

Temporal variation of the chemical composition of Asian dust at Tajikistan

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Asian dust at Dushanbe (Tajikistan) was characterized between March 2015 and March 2016 within the framework of the Central Asian Dust Experiment (CADEX). Aerosol samples were collected using a high volume DIGITEL DHA-80 sampler on quartz fiber filters in a 48 h sampling period. The filters were analyzed for inorganic ions, trace metals as well as organic and elemental carbon (OC/EC).

The aerosol mass concentration showed strong temporal variation ranging from 20 $\mu\text{g}/\text{m}^3$ to 430 $\mu\text{g}/\text{m}^3$. The dust concentrations varied between 3 $\mu\text{g}/\text{m}^3$ and 320 $\mu\text{g}/\text{m}^3$. Days of high aerosol mass loadings were dominated with mineral dust which made up about 80% of the aerosol mass. Organic matter and inorganic ions made up about 70% of the aerosol mass during days of low aerosol mass loadings. A significant seasonal trend was observed with high dust concentrations in summer and lower dust concentration in the spring. The mineral dust composition revealed different trace metal signatures in comparison to Saharan dust. Ca and Fe were the dominant metals with concentrations of about 0.2 to 20 $\mu\text{g}/\text{m}^3$ and 0.1 to 8 $\mu\text{g}/\text{m}^3$, respectively. Ca/Fe ratios were twice as high as those observed in Saharan dust indicating that Dushanbe dust is highly enriched in calcium.

Strong influence of anthropogenic activities was observed in the trace metal concentrations with significantly high Zn and Pb concentrations ranging from 29 to 1080 ng/m^3 and 8 to 101 ng/m^3 , respectively. The aerosol sources were related to fossil fuel and coal combustion, mineral dust, traffic, long range transport as well as metallurgical industrial emissions. Comparatively to average urban dust concentrations in other European cities such as Leipzig, Germany, Zn concentrations in Dushanbe were 5 times higher while lead concentrations were about 3 times higher. The high heavy metal concentrations are of potential health risk.