

Climate & Environmental Change – MAIOLICA Special

Ash cloud observations above Switzerland

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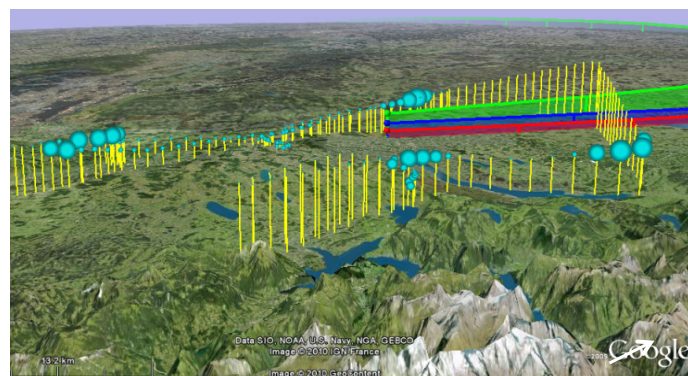
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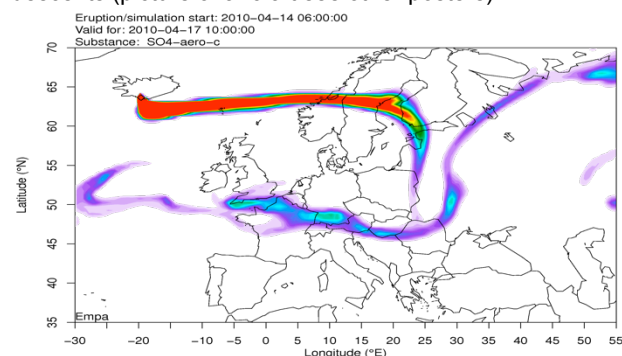


Summary

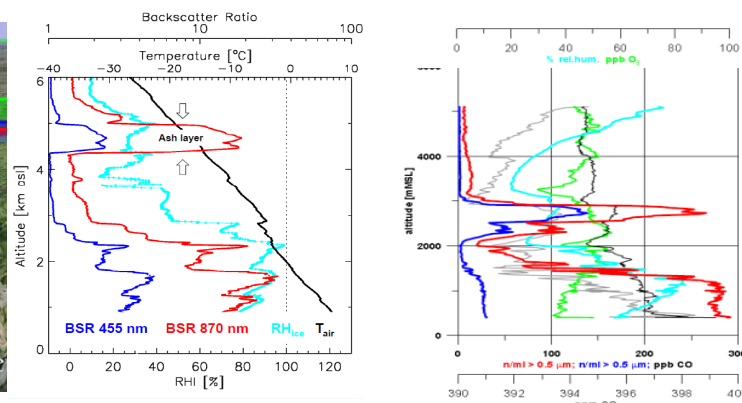
In April 2010, Iceland's volcano Eyjafjallajökull paralyzed European air traffic for several days. Using Metair's small research aircraft, MAIOLICA and FOCA enabled the first in-situ measurements of the ash cloud above the European continent. These measurements have been an important factor in the decision making by the Swiss Federal Office for Civil Aviation (FOCA). We combined these measurements with remote sensing using a continuously running aerosol lidar, with in-situ backscatter sonde measurements, and with detailed ground-based in-situ measurements at the Jungfraujoch. We estimate that total mass densities in the volcanic layer reached 0.9-1.4 mg/m³ on 17 April and 18 May, and lower values on 19 April and 9 May.



Flights of **METAIR-DIMO** on April-17 (large light blue points = highest ash concentration during the ascents and descents (picture of aircraft see other posters).



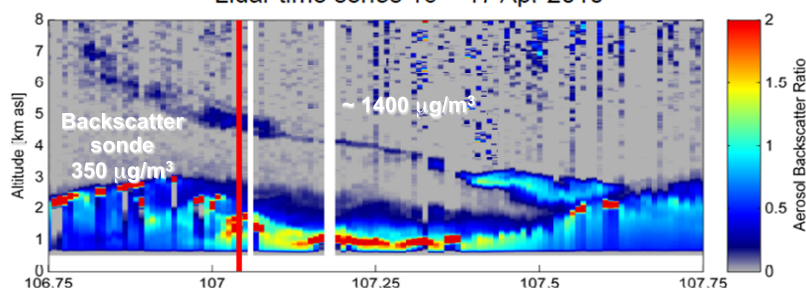
Position of the ash plume (vertically integrated mass) over Europe on 17 April 09:00 UTC simulated by Empa using the model **FLEXPART**



Left: Profiles of aerosol backscatter ratios observed by the **COBALD backscatter sonde** of ETH on 17 April 02:00 h LT

Right: Particle number concentration profiles (red and blue) together with other parameters measured on the **Metair flights** on April-17 noon

Lidar time series 16 – 17 Apr 2010



Backscatter ratio measured with the **ETH Aerosol and Cloud Lidar** (Leosphere ALS 450 EZ), 24 h starting from 16 April 18 UTC

All the research groups listed in the header contributed more unique data, and modeling results. Since the ash layer subsided to altitudes below 4 km, it was also documented in detail at the mountaintop station of Jungfraujoch (PSI/EMPA) both in the April-period, and May-18/19. Joint publications are work in progress.

What was special?

The aircraft measurements were not planned in advance, but were enabled by a scientific network grown in the last 30 years, linking aviation via METAIR and the ZHAW (Zurich University of Applied Sciences), which led to quick permissions from the FOCA and Skyguide, and to an international impact via EUFAR. Experience and trust within the network allowed to make shortcuts. Due to the ongoing MAIOLICA campaign, the measuring system was ready and operational, including a particle counter as the key instrument, and MAIOLICA financially supported the first flight activities, before FOCA continued the funding. Cooperation with ETH provided sonde measurements for guidance, and with PSI allowed to correct the initially semi-quantitative particle counters.