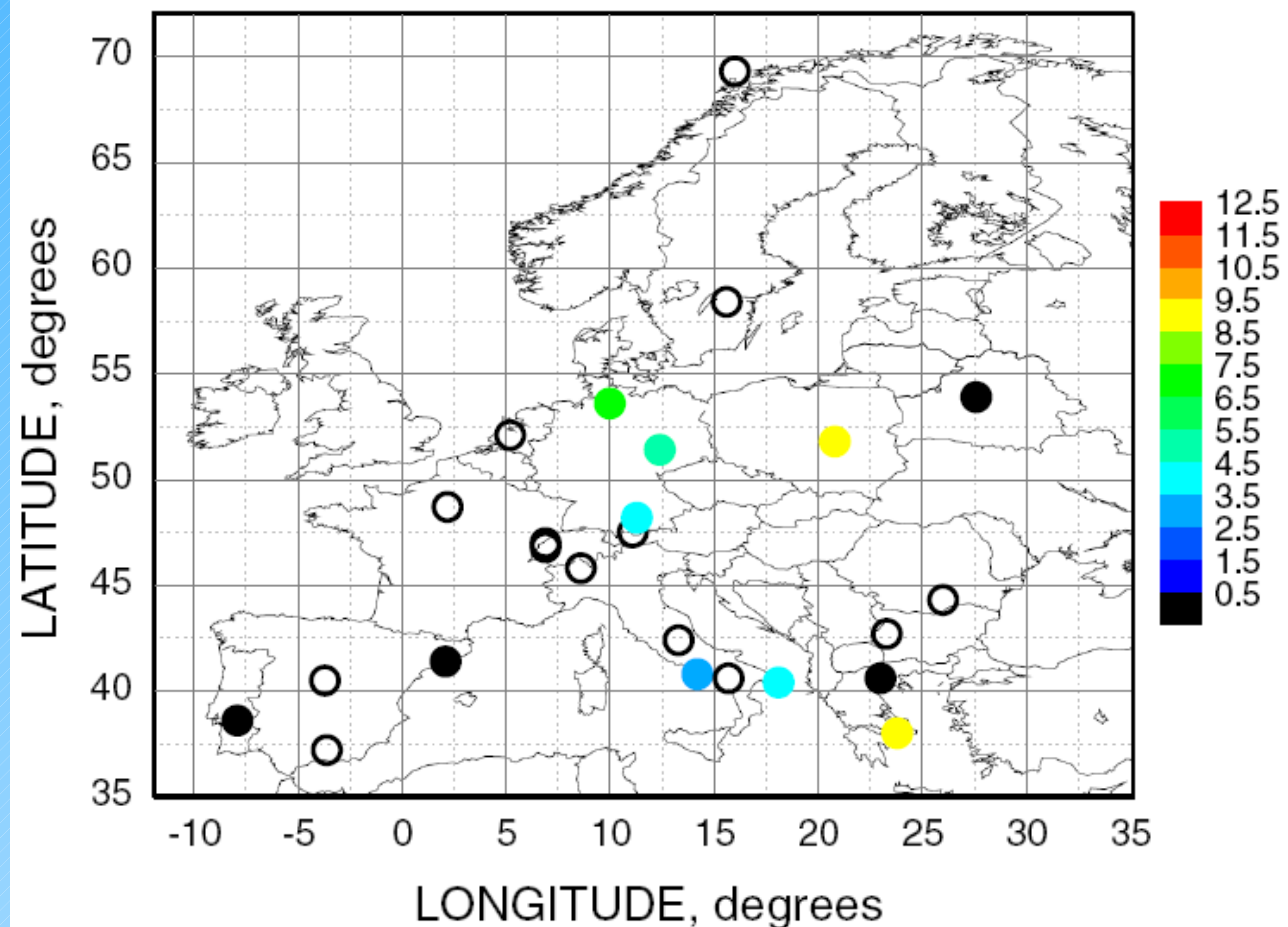
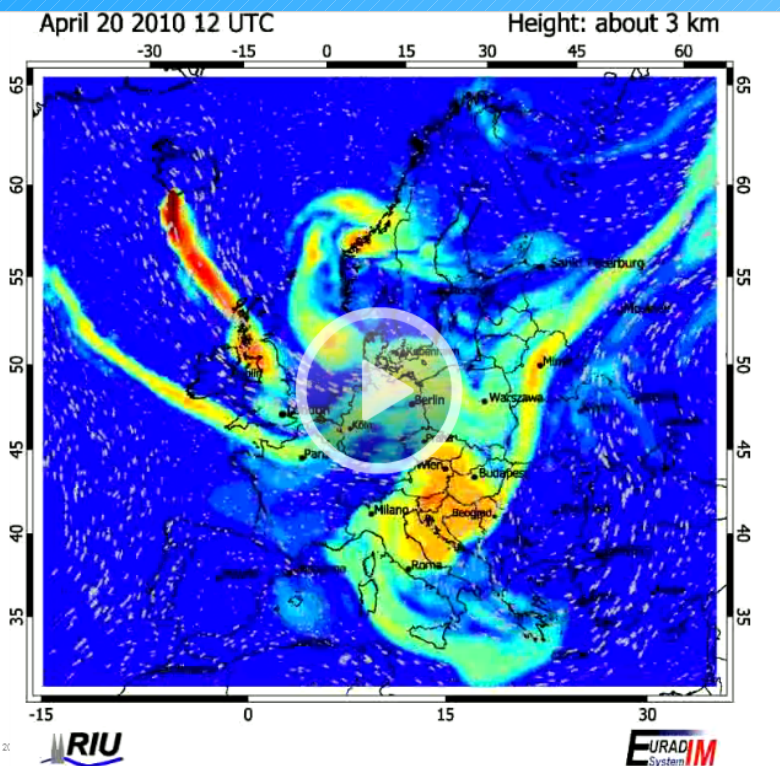
Preliminary data



4-dimensional data set from EARLINET



Layer top height of the volcanic plume:
April 20 12 UTC

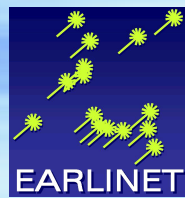


<http://www.eurad.uni-koeln.de/>

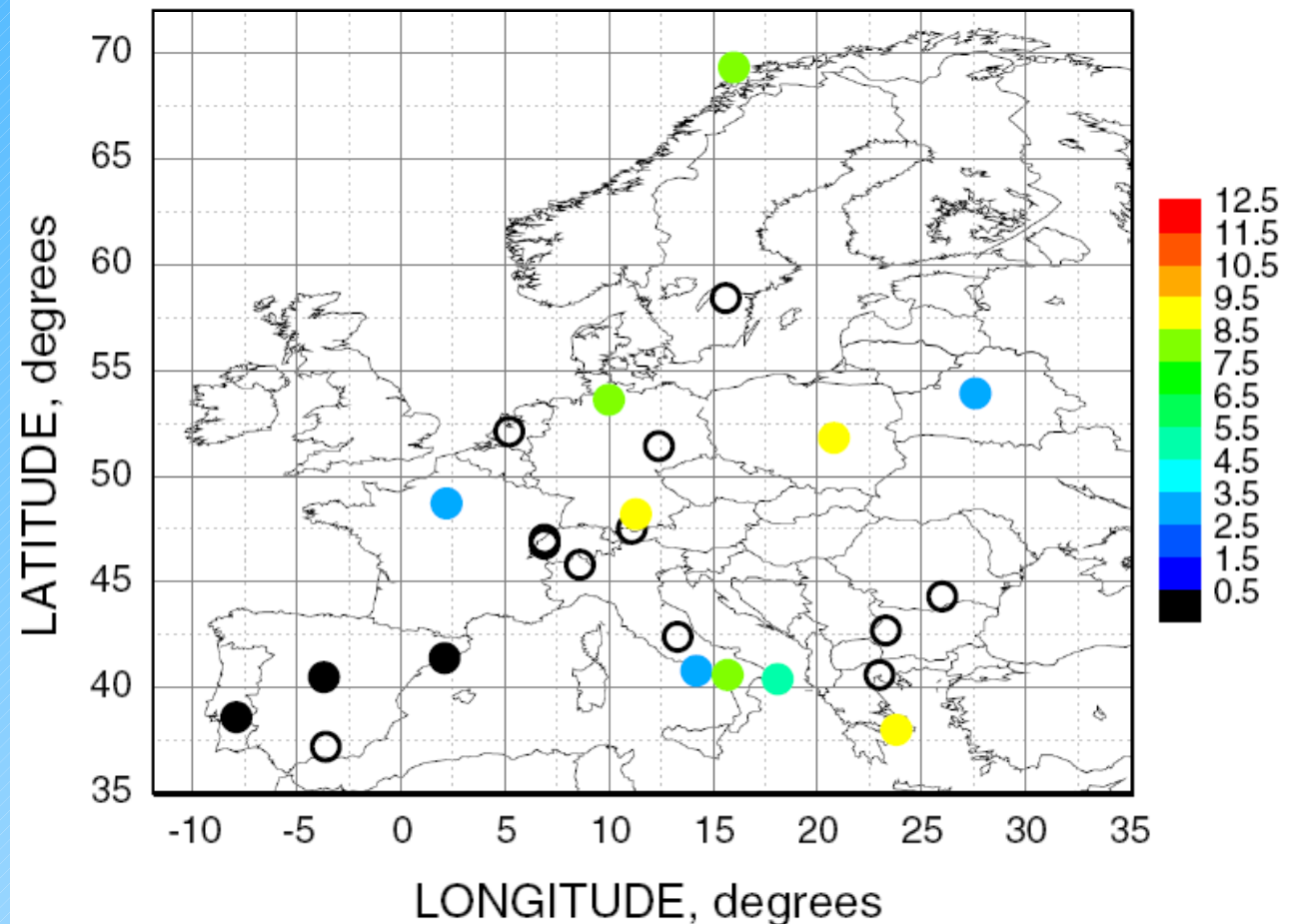
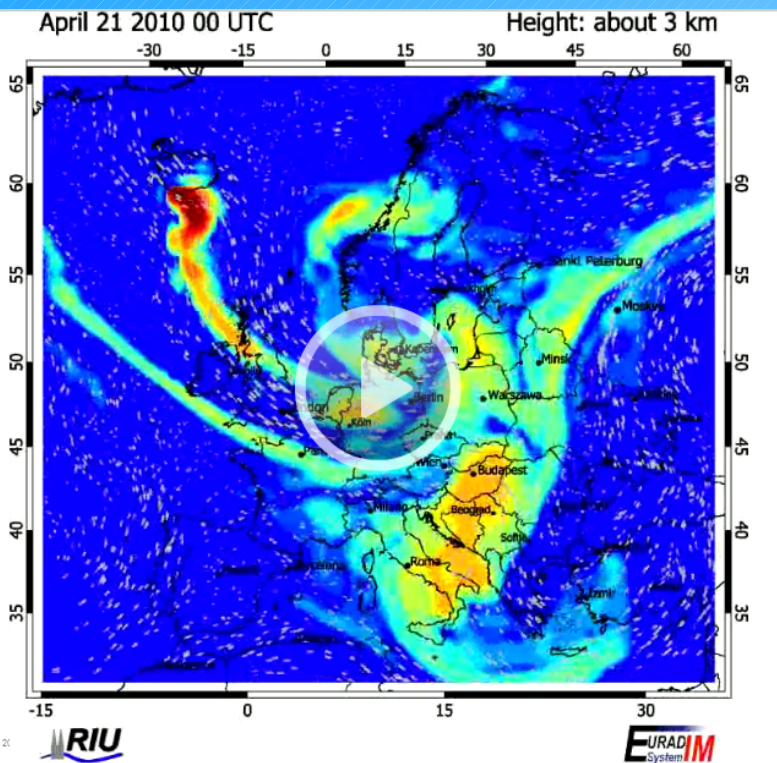
Preliminary data



