# Aerosol concentrations during a combined Saharan dust and wildfire event observed at Sonnblick Observatory

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Mountain sites allow the characterization of background aerosol concentrations above Europe and thus the investigation of long range transport events. The Sahara is the most powerful source for the emission of soil dust in the world and transport to Europe is accounted on a regular base. Another source for elevated concentrations of primary and secondary air pollutants, are wildfires. Here we investigate a combined wildfire and Saharan dust event observed at the Sonnblick Observatory in August 2013 aiming at a differentiation of the influence of the different sources for particulate matter.

The Sonnblick Observatory (SBO) is situated at 3.106 m asl in the Austrian Alps (12°57'E, 47°03'N) surrounded by large glacier fields and located approx. 1000 m above the tree line. The only access to SBO is via a ropeway restricted to the transport of supplies and personnel or via a five hours hike from the valley floor. To minimize emissions the observatory is supplied with electricity via a permanent line from the valley. In the larger context the observatory is located in the center of Europe surrounded by regions with large emission densities at distances of a few hundred kilometers.

Aerosol characterization during the period of interest included the determination of aerosol mass with a SHARP monitor (Sharp 5030, Thermo), total number concentration using a condensation particle counter (TSI, CPC 3022A) and particle size distributions in the size range between 0.3 and > 5 µm with an optical particle counter (Klotz, TCC-3). A three-wavelength polar Nephelometer (Ecotech Aurora 4000) was used for the determination of the light scattering coefficients at 450, 525 and 635 nm. Absorption coefficients were determined at seven wavelengths (370, 470, 525, 590, 660, 880 and 940 nm) with an Aethalometer (Magee Scientific AE 33). Meteorological data are measured by ZAMG (Central Institute for Meteorology and Geodynamics) while trace gas concentrations (CO, $CO_2$, NO, $NO_2$, $CH_4$, $O_3$, $SO_2$) are determined by the Umweltbundesamt (Austrian Environmental Protection Agency).

Aerosol mass concentrations determined in August 2013 averaged at 9,4 µg/m³. Elevated concentrations were determined in the time period from August 3 to 9, ranging from 3,4 to 26,4 µg/m³ ($5^{th}$ to $95^{th}$ percentile) and an average value of 22,4 µg/m³.

Trajectories showed the influence of air masses originating from the Sahara, while wildfire maps pointed to the additional input of emissions from fires being active in the regions south of the site at a distance of 50 to 200 km.

Dust episodes were identified following the method described by Collaud Coen et al. (2004), which is based on the wavelength dependence of the single scattering albedo (SSA). The inversion of the wavelength dependence is taken as an indication for Saharan dust affecting the site. A repeated, but not permanent influence of Saharan dust was determined.

An estimate of the increase of particulate matter due to regional wildfires was based on concentrations of carbon monoxide and compared to the observations of Wigder et al. (2013) reported for Mt. Bachelor.

Furthermore aethalometer data was used to separate time periods dominated by Saharan dust from time periods with an stronger influence of emissions from wildfires. Following the approach by Fialho et al. (2005) described for the differentiation of Saharan dust and black carbon, we adapted the methods to the conditions observed at Sonnblick and the influence of brown carbon in the wildfire emissions.

M. Collaud Coen et al. (2004) *Atmos. Chem. Phys.* ***4****, 2465-2480*
P. Fialho et al. (2005) *J Aerosol Sci.*, **36**, 267-282
N.L. Widger et al. (2013) *Atmos. Environ.*, **75**, 24–31