Atmospheric aerosol modal structure in the urban and rural area of Bologna, Italy

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Methodology and materials

The aerosol particle number size distributions were measured at two places in Bologna area (GM and SPC) with the aim to evaluate the characteristics of urban and rural aerosol particles focusing principally on the modal strucure. The GM and SPC measurements campaigns were carried out respectively in summer and autumn. The GM station is located in an urban park and SPC in a rural area north to Bologna; they are actually used as the urban background and rural background stations for the assessment of the air quality as request by the 1999/30/CE and 2000/69/CE EU directives.

The aerosol particle size distributions were measured with a TSI 3091 fast mobility particle size spectrometer, in the range 5.6 to 560 nm, with a total of 32 channels, 16 channels per decade, and 1 second of time resolution.

Results and discussion

The mean particle size distributions observed in GM and SPC are shown in the figure. The results are characterized by three modes: mode 1 (nucleation), mode 2 (Aitken) and mode 3 (accumulation). The geometric mean diameter of mode 1 was 10.8 nm, the mode 2 40.9 nm and mode 3 105.3 in GM, in SPC the mode 1 was 12.9 nm, the mode 2 55.2 nm and the mode 3 97.8 nm.

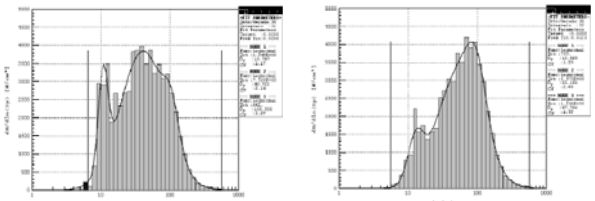

Figure 1: Modal structure of the aerosol; left GM, right SPC

The SPC site shows the 88 % of the total particles than GM probably because of the higher traffic flows in the urban area [1]. Nucleation episodes were also observed in both places during the central hours of the days after atmospheric disturbances.

[1] Hussein *et al*. (2005) *Atmos. Environ.* **39**, 1655-1668.

Mantle helium and other components in thermal fluids of the Chukchi Peninsula: The signs of recent magmatism

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The original data on the composition of water and gases from 33 thermal springs of the Chukchi Peninsula (CP) were obtained and discussed to reveal spatio-temporal variations of the $^3He/^4He$ ratio in subsurface fluids.

The basement of the peninsula presents a fragment of the Precambrian Chukchi-Seward continental block. During Phanerozoic the region underwent repeated tectono-magmatic activations supplying mantle-derived helium into the crust. As a result, the $^3He/^4He$=R ratio values in the sampled fluids are more or less distinguished from that of "canonic radiogenic" crustal helium.

On the south and west of the peninsula N_2 prevails in spring gases amounting to 98 vol %. The average R-value in these gases is equal 35.3×10^{-8} ($0.25R_a$) being in close agreement with the estimation for the continental crust re-activated in Late Cretacious [1]. It looks quite natural since just in that epoch the Okhotsk-Chukot volcano-plutonic belt was superimposed on older structures of the peninsula.

In the other parts of the CP the R-values are noticeably higher amounting to 172×10^{-8} ($1.23R_a$) in Kolyuchin-Mechigmen Zone (KMZ) which dissects the peninsula in NW-SE direction. The average R-value in the KMZ gases is equal 72.6×10^{-8} ($0.52R_a$). The KMZ is distinguished by sporadic manifestations of Late Cenozoic basalts, seismic activity and recent vertical movements. Spring gases in the KMZ are enriched in CO_2 up to 95 vol. %. The $\delta^{13}C$-values in this CO_2 are higher than those in CO_2 from N_2-rich hydrothermal gases. The latter contain N_2 captured from atmosphere according to values of $\delta^{15}N$ and N_2/Ar_{atm} ratio. On the contrary, N_2 presenting as minor admixture in CO_2-rich gases contains non-atmospheric component ($N_2/Ar_{atm} > 80$) with the $\delta^{15}N$ up to 4.5‰. Taking in mind geological and geophysical environment, the features of thermal springs of the KMZ could be explained by uplifting of mantle diapir.

[1] Polyak & Tolstikhin (1985) *Chem. Geol.,* 1985, **52**, 9-33.