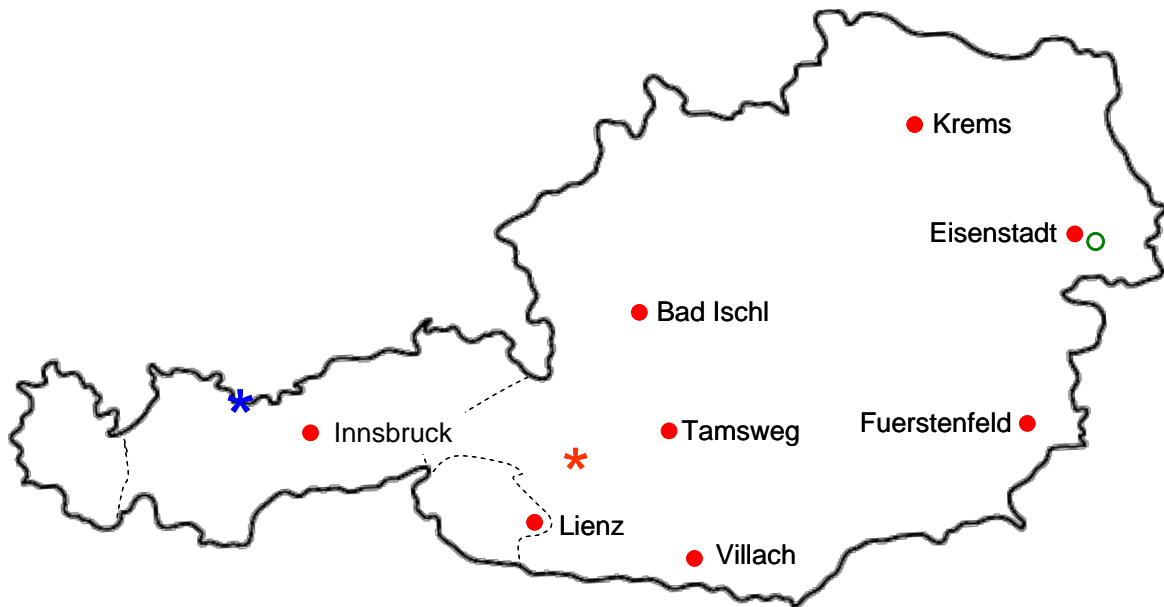
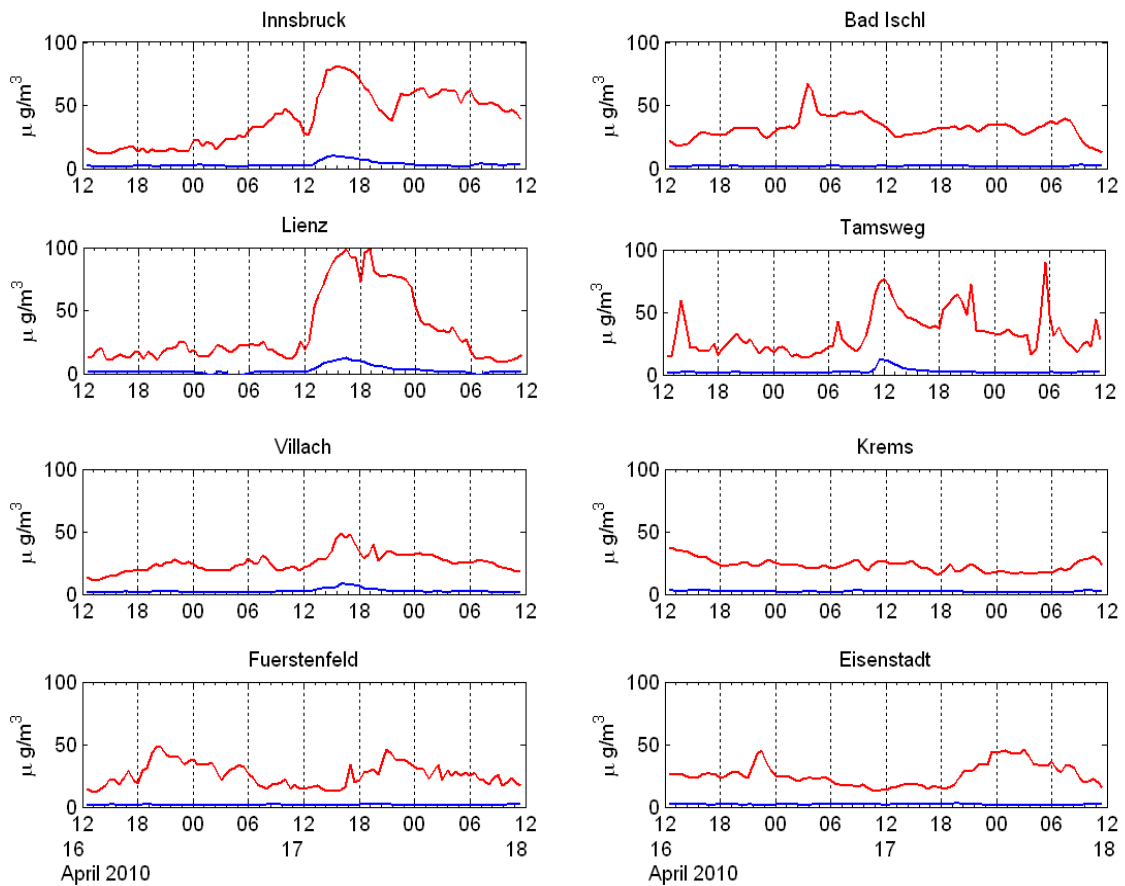