4-dimensional data set from EARLINET



Layer top height of the volcanic plume:
April 21 00 UTC

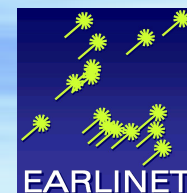


<http://www.eurad.uni-koeln.de/>

Preliminary data

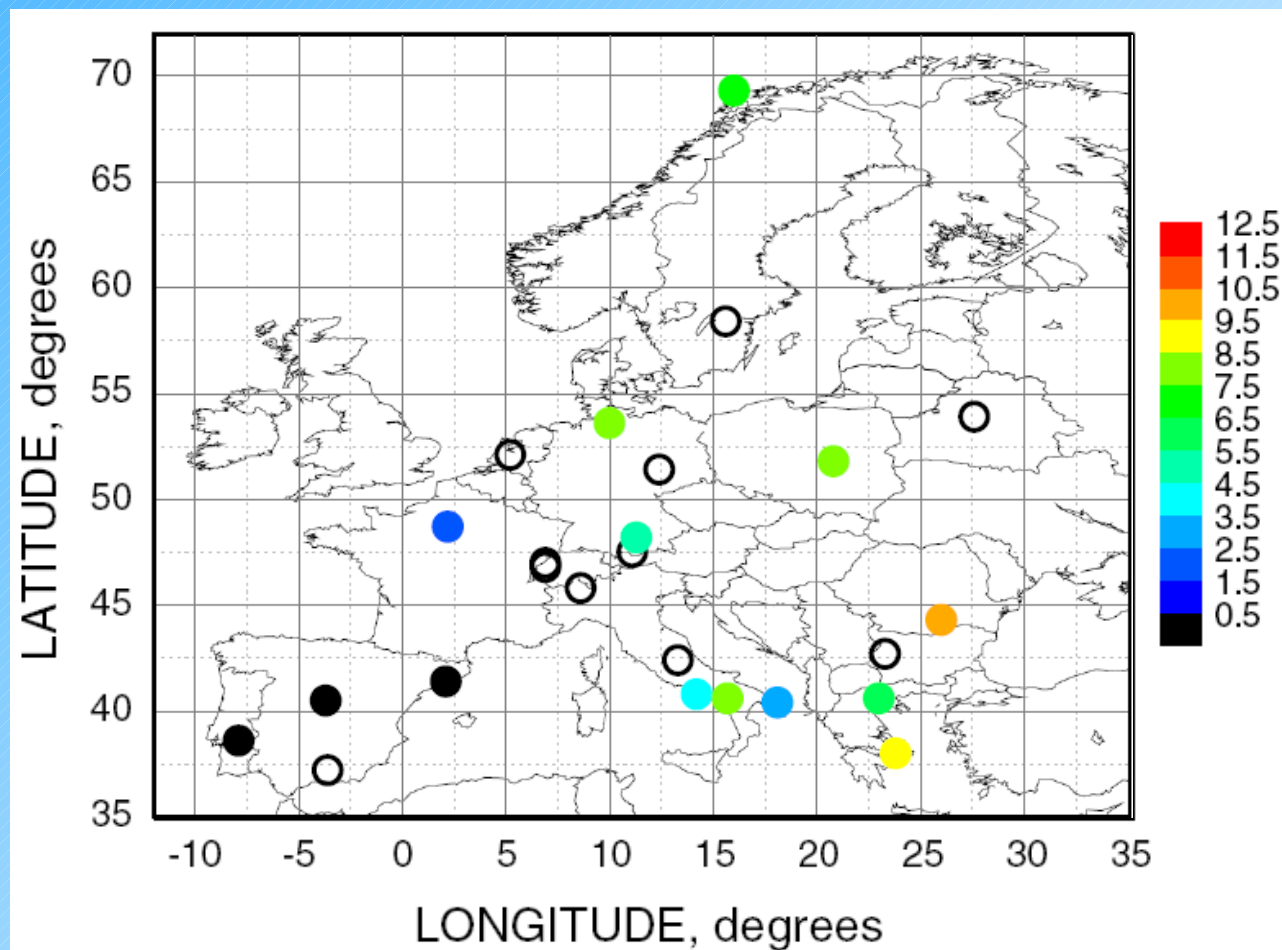
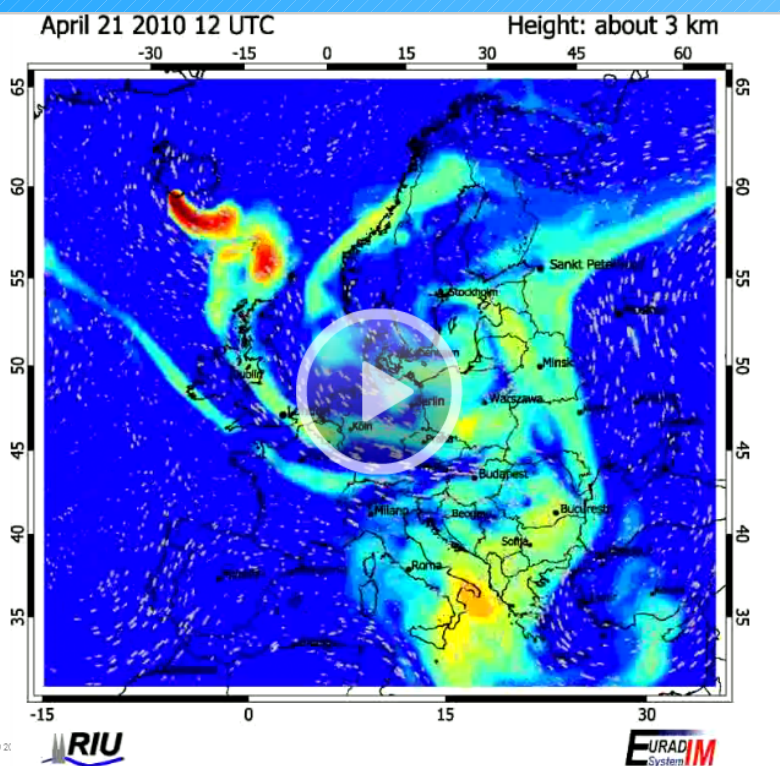


