Measurement Campaign of Icelandic Volcanic Ash During Its Arrival to Slovenia in April 2010

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I. Predicted Arrivals

Predicted arrivals in Slovenia of volcanic ash from Icelandic Eyjafjallajökull volcano are based on the synoptic situation over Europe and especially above the neighboring countries:

1. Initial arrival: higher altitudes during the night of 17 April 2010.
2. Second arrival: lower altitudes on 20 April 2010.

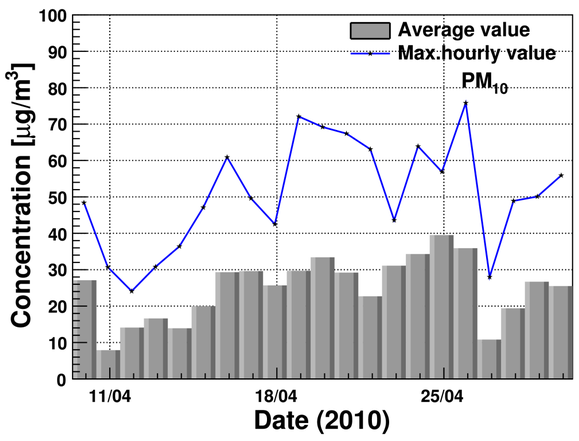
II. Measurements

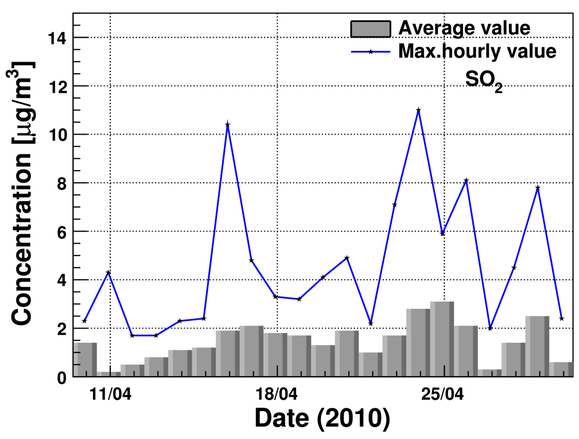
Ljubljana
- Ground in-situ measurements

Nova Gorica and Otlica
- Lidar-based remote sensing

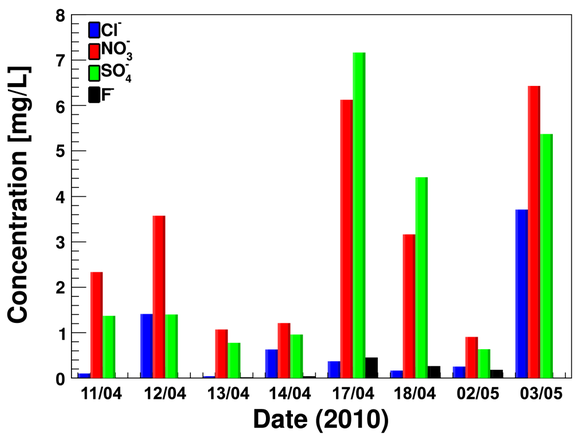
Divača and Vrhnika
- airborne in-situ measurement

