The results of long-term monitoring of atmospheric aerosols biogenic components at altitudes 500 – 7000 m in the South of Western Siberia

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The biogenic components of atmospheric aerosols were monitored by authors since the end of 1998 at altitudes 500 – 7000 m in the South of Western Siberia. The aim of this study was to analyze long-term data on concentrations of atmospheric aerosol (PM) in Southwestern Siberia and those of total protein (TP, universal marker of components of biological origin) and culturable microorganisms (CM) in the layer 500 – 7000 m. We'd like to reveal long term trends of these values, its intrannual changes and its altitude profiles.

Altitude samples were collected on a day during the last ten days of each month at successive altitudes of 7000, 5500, 4000, 3000, 2000, 1500, 1000 and 500 m using an aircraft laboratory Antonov-30 or Tupolev-134 into the impingers (volume sample of about 0.5 m^3) and on fibrous filters (sample volume of about 2 m^3). The concentration of culturable microorganisms in the samples was determined by culturing methods, and the species they belonged to were determined by molecular biological methods (Safatov *et al.*, 2010). The concentrations of the total protein, the main elements and ions (its total mass is equal to aerosol mass) in the samples were determined by methods described in Safatov *et al*. (2010).

The decreasing trends of PM, TP and CM annual average concentrations in the atmospheric layer 500 - 7000 m are revealed in the South of Western Siberia. In general the decrease of TP concentrations is not large: about 1.5 times for 15 years of observation. But the decrease of CM concentrations for the same period is much larger: about 30 times. Having data for PM concentrations for the same period (which decreased about 2 times for 15 years of observation), one can construct the trends of TP to PM ratios in atmospheric aerosol in the layer 500 - 7000 m.

Differ to trends of PM, TP and CM annual average concentrations in aerosol in the atmospheric layer 500 - 7000 m are revealed in the South of Western Siberia, the trend of TP/PM rations increasing. It may be due to climate change leading to changes of bioaerosol sampled in Siberia sources' positions and power, and, possibly, bioaerosol roots of propagation from sources to sampling points.

Strongly pronounced season changes of TP concentrations (3 to 5 times differences) and CM (amplitude is more than an order of magnitude) are observed for all altitudes in the layer 500 - 7000 m.

The analysis of CM biodiversity shows that there are many different strains of culturable bacteria and fungi in atmospheric air samples but no viruses (including ones causing respiratory infections) were found there. Differ to total CM concentrations no seasonal changes were observed for individual microorganisms' genera. It is due to high changeability of microorganisms occurrence and usually low concentrations of microorganisms individual strains in the samples.

As soon as the main part of culturable microorganisms in aerosol in the atmospheric layer 500 - 7000 m are revealed in the South of Western Siberia are not pathogenic, a method for estimation of potential danger of any bacterium, including unidentified yet ones, without tests involving animal experiments for direct determination of microorganisms' pathogenicity, see Safatov *et al*. (2008). The method is based on the determination of each bacterial isolate number in the air sample and some biochemical and morphological characteristics of this isolate. The method may be applied as to individual isolates as to all bacteria in the air sample. In this case it serves as estimation of sampled air potential pathogenicity.

So the important fundamental scientific results are obtained. Particularly long-term monitoring data shows that recent climate changes lead to marked decreasing of PM, TP and CM concentrations in aerosol in the atmospheric layer 500 - 7000 m. The data obtained are important for air quality monitoring and for estimation of it potential danger for human.

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Safatov, A.S., *et al.* (2010) Atmospheric bioaerosols / in: Aerosols – Science and Technology. / I. Agranovski, Ed. – Wiley – VCH, 407-454.

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