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 21 12 UTC

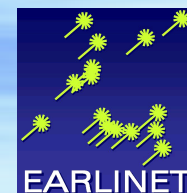


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Preliminary data

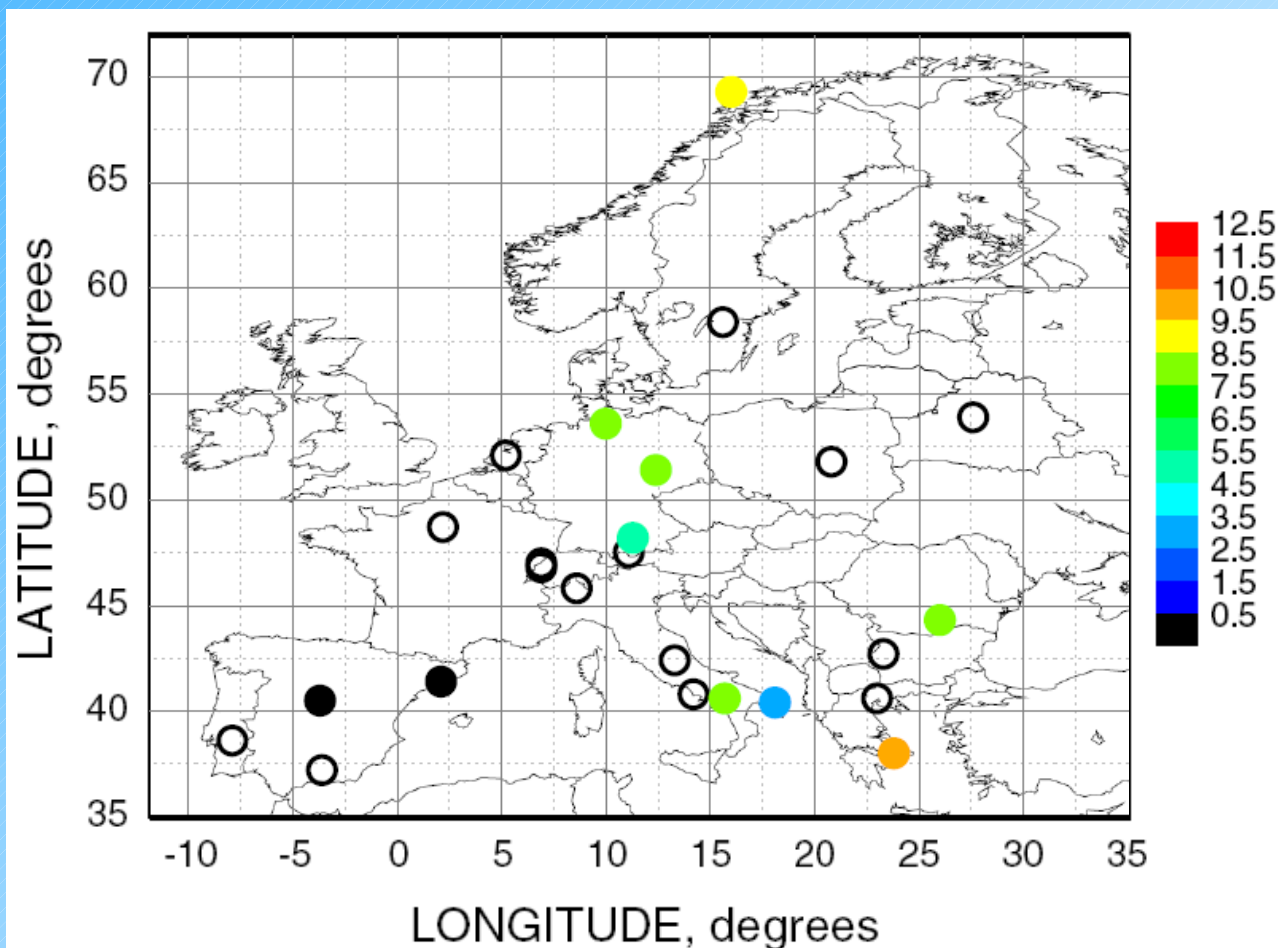
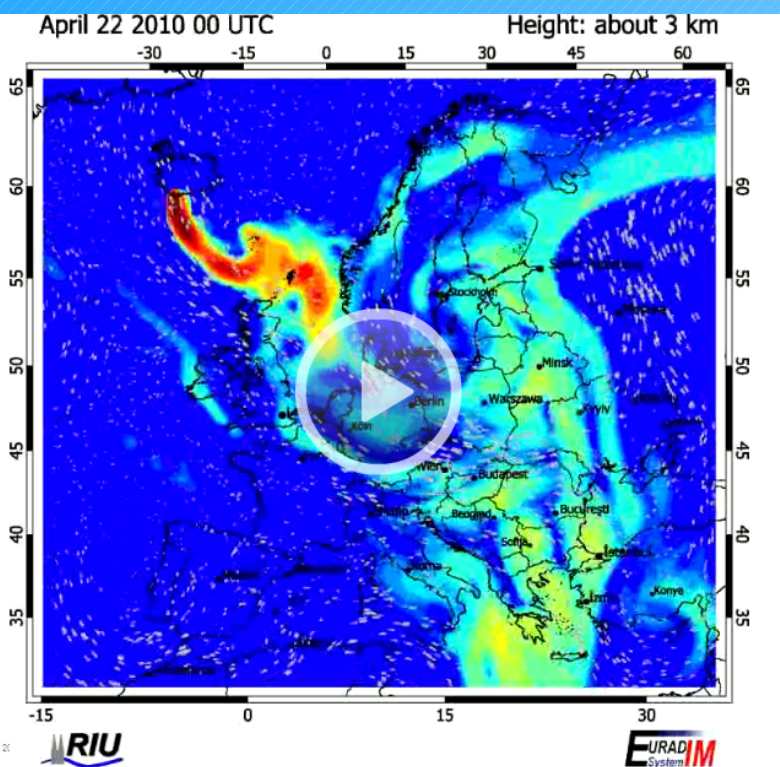


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 22 00 UTC

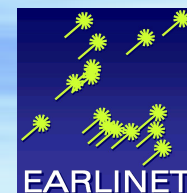


<http://www.eurad.uni-koeln.de/>

Preliminary data

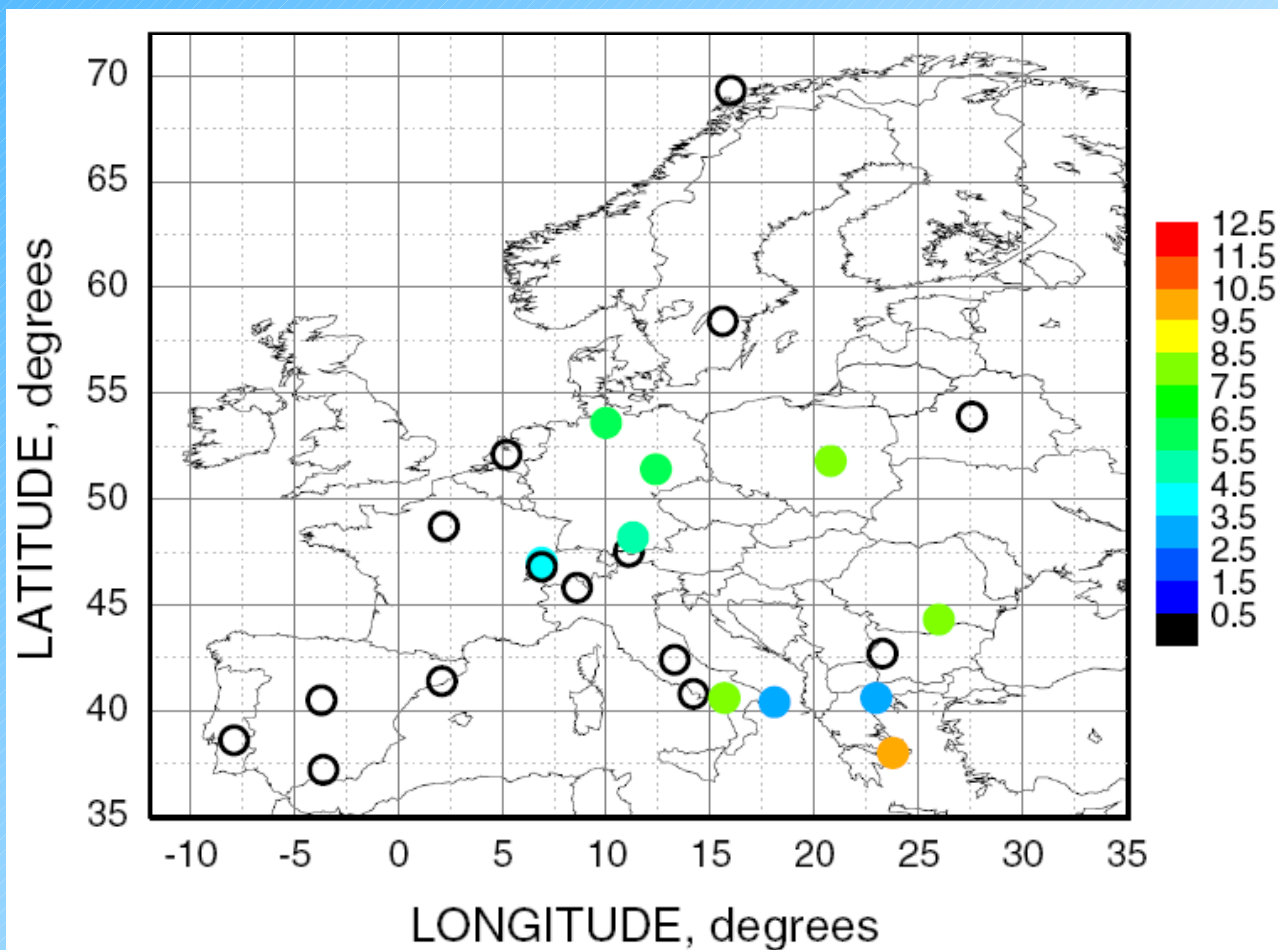
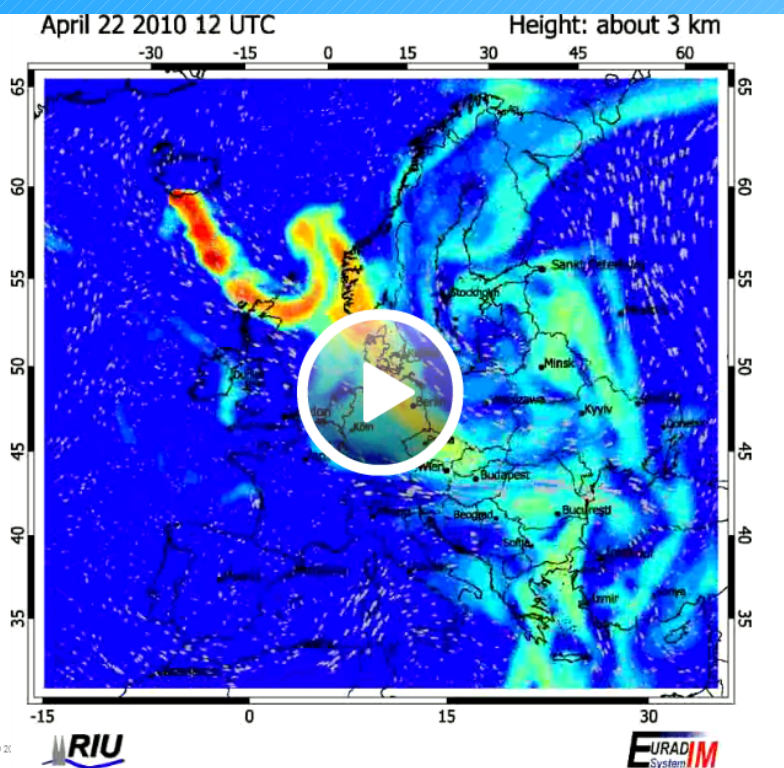


