# The relationship between PM10 and meteorological conditions in Sosnowiec (Poland) in view of potential health hazard

JANECZEK JANUSZ[1*], JABLONSKA MARIOLA[1], LESNIOK MIECZYSLAW[2],

[1]University of Silesia, Department of Geochemistry, Mineralogy and Petrology; Sosnowiec, Poland
janusz.janeczek@us.edu.pl; mariola.jablonska@us.edu.pl
[2]University University of Silesia, Department of Climatology,Sosnowiec, Poland,
mlesniok@op.pl

The aim of this study was to determine concentrations and chemistry of PM10 in one of the major cities in densely populated and industrial region of Upper Silesia, SW Poland, in relation to meteorological conditions. Meteorological conditions and atmospheric circulations play an important role in dispersion of air pollutants [1].

Both concentrations of PM10 and meteorological parameters were monitored from June to December 2011. In addition, the collected PM10 was investigated by analytical scanning and transmission electron microscopies (SEM, TEM). The identification of phases in PM10, their morfology, chemical compositions, structure and particle size enabled the precise pinpointing of the emission sources.

The abundant ultraparticles occur in the PM10 fraction. Those ultraparticles are carriers of heavy metals inluding Pb, Zn, Cd, U and others. The most common constituent of PM10 is soot. A large number of nano-sized particles containing toxic elements adhered to the soot surface and together with respirable soot particles can be inhaled by the humans.

Quartz, iron oxides, amorphous and crystalline alumino-silicates are also abundant in PM10 and in ultraparticles. Regardless of their size they may have a negative impact on human health as suggested by medical data for this part of Poland. All of the observed mineral phases in PM10 are typical of fossil fuels combustion and of car exhausts.

As expected, the highest concentrations of PM10 was observed during the prevalence of anticyclonic conditions, at low speed winds, and the lack of precipitation. The extremaly high concentrations of PM10 were associated with the thermal inversion. The presence of some mineral phases in PM10 (e.g. Zn, Pb, Cd-sulfides, Sn alloys) combined with back-tracing of air flow allowed precise location of particular sources of dust emissions.

[1] Niedzwiedz T.(2005) *The role of cities in climate modification – selected issues. Global Change* **12**, 23-33

# Authigenic neodymium isotopes recording change in Arctic Ocean circulation

KWANGCHUL JANG[1*], YEONGCHEOL HAN[1], YOUNGSOOK HUH[1], SEUNG-IL NAM[2]

[1]Seoul National University, Seoul, Korea, wkdrhkd3@snu.ac.kr (* presenting author), hanlove7@snu.ac.kr, yhuh@snu.ac.kr
[2]Korea Polar Research Institute, Incheon, Korea, sinam@kopri.re.kr

We analyzed neodymium isotope ratios of Fe-Mn oxide coatings in sediments from the Mendeleev Ridge collected during RV Polarstern Expedition ARK-XXIII/3. According to our age model constructed using AMS $^{14}C$ ages (n=4) and by correlating $\delta^{18}O$ and $\delta^{13}C$ with neighbouring cores 94B16 [1] and 0503-8JPC [2], the record extends to MIS 5a. The average $\varepsilon_{Nd}$ value (n = 39) was -10.2, which is quite similar to the present-day water column values of the Canada and Makarov basins [3]. Two significant deviations from the average $\varepsilon_{Nd}$ were observed. Middle MIS 3 displayed unradiogenic $\varepsilon_{Nd}$ accompanied by decreases in $\delta^{18}O$ and $\delta^{13}C$ of planktonic foraminifera (*N. pachyderma* sin.) and an increase in $\%CaCO_3$. The unradiogenic dissolved Nd of the Mackenzie River [4] and carbonate-rich lithology of the Canadian Archipelago suggest that the melting of the Laurentide Ice Sheet (LIS) was mainly responsible. Additionally, the pinkish carbonate layer observed at this depth interval is reported to be derived from Banks and Victoria islands of the Canadian Archipelago [5]. The radiogenic $\varepsilon_{Nd}$ peak during Late MIS 4–Early MIS 3 period coincided with decreases in $\delta^{18}O$ and $\delta^{13}C$ values and low $\%CaCO_3$. The radiogenic dissolved Nd of the Ob and Yenisei rivers [6] and the carbonate-poor lithology of western Siberia suggest that outburst of ice-dammed lakes from this region could have affected the western Arctic Ocean [7].

The two contrasting sources mentioned above imply that the water circulation pathway has changed. During the Mid-MIS3, transport via the Beaufort Gyre may have expanded and water from the Canadian Archipelago bathed the southern Mendeleev Ridge. On the other hand, during the Late MIS 4–Early MIS 3 period, the Beaufort Gyre may have weaked and water from western Siberia dominated on the southern Mendeleev Ridge. According to Morison et al. [8], the strength of the Beaufort Gyre is modulated by the Arctic Oscillation (AO). Consequently, our results suggest that the negative mode of AO is associated with the warmer Mid-MIS3 and the positive mode with the colder Late MIS 4-Early MIS 3.

[1] Poore et al. (1999) *Geology* **27**, 759-762. [2] Adler et al. (2009) *Glob. Planet. Change* **68**, 18-29. [3] Porcelli et al. (2009) *Geochim. Cosmochim. Acta* **73**, 2645-2659. [4] Woo and Thorne (2003) *Arctic* **56**, 328-340. [5] Polyak et al. (2004) *Palaeogeogr. Palaeoclimatol. Palaeoecol.* **203**, 73-93. [6] Zimmermann et al. (2009) *Geochim. Cosmochim. Acta* **73**, 3218-3233. [7] Spielhagen et al. (2004) *Quat Sci Rev* **23**, 1455-1483. [8] Morison et al. (2012) *Nature* **481**, 66-70.