This supplement aims at providing complementary information about the PM<sub>10</sub> and SO<sub>2</sub> concentrations measured across Austria during the April 2011 Eyjafjallajökull volcanic period discussed in the main paper. These figures are also referred to in the text and some key notes on their basic interpretation are given in the figure legends.



**Figure S1:**

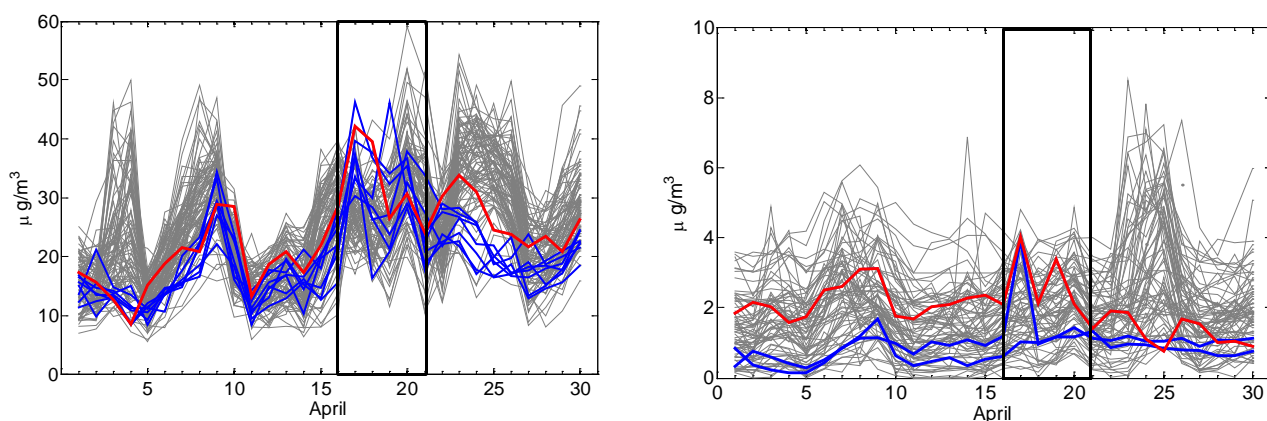
Location of key Austrian air quality monitoring stations addressed in the following figures. The country of Tyrol is delineated by the dashed lines, blue star indicates Zugspitze (Schneefernerhaus), red star indicates Sonnblick and green circle denotes site Illmitz.