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 22 12 UTC

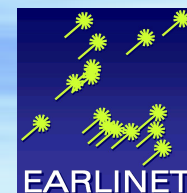


<http://www.eurad.uni-koeln.de/>

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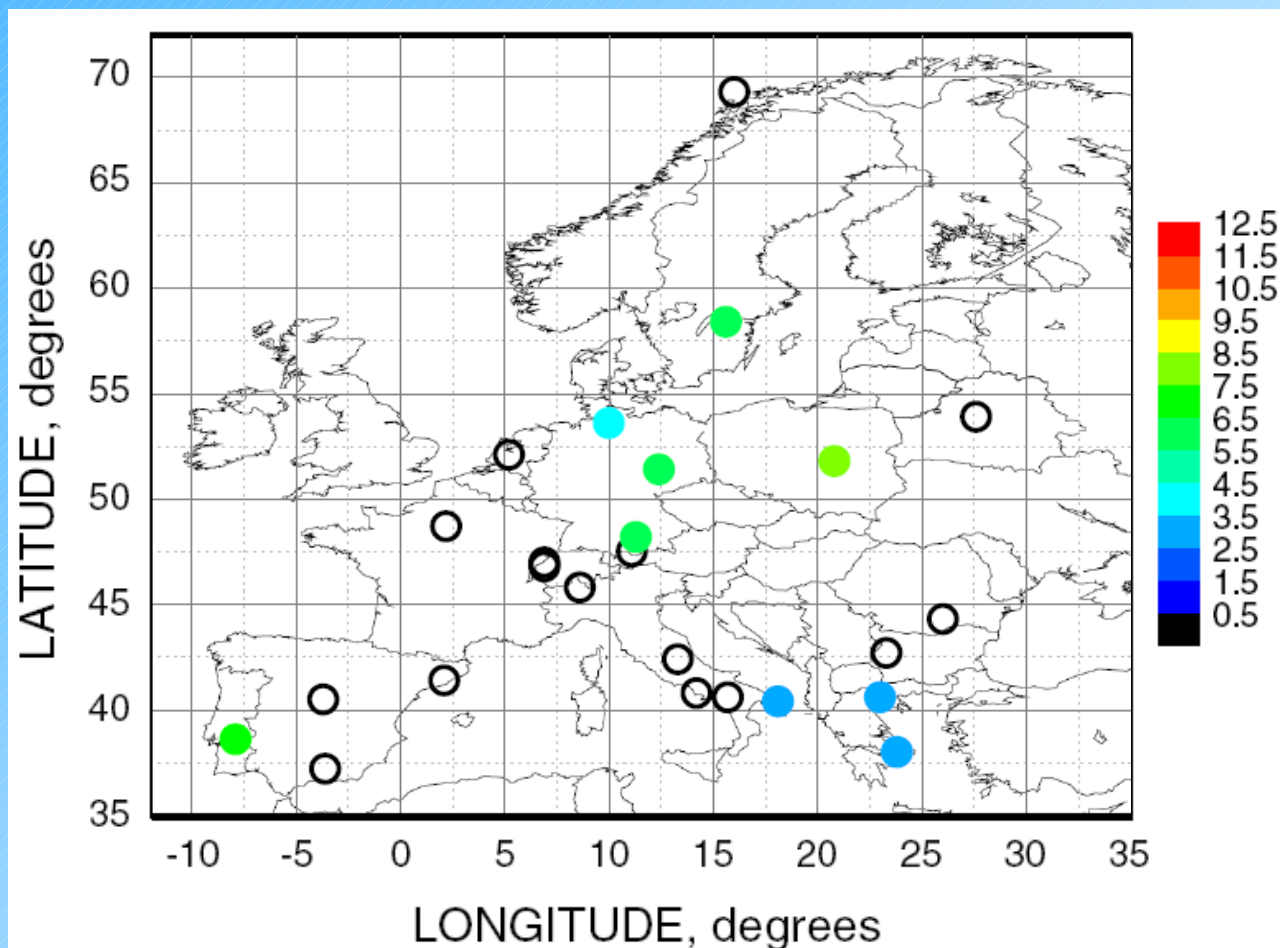
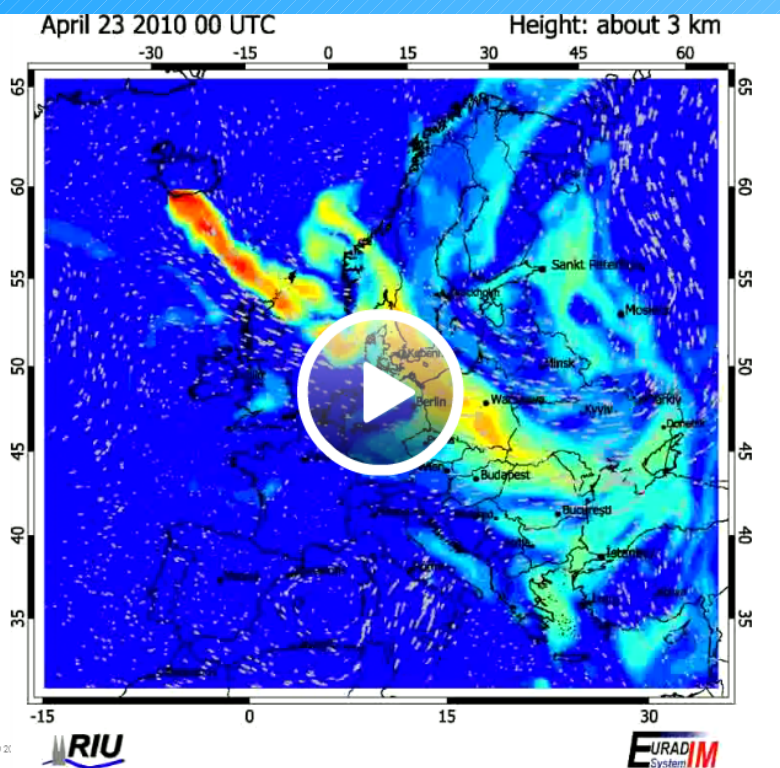