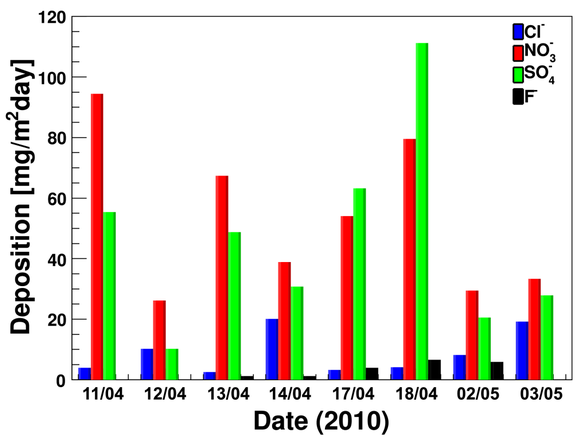
2.1 Ground Measurements





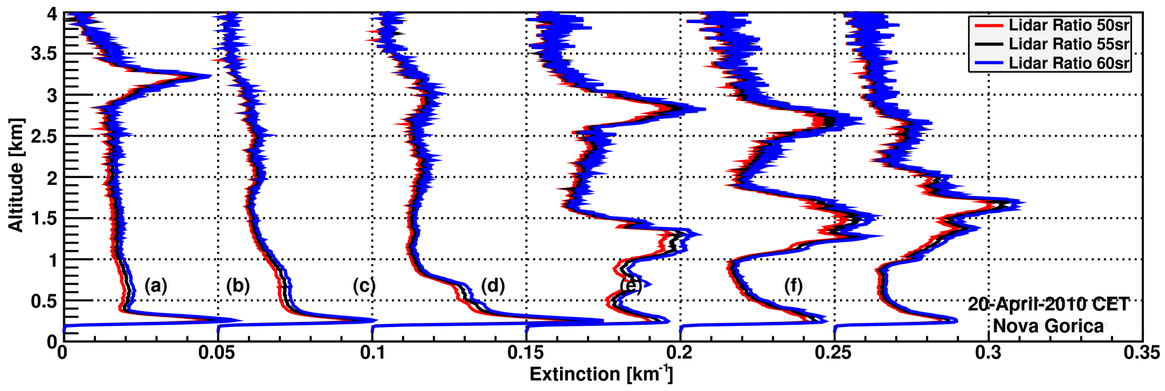
Monitoring results of the concentration of PM_{10} and SO_2 in the air at Ljubljana from 10 April to the end of April 2010.



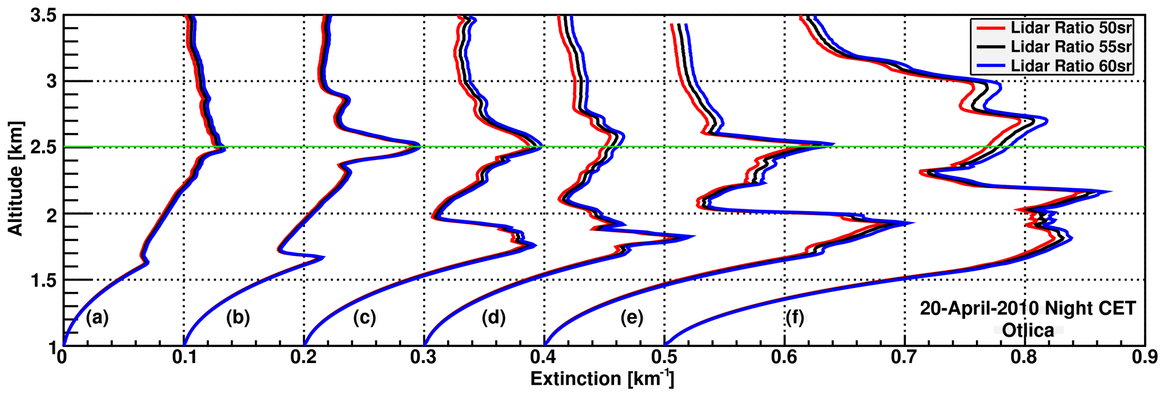


Results of the composition analysis of precipitation including concentration and deposition in Ljubljana between 10 April and 3 May 2010.