**Figure S2:**

Half hourly mean  $\text{PM}_{10}$  (red) and  $\text{SO}_2$  concentrations (blue) at key air quality monitoring stations representing different regions in Austria (data provided by Umweltbundesamt GmbH, Vienna, Austria) from 16 to 18 April 2010.

Note the generally weak signal in  $\text{SO}_2$  compared to  $\text{PM}_{10}$ , the time shift in peak concentrations indicating the progression of volcanic plume material while crossing the Alps from North to South (Innsbruck-Lienz-Villach) and the pronounced west-east gradient (Krems and Eisenstadt vs. other sites).

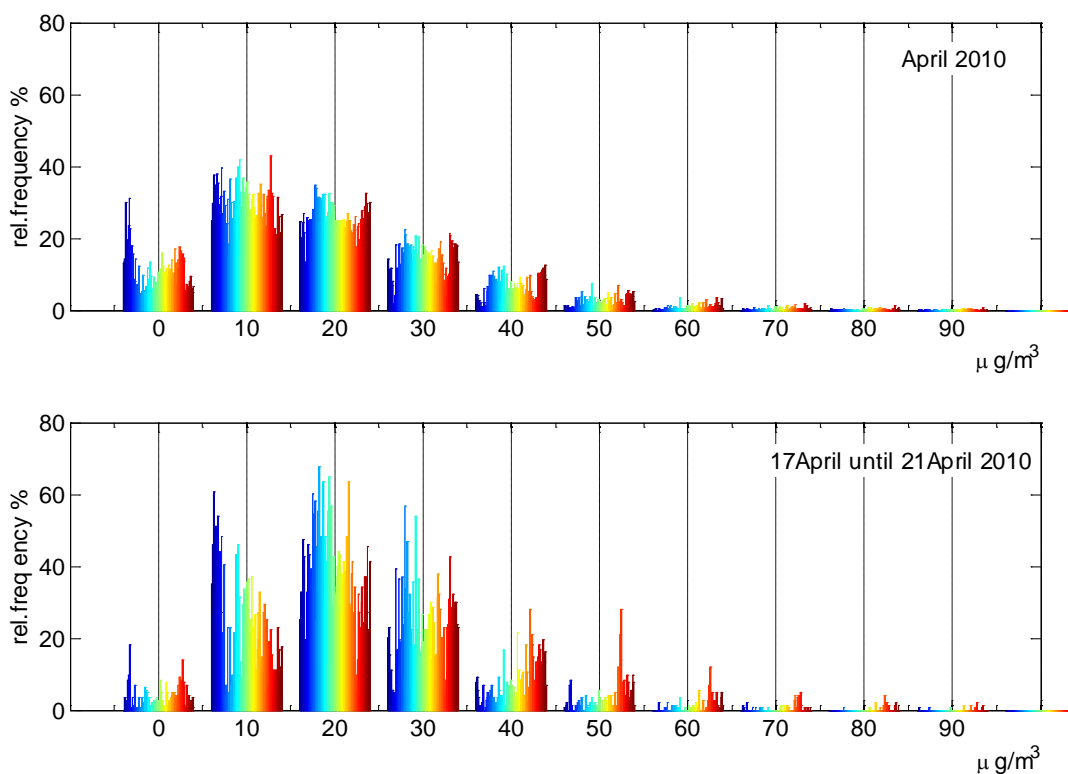


**Figure S3:**

Mean daily PM<sub>10</sub> (right panel) and mean daily SO<sub>2</sub> concentration (left panel) at 96 (65) Austrian air quality monitoring stations during April 2010. The black frame indicates the Eyjafjallajökull volcanic period discussed in the main paper, data was provided by Umweltbundesamt GmbH, Vienna, Austria.

Grey indicating time series at all sites (excluding sites with strong anthropogenic influences or insufficient data coverage), blue indicating monitoring stations within Tyrol (see Fig. S1), red indicating Innsbruck Zentrum (IBK).