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 23 00 UTC



<http://www.eurad.uni-koeln.de/>

Preliminary data

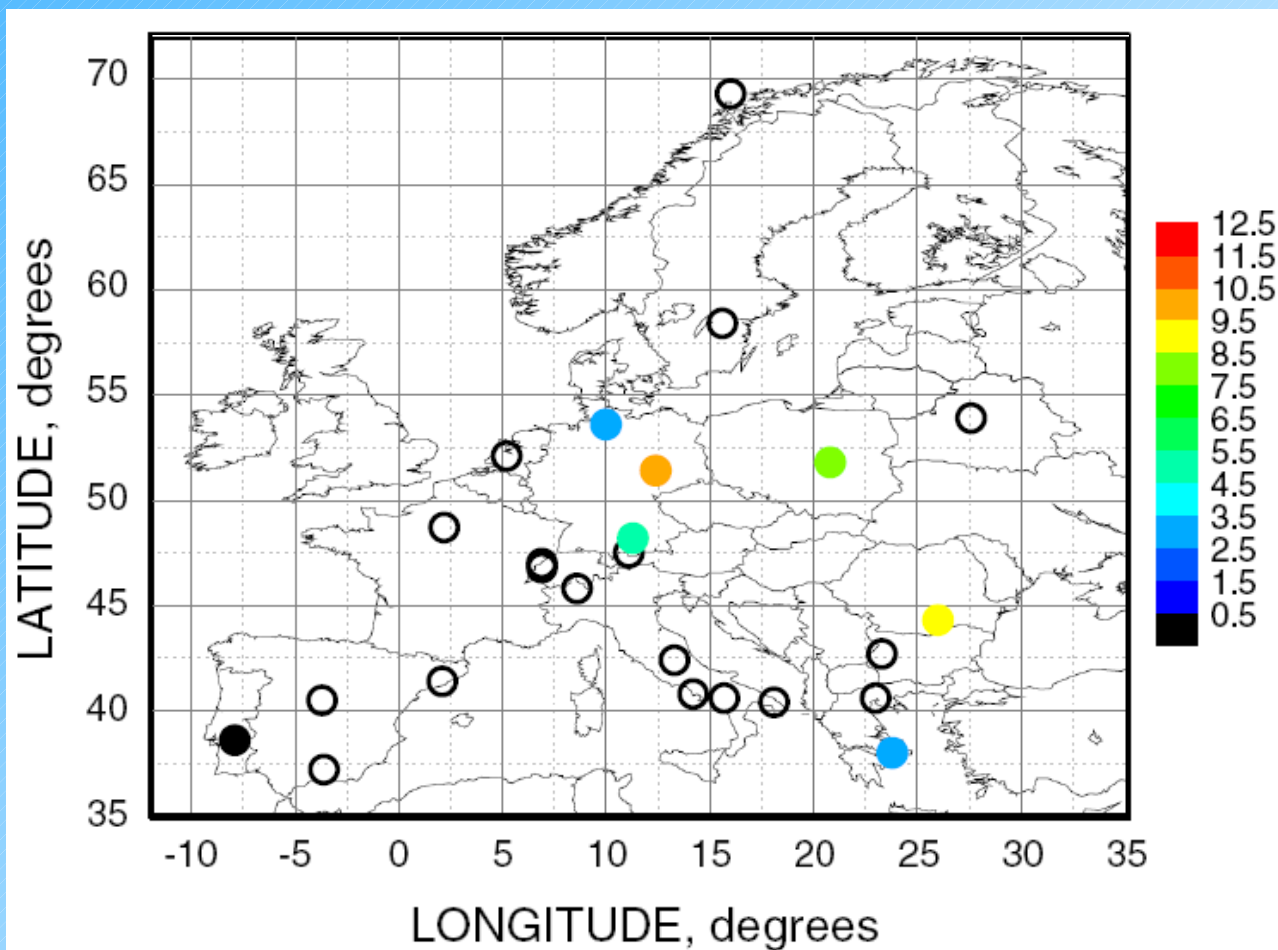
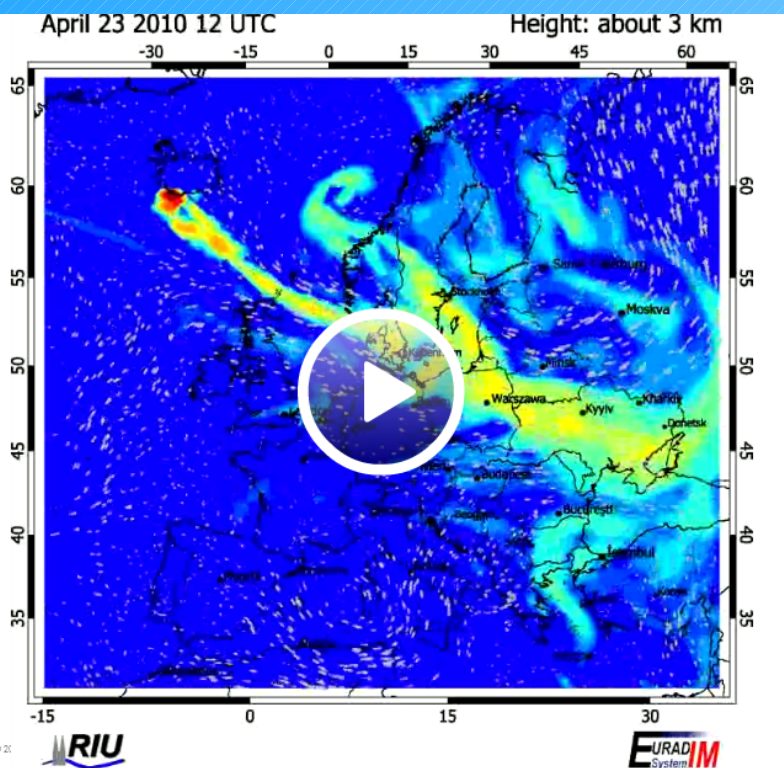


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 23 12 UTC

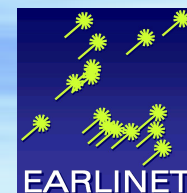


<http://www.eurad.uni-koeln.de/>

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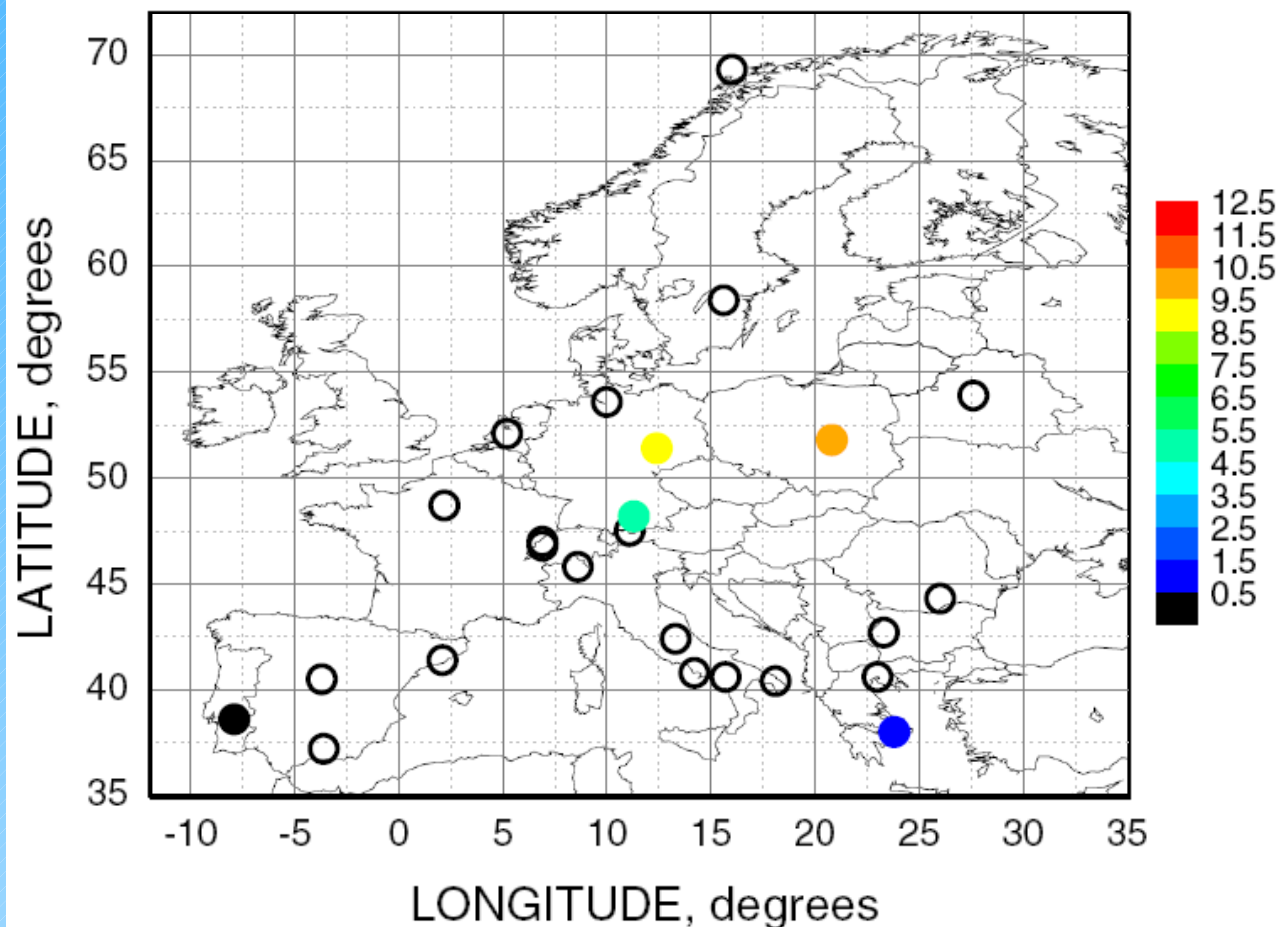
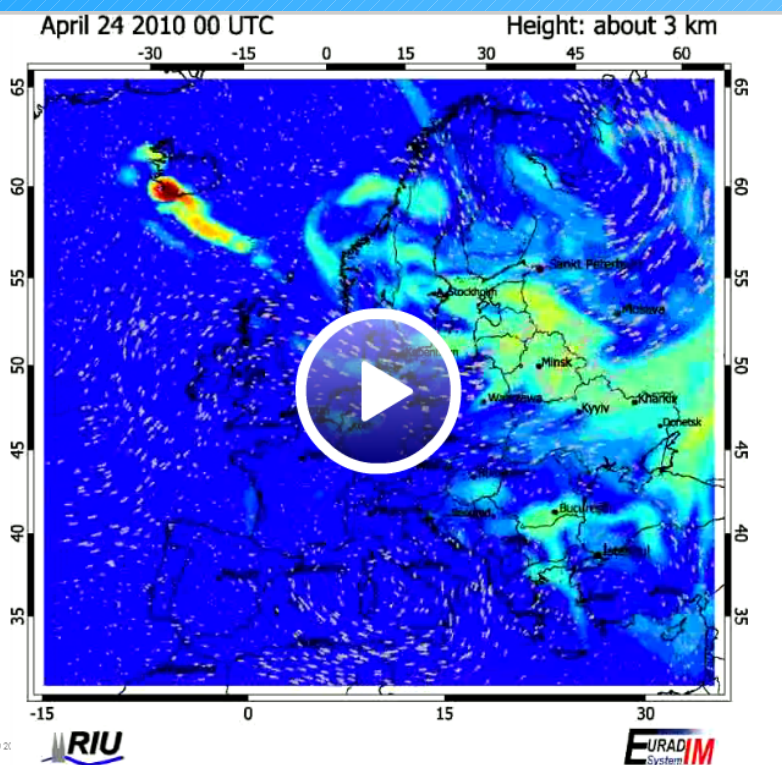


4-dimensional data set from EARLINET



Layer top height of the volcanic plume:

April 24 00 UTC



<http://www.eurad.uni-koeln.de/>

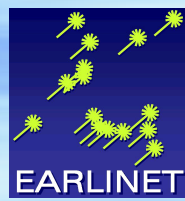
Preliminary data



4-dimensional distribution of Eyjafjalljökull ash over Europe from EARLINET observations