2.2 Lidar-based Remote Sensing

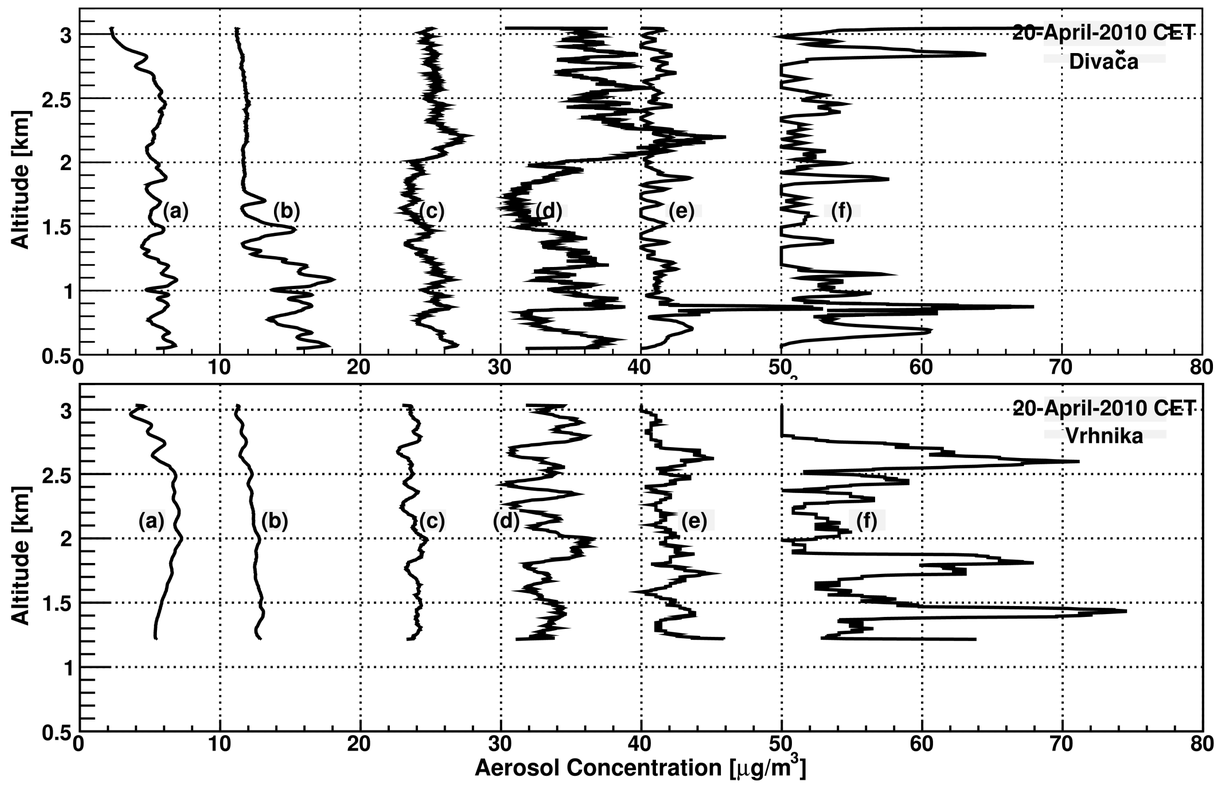


Examples of atmospheric extinction profiles obtained from measurements by the Nova Gorica lidar on 20 April 2010. (a) denotes the atmospheric extinction at 10:38, (b) at 15:41, (c) at 16:33, (d) at 20:41, (e) 21:40 and (f) 22:40 (CET) with 0.05km^{-1} offset between each other.



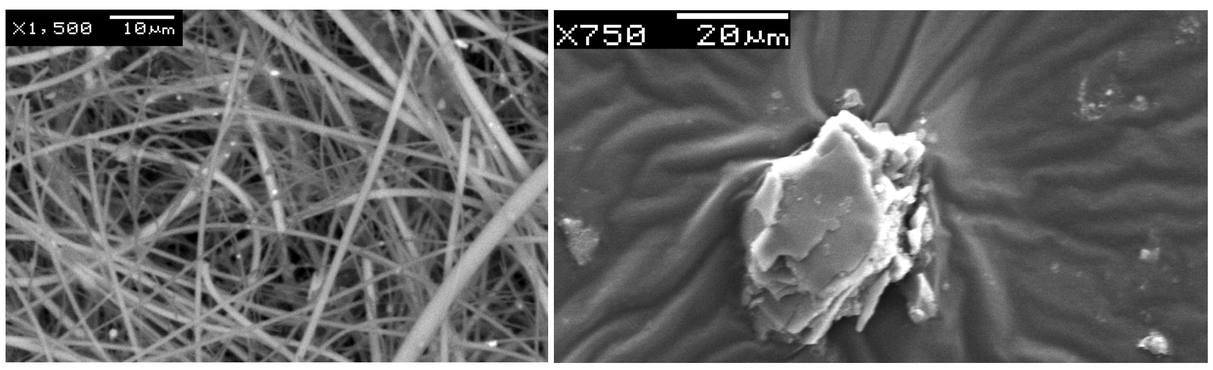
Time series of atmospheric extinction profiles obtained from measurements by the Otlica lidar during the night of 20 April 2010. (a) denotes the atmospheric extinction at 10:38, (b) at 15:41, (c) at 16:33, (d) at 20:41, (e) 21:40 and (f) 22:40 (CET) with 0.1km^{-1} offset between each other.

