Vertical differentation of PM10 concentration and mineral composition in the first 100 m of troposphere related to meteorological conditions in the Sosnowiec urban area, S Poland

JABLONSKA M[1], JANECZEK J[2] AND LESNIOK M[3]

[1]mariola.jablonska@us.edu.pl
[2]janusz.janeczek@us.edu.pl
[3]mlesniok@op.pl

Airborne particulate matter (PM10) was collected in the Sosnowiec city, Upper Silesia conurbation, Poland, at 3 m and 100 m above ground level (a.g.l.) in conjuction with meteorological observations to determine the difference in both PM10 concentrations and mineral composition within the so-called free atmosphere. Samples were examined by the environmental ASEM, ATEM, and X-ray powder diffraction. Particular attention was paid to smog episodes caused by temperature inversion, and responsible for extremaly high concentrations of particulate matter. We found no difference in concentrations and mineral composition of PM10 in samples collected at 3 m and 100 m a.g.l. during smog associated with almost stagnant air. The inventory of PM10 included particles originating from traffic (soot, Pb-chloride) and abundant coal combustion-related particles (soot, glassy aluminosilicates, Fe-oxides, barite, gypsum, Na- and K-chlorides) typical of low emission.

Differentiation of PM10 concentration and mineral composition was observed during inflow of air-masses associated with increased speed of wind. Mineral composition of PM10 at 3 m a.g.l. reflected local sources of anthropogenic pollution, whereas PM10 sampled at 100 m a.g.l. consisted of particles indicative of long-range transport, i.e. derived from natural sources, in addition to anthropogenic particles typical of the Upper Silesia.

Two modes of change in Southern Ocean export production over the past million years

JACCARD, S.L.[1], HAIN, M.P.[2], HAYES, C.T.[3], MARTINEZ-GARCIA, A.[1], ANDERSON, R.F.[3], SIGMAN, D.M.[2] AND HAUG, G.H.[1]

[1]D-ERDW, ETH Zurich, Zurich, Switzerland; samuel.jaccard@erdw.ethz.ch
[2]Department of Geosciences, Princeton University, Princeton, USA
[3]LDEO, Columbia University, Palisades, USA

Export of organic carbon from surface waters of the Antarctic Zone of the Southern Ocean decreased during the last ice age, coinciding with declining atmospheric carbon dioxide (CO_2) concentrations, signaling reduced exchange of CO_2 between the ocean interior and the atmosphere. In contrast, in the Subantarctic Zone, export production increased into ice ages coinciding with rising dust fluxes, thus suggesting iron fertilization of Subantarctic phytoplankton.

Here, a new high-resolution productivity record from the Antarctic Zone is compiled with parallel Subantarctic data over the past million years. Together, they fit the view that the combination of these two modes of Southern Ocean change determines the temporal structure of the glacial interglacial atmospheric CO_2 record, including during the interval of "lukewarm" interglacials between 450 and 800 thousand years ago.

In addition, we present CYCLOPS model runs to separate the implied relative contribution of each parameter to the atmospheric CO_2 budget. Extending this model-based approach holds the promise to quantitatively cross-verify diverse paleoceanographic data, and to refine our mechanistic understanding of the coupling between climate, ocean biogeochemistry and atmospheric CO_2.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.10