→ will be provided soon

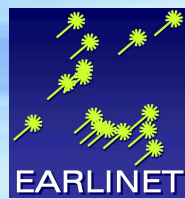
→ contact Gelsomina Pappalardo pappalardo@imaa.cnr.it



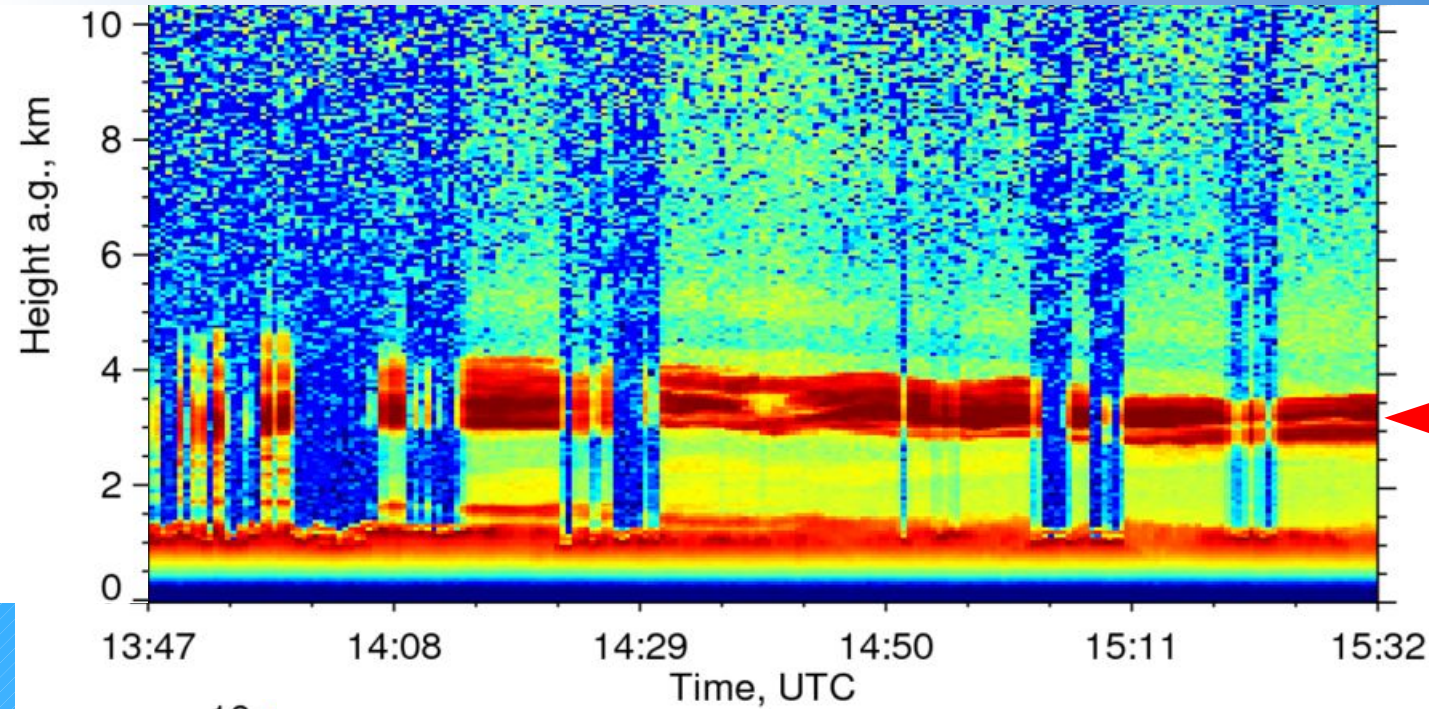
- * What is EARLINET ?
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Detection limits: lidar vs. ceilometer

