The comparison of long-term changes in the bioerosol components in Southwestern Siberia in the near-ground atmospheric layer and at the altitudes of 500 - 7000 m

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Since 1999, the authors have been monitoring the biological components of atmospheric aerosol in Southwestern Siberia by both ground sampling and aircraft probing of the atmosphere (Arshinov *et al.*, 2010). The purpose of this work is to analyze the data obtained during 14 years and to reveal the differences between the near-ground and high-altitude concentrations of biological components of atmospheric aerosols in the region.

Ground-based measurements were conducted at the site of FSRI SRC "Vector" located in the vicinity of Novosibirsk for 1 day (4 samples) in the middle of each month. Samples were collected into impingers (1.5 m^3) to detect viable microorganisms and on fiber filters (9 m^3) for chemical analysis of samples. 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 Tupolev-134 (Belan *et al.*, 2011) on the same impingers (volume sample of 0.5 m^3) and 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 in the samples were determined by methods described in Safatov *et al*. (2010).

Figures 1 and 2 present the changes in the concentrations of culturable microorganisms and the total protein in the atmosphere of Southwestern Siberia averaged over all the measurements performed during a calendar year. As follows from the presented data, the concentrations of culturable microorganisms in the near-ground atmospheric layer and on the average at the altitudes of 500-7000 m are close to each other. The concentration of the total protein in the near-ground atmospheric layer is considerably **lower** than that at the altitudes of 500 – 7000 m. The observed fact can be explained by a more essential contribution of remote bioaerosol sources as compared to local ones into the observed concentrations.

The concentrations of both the total protein and culturable microorganisms showed downward trends during the observation period. The concentrations of viable microorganisms decreased by approximately 10 times both in the near-ground layer and at the altitudes of 500- 7000 m. The total protein concentration in the near-ground layer remains practically unchanged, and that in the layer at the altitudes of 500 – 7000 m decreases by approximately 2.5 times. An intra-year trend is revealed in these concentrations against the background of a decrease: the maximal value (in the warm period of the year) was greater than the minimal one (in the cold period of the year) by approximately 2 times for the total protein and by approximately 10 times for culturable microorganisms.

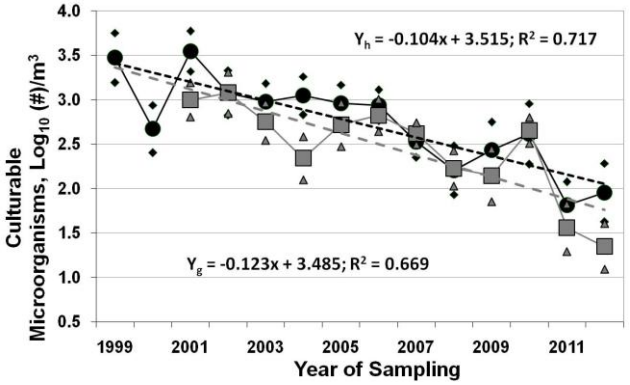

Figure 1. Annual average concentrations of culturable microorganisms in the near-ground layer (grey, g) and in the layer at the altitudes of 500- 7000 m (black, h). The average and mean-square values are given.

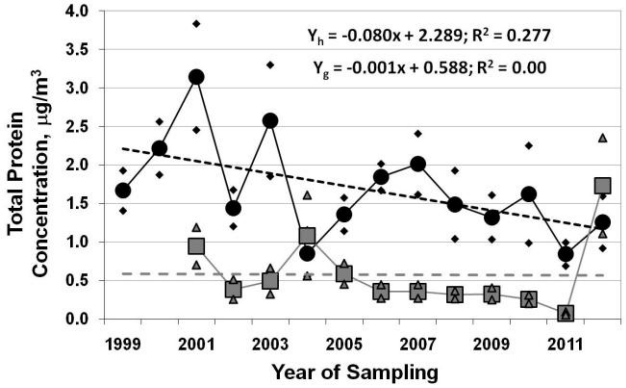

Figure 2. The same for total protein.

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