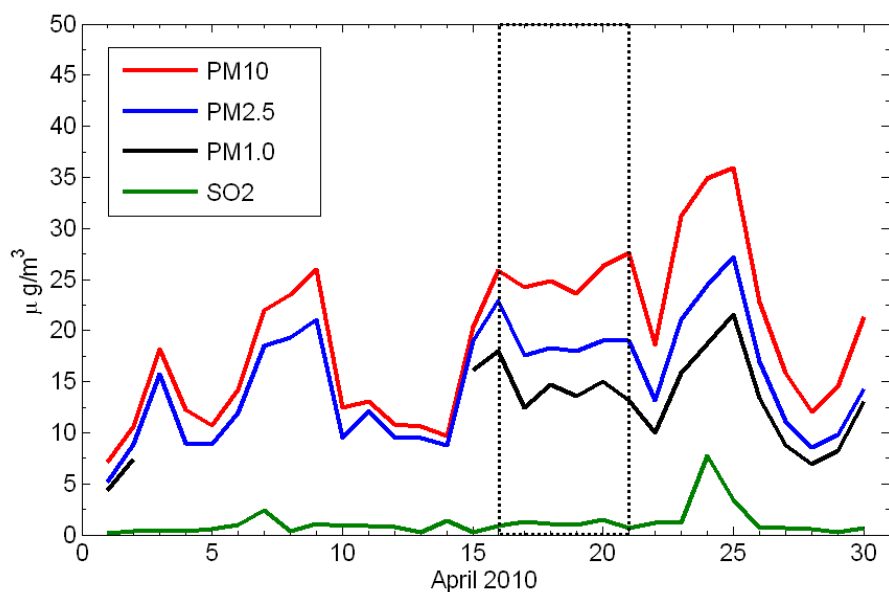
This analysis firstly demonstrates that the development observed at Innsbruck is fairly representative for the northern Alpine area, which is addressed in the main manuscript. Note also that the volcanic period yielded peak concentrations, although similarly high concentration occurred also before and afterwards without volcanic influence. The latter are mainly related to persistent high pressure periods (ZAMG, 2011) which are known favouring high concentrations of air pollutants (Schäfer et al., 2008). This also emphasises the importance of enhanced chemical analysis to distinguish volcanic influences from other factors and processes as is addressed in the main manuscript and in Fig. S5, too.



**Figure S4:**

Colour coded histograms of  $PM_{10}$  concentration observed at 96 Austrian air quality monitoring stations during April 2010 (upper panel) and during the Eyjafjallajökull volcanic period considered in the main paper (lower panel). Data was provided by Umweltbundesamt GmbH, Vienna, Austria.

Note that at virtually all sites across Austria a shift towards higher concentrations occurred during the period of volcanic plume influence, which was particularly pronounced in the western regions (red bars). The effect was markedly less regarding  $SO_2$  as indicated in Figs. S2 and S3, too.



**Figure S5:**

Daily mean concentration of SO<sub>2</sub> and particulate matter in different size classes observed at Illmitz air quality monitoring station during April 2010. Dashed frame indicates the Eyjafjallajökull volcanic period discussed in the main paper, data was provided by Umweltbundesamt GmbH, Vienna, Austria).

Note the location of this site in Fig. S1 and the relatively strong increase of coarse particles as noted elsewhere (see Fig. 7 and Fig. 11 in the main manuscript). This development also conforms to preliminary analysis of size discriminated particle concentrations measured at Sonnblick (Fig. S1; ZAMG, 2011b).

## References:

Schäfer, K., Vergeiner, J., Emeis, S., Wittig, J., Hoffmann, M., Obleitner, F., and Suppan, P.: Atmospheric influences and local variability of air pollution close to a motorway in an Alpine valley during winter, *Meteorol. Z.*, 17, 297-309, doi: 10.1127/0941-2948/2008/02902008, 2008.

ZAMG: [http://www.zamg.ac.at/klima/klima\\_monat/wetterlagen/](http://www.zamg.ac.at/klima/klima_monat/wetterlagen/), 2011a.

ZAMG: <http://www.sonnblick.net/portal/content/view/191/248/lang.de/>, 2011b.