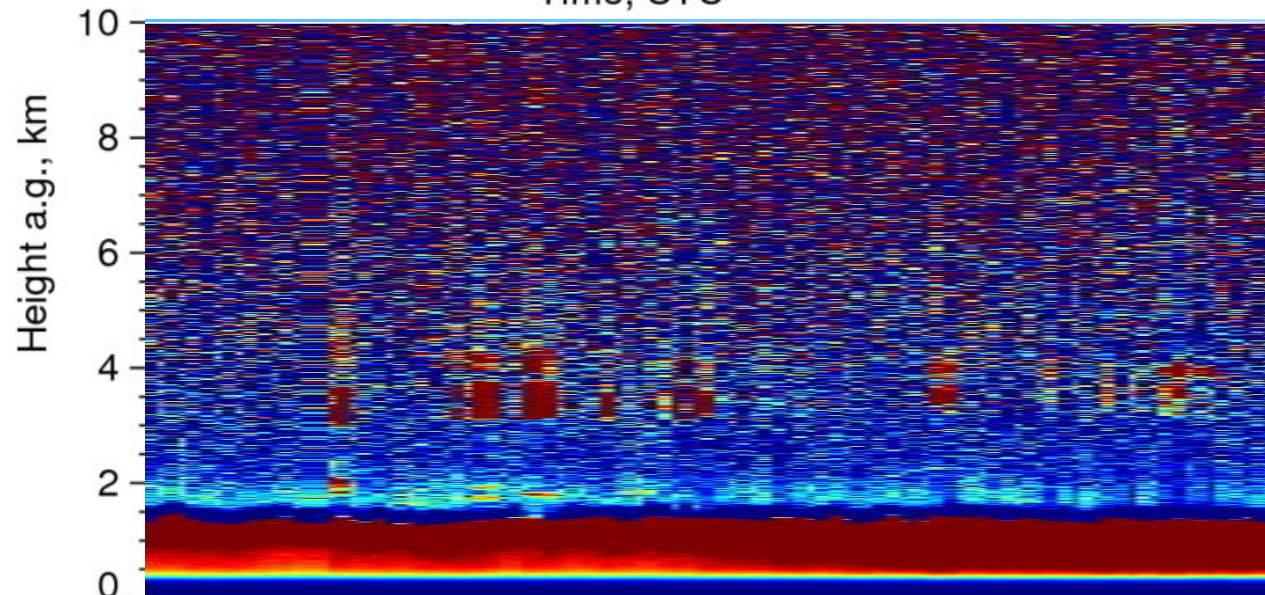


1) strong, low-altitude plume



MARTHA
lidar optimized for the
free troposphere

ash layer



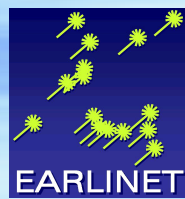
Jenoptik
Ceilometer CHX

ash layer

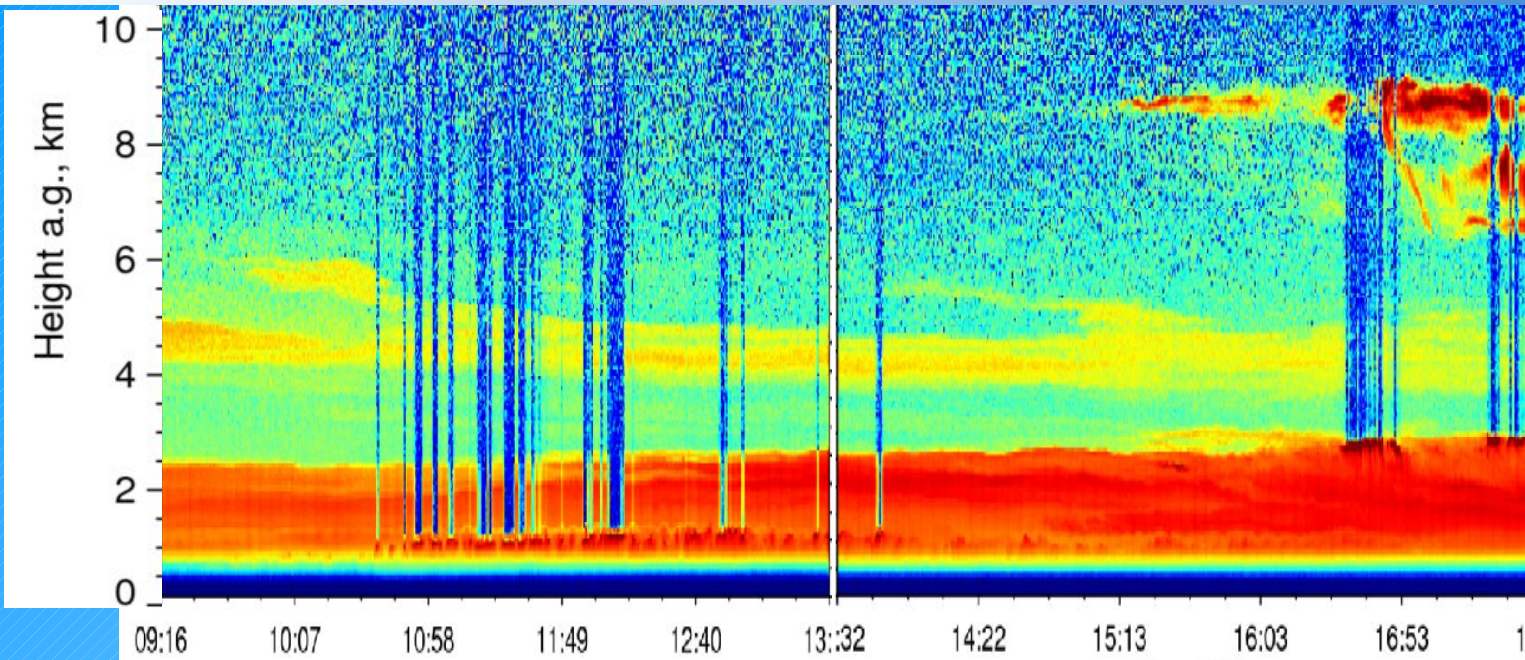
Preliminary data



Detection limits: lidar vs. ceilometer

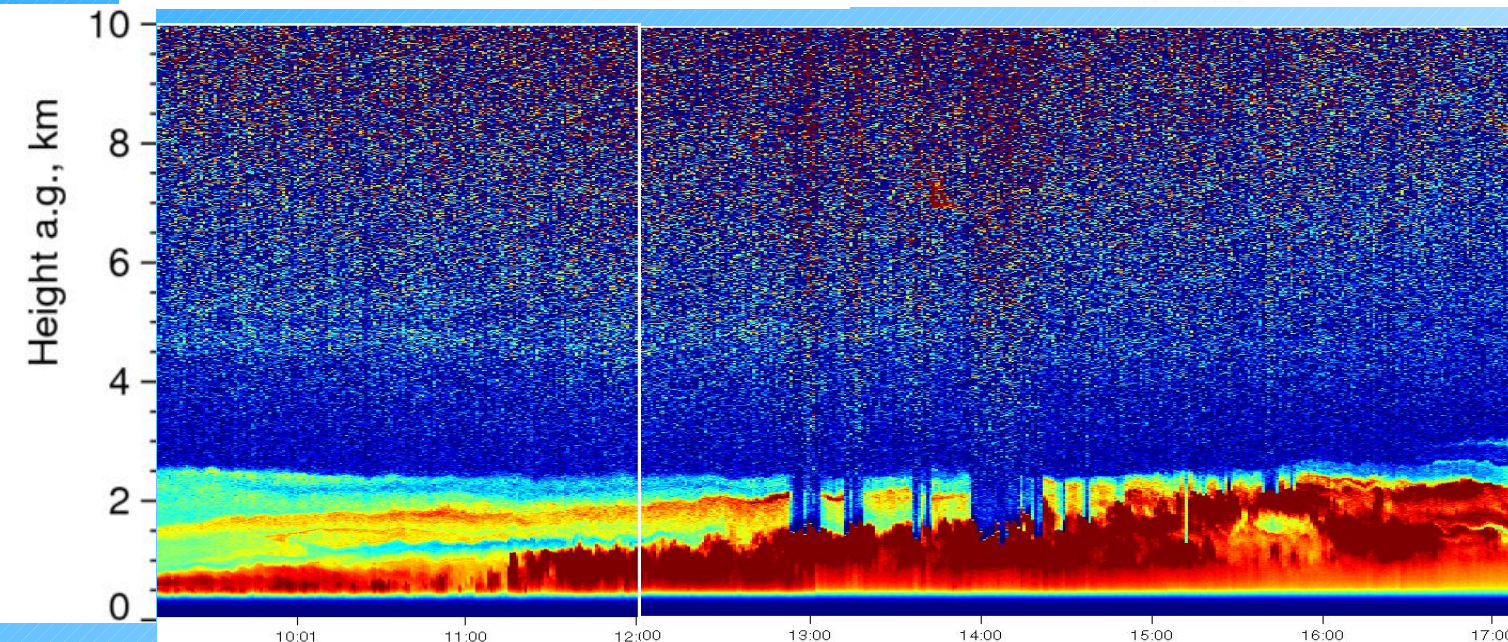


1) thin, high-altitude plume



MARTHA
lidar optimized for the
free troposphere

ash layer



Jenoptik
Ceilometer CHX

ash layer

Preliminary data



Ceilometers and PBL lidars can detect only strong layers

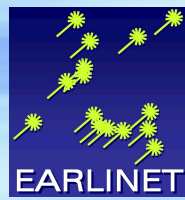
→ o.k. for fast warnings in case of dense plumes

but

→ validation of models and assimilation need quantitative measurements of extinction profiles

→ separation between dangerous aerosol (e.g. ash) layers and 'usual' continental aerosols needs

multi-wavelength information and depolarization



- * What is EARLINET ?
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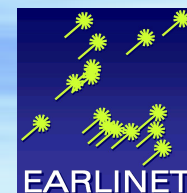
volcanic layers over Europe are very inhomogeneous in

- * shape (depolarization profiles)
- * size (Angström exponent profiles)
- * density (extinction profiles)
- * aging effects

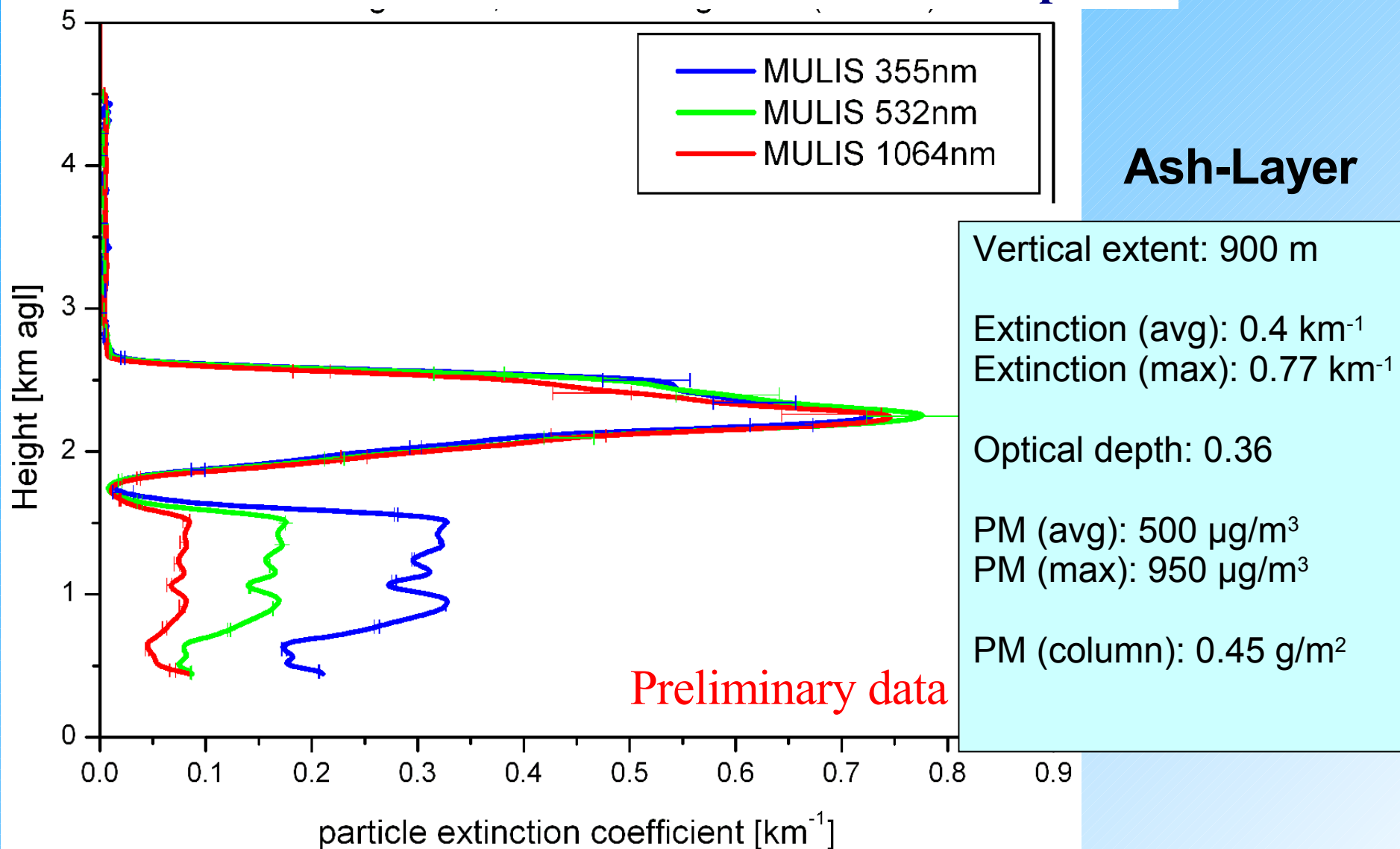
→ How to derive trustworthy microphysical properties?

(age dependent backscatter-to-mass conversion factors)

