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Chemical composition of free tropospheric aerosol for PM1 and coarse mode at the high alpine site Jungfraujoch

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Abstract. The chemical composition of submicron (fine mode) and supermicron (coarse mode) aerosol particles has been investigated at the Jungfraujoch high alpine research station (3580 m a.s.l., Switzerland) as part of the GAW aerosol monitoring program since 1999. A clear seasonality was observed for all major components throughout the period with low concentrations in winter (predominantly free tropospheric aerosol) and higher concentrations in summer (enhanced vertical transport of boundary layer pollutants). In addition, mass closure was attempted during intensive campaigns in March 2004, February–March 2005 and August 2005. Ionic, carbonaceous and non-refractory components of the aerosol were quantified as well as the PM1 and coarse mode total aerosol mass concentrations. A relatively low conversion factor of 1.8 for organic carbon (OC) to particulate organic matter (OM) was found in winter (February–March 2005). Organics, sulfate, ammonium, and nitrate were the major components of the fine aerosol fraction that were identified, while calcium and nitrate were the only two measured components contributing to the coarse mode. The aerosol mass concentrations for fine and coarse mode aerosol measured during the intensive campaigns were not typical of the long-term seasonality due largely to dynamical differences. Average fine and coarse mode concentrations during the intensive field campaigns were $1.7 \mu\text{g m}^{-3}$ and $2.4 \mu\text{g m}^{-3}$ in winter and $2.5 \mu\text{g m}^{-3}$ and $2.0 \mu\text{g m}^{-3}$ in summer, respectively. The mass balance of aerosols showed higher contributions of calcium and nitrate in the coarse mode during Saharan dust events (SDE) than without SDE.

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