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Aerosols of Mongolian arid area

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Sampling was performed in July-August 2005-2010 at Station Sain Shand (44°54′N, 110°07′E) in the Gobi desert (1000 m a.s.l.), West Mongolia. Aerosol samples were collected with a high volume sampler PM 10 (Andersen Instruments Inc., USA) onto Whatman-41 filters. The substance was extracted from the filters by de-ionized water. The solution was screened through an acetate-cellulose filter with 0.2 micron pore size. Ions of ammonium, sodium, potassium, magnesium, and calcium, as well as sulphate ions, nitrate ions, hydrocarbonate, chloride ions were determined in the filtrate by means of an atomic adsorption spectrometer Carl Zeiss Jena (Germany), a high performance liquid chromatographer «Milichrome A-02» (Russia), and an ionic chromatographer ICS-3000 (Dionex, USA). The PAH fraction was separated from aerosol samples using hexane extraction at room temperature under UV environment. The extract was concentrated to 0.1-0.2 ml and analysed by a mass-spectrometer "Agilent, GC 6890, MSD 5973 Network".
Analysis of concentrations of aerosols components, their correlation ratios, and meteorological modeling show that the main factor affecting chemical composition of aerosols is a flow of contaminants transferred by air masses to the sampling area mainly from the south and south-east, as well as wind conditions of the area, dust storms in particular. Sulphate, nitrate, and ammonium are major ions in aerosol particles at Station Sain Shand.
Dust-borne aerosol is known to be a sorbent for both mineral and organic admixtures. Polycyclic aromatic hydrocarbons (PAH) being among superecotoxicants play an important role among resistant organic substances. PAH concentrations were determined in the samples collected in 2010. All aerosol samples contained dominant PAHs with 5-6 benzene rings ((benze(k)fluoranthen, benze(b)flouranthen, benze(a)pyren, benze()pyren, perylene, benze(g,h,i)perylene, and indene(1,2,3-c,d)pyrene). Their total quantity varied between 42 and 90%. Compounds with low molecular weight and 3 benzene rings in its composition (phenanthrene and anthracene) amounted to 9-38% of the total PAH. PAH percentage in aerosol samples is characteristic of the warm season. Elevated fraction of low molecular weight PAHs (29-38%) was found in aerosol samples collected on 12-14 August and 18-19 August. High molecular weight PAHs were found in aerosols sampled on 14 and 16 August. Benze(g,h,i)perylene, indene(1,2,3-c,d)pyrene, and di-benze(,h)anthracene were found in aerosols on 10, 11, 14, 15, 17, 19, and 20 August, and their fraction of total PAH amounted to 14-30%. These compounds are indicative of automotive emissions. Benze(a)pyrene is the most hazardous cancerogene from the list of the prioritized PAHs. Cases of exceeding benze(a)pyrene maximum permissible concentrations (1 ng/m3) in the air at Station Sain Shand were not recorded.