→ several approaches tested in EARLINET



From OPAC conversion factor: Maisach April 17

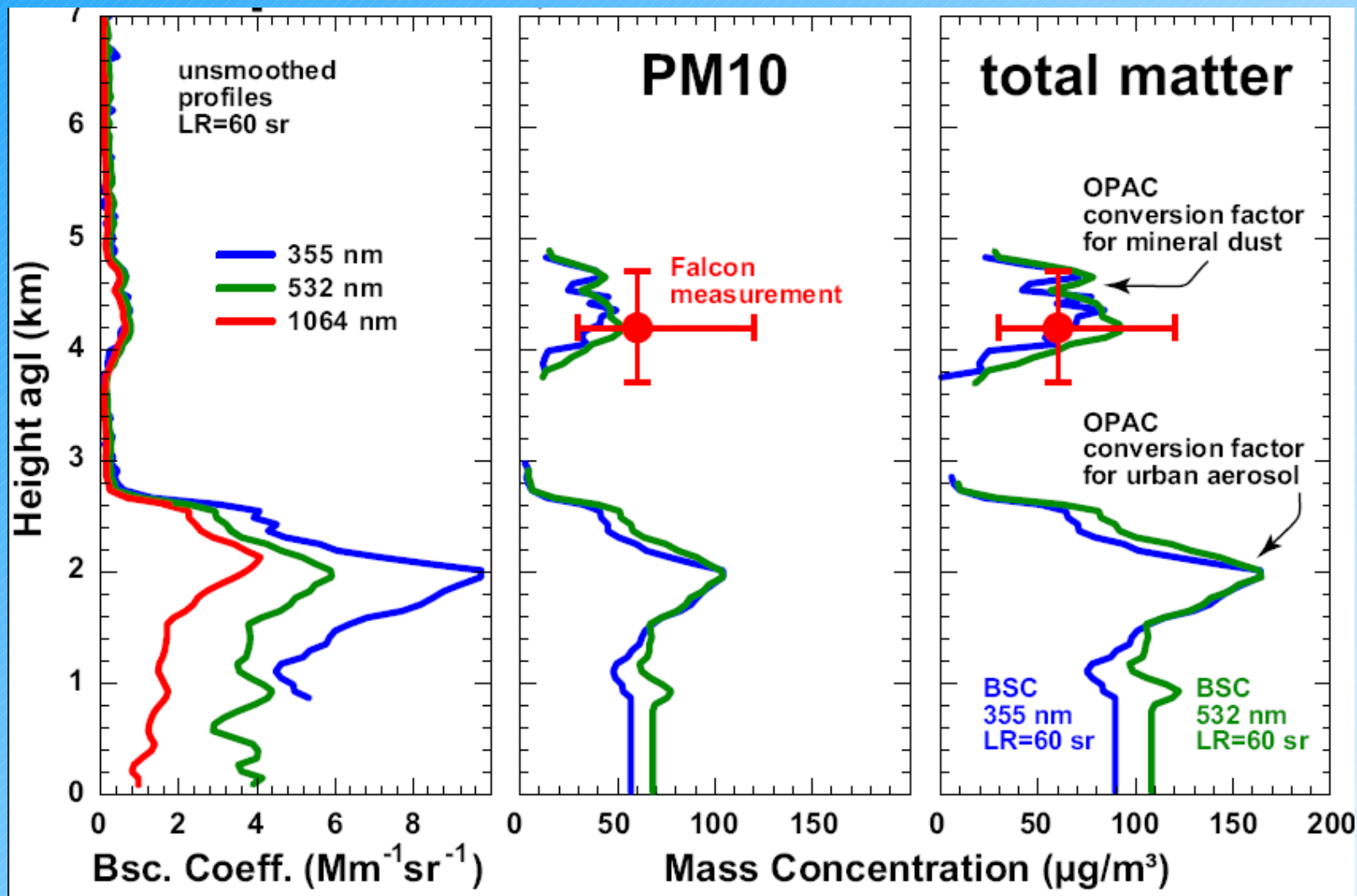




Estimation of mass concentration profiles



From OPAC conversion factor: Leipzig April 19



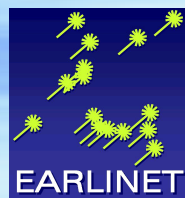
Falcon data:

http://bmvbs.de/Anlage/original_1134685/Bericht-zum-Falcon-Messflug-am-19.-April-2010.pdf

lidar data: By Courtesy of IfT Leipzig; M. Tesche, P. Seifert, A. Hiebsch, J. Schmidt



Estimation of mass concentration profiles

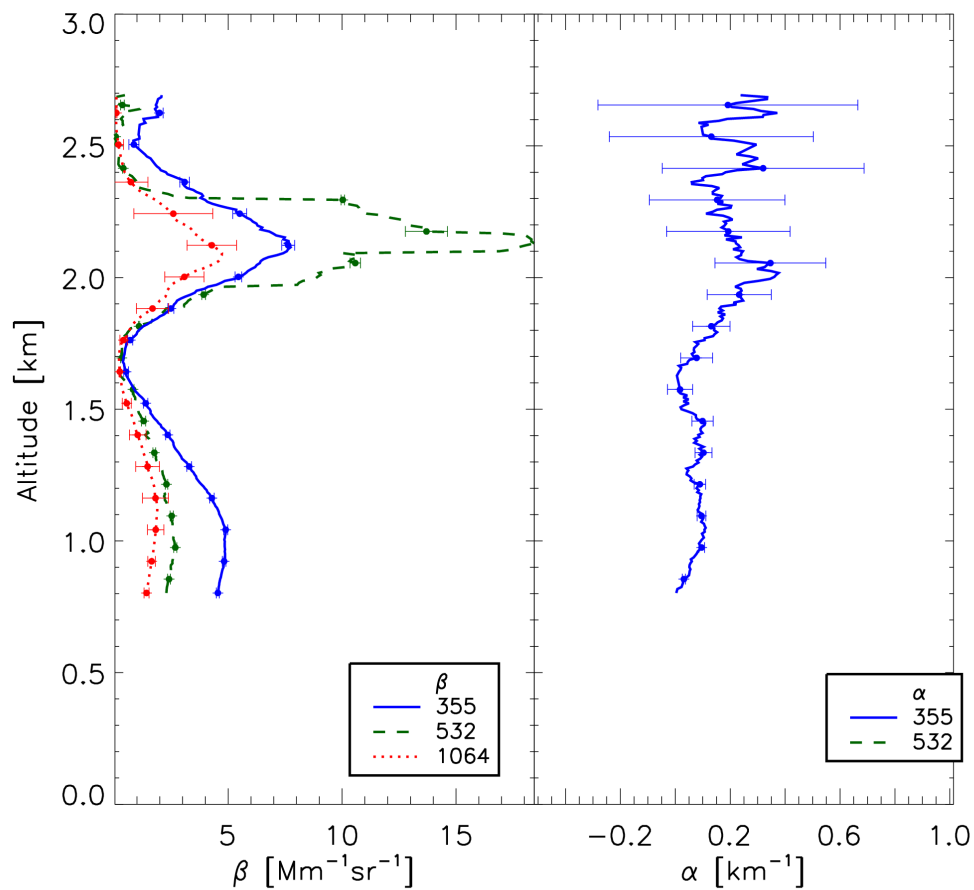


From principle component analysis: Cabauw April 16

Caeli 16/04/2010 13:55:22 - 14:59:52

Backscatter

Extinction



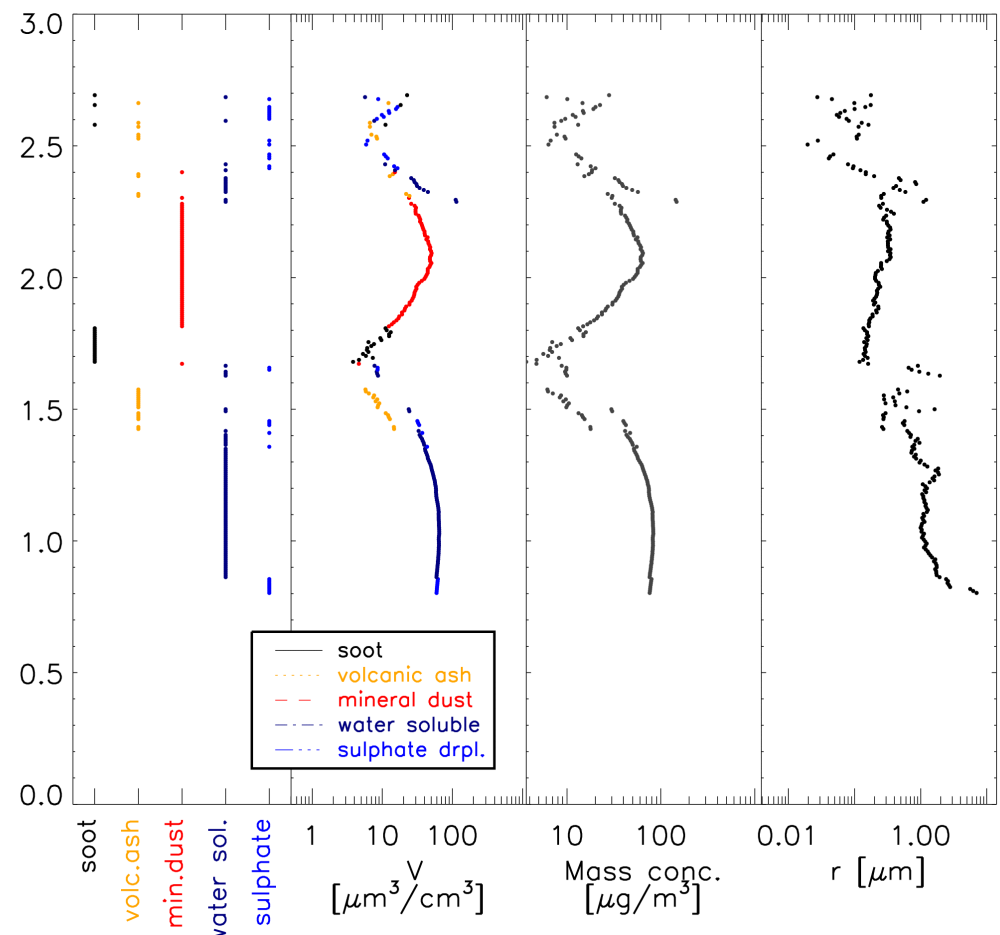
Caeli 16/04/2010 13:55:22 - 14:59:52

Selected model

Volume Conc.

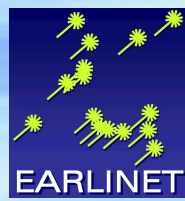
Mass conc.

Effective Radius





Summary



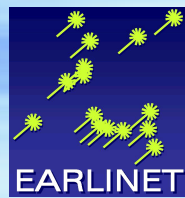
- * EARLINET is a unique tool for the measurement of the 4dim distribution of pollutant plumes over Europe
- * EARLINET lidars can detect filaments of pollution
- * different approaches for estimation of mass profiles are tested

- * EARLINET is a research infrastructure, no operational network
 - flexible measurement schedule, short reaction times
 - near-real time data processing to be improved

- * see posters: A 519 – A 530, Wed. 17:30 - 19:00



EARLINET



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