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Physical characteristics of concentration fields of tropospheric bioaerosols in the South of Western Siberia

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Abstract

The State Research Center of Virology and Biotechnology "Vector" and the Institute of Optics SB RAS are performing systematic study of tropospheric bioaerosols in the South of Western Siberia. The work summarizes the results of analysis of some physical characteristics of the data array on bioaerosol concentration obtained with an airplane laboratory at the altitudes of 0.5, 1, 1.5, 2, 3, 4, 5.5 and 7 km. The flights were performed during the last 10 days of each month in 1999-2003. It was shown that the concentration of total protein aerosols obeyed the laws of continual statistics, and the concentration of culturable microorganism aerosols obeyed the laws of discrete statistics. The analysis of correlation coefficients and cross correlation of bioaerosol concentration fields was performed. Wavelet analysis of the data showed that variations of tropospheric bioaerosol concentration were mainly determined by typical seasonal processes with periods of 12, 6, 4 and 8-9 months. Seasonal variations cause approximately 80% of the total dispersion of variations of total protein concentration, and the amplitudes of variations of culturable microorganism concentration are small as compared with the constant component. Harmonic analysis of bioaerosol concentration fields was performed. Harmonics that are significant in wavelet spectra for all time series were taken for the approximation of the series. It was revealed that four-month periodicity was internal and was caused by a wave spreading from above with a vertical rate of about 4 km/month. © 2005 Elsevier Ltd. All rights reserved.

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Keywords

Bioaerosols, Concentration fields, Culturable microorganisms, Total protein, Troposphere