2.3 Airborne Measurement



Aerosol concentration profiles for six different AED measured on 20 April 2010 above Divača (top) and Vrhnika (bottom). In both plots, (a) denotes the aerosol concentration profile for 0.3μm; (b) for 0.5μm; (c) for 1.0μm; (d) for 2.5μm; (e) for 5.0μm; (f) for 10.0μm particles.

III. Identification of Ash Particles

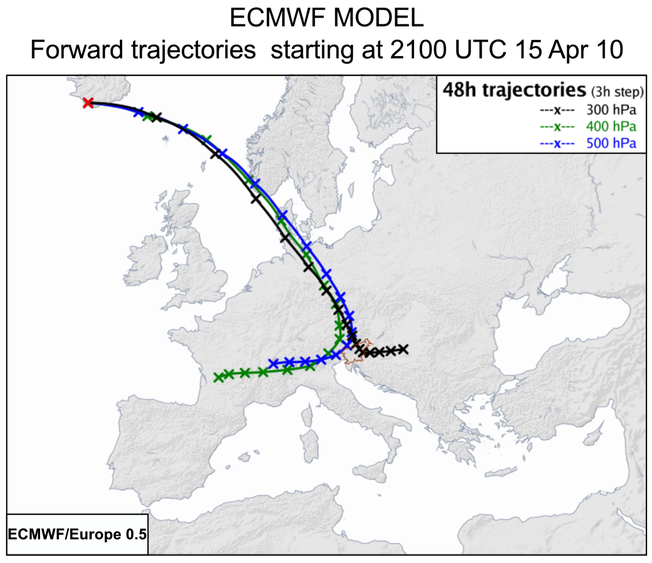


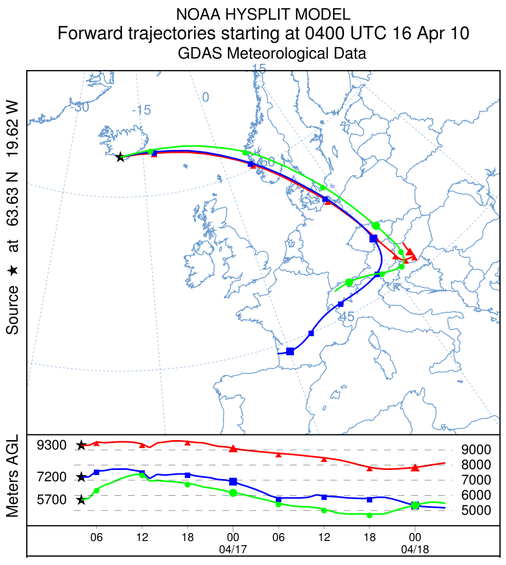
SEM images of aerosol particles obtained from ground (left, on 17 April 2010) and airborne measurements (right, on 20 April 2010 at 2.2 km a.s.l.)

Comparison of chemical composition of particle samples

	Al_2O_3	SiO_2	K_2O	Na_2O	CaO	TiO_2	MgO	FeO	MnO
Ori. Iceland	14.4 %	48.6 %	0.7 %	2.8 %	10.3 %	1.9 %	4.8 %	15.7 %	0.8 %
Ground	15.3 %	52.6 %	1.2 %	2.5 %	9.7 %	1.6 %	4.4 %	12.7 %	/
Airborne	16.3 %	53.7 %	0.9 %	1.6 %	7.6 %	2.9 %	3.6 %	13.4 %	/

IV. Simulation of Air Flow Trajectories





V. Conclusions

1. Arrival of volcanic ash to Slovenia was observed by our measuring campaign on 17 and 20 April 2010. The second arrival was not seen in satellite images.

2. Unresolved issues in ground measurements: PM_{10} and SO_2 concentrations were larger during 23 – 26 April than 17 – 21 April; small amount of F^- anions remained in precipitation until 2 May 2010.

3. Correlation between simultaneously taken airborne TPM content data and lidar retrieved atmospheric extinction was found. Estimated mass concentrations of volcanic ash were ~90 μg/m^3 over Nova Gorica and ~115 μg/m^3 over Otlica.

4. Based on the campaign success, lidar-based remote sensing will be used in the decision making process on airspace closure in the future.

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