Geophysical Research Abstracts, Vol. 9, 01341, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01341

Estimation of a vertical flux of fine-dispersed arid aerosol in the absence of dust storms

I. Granberg (1), A. Andronova (2), M. Artamonova (1), N. Efimenko (3), E. Grechko (1), M. Iordansky (2), A. Kazansky (1), V. Kramar (1), L. Maksimenkov (1), F. Pogarsky (1)

(1) A.M.Obukhov Institute of Atmospheric Physics RAS, Moscow, Russia, (2) State institution "Karpov Physics and Chemistry Institute", Moscow, Russia, (3) State institution "Pyatigorsk State Research Institute of Curortology of the Ministry of Public Health of Russian Federation", Moscow, Russia (igran@ifaran.ru / Phone/Fax: +7(495)953-21-58)

Systematization of experimental studies and correlation analysis of measurement results allow one to distinguish three different states that characterize correlations between the mass concentrations of particles of different fractions: (1) wind removal, (2) thermo-convective emission, and (3) intermediate state, when the elements of (1) and (2) are present. On the basis of the analysis of measurements of fine-dispersed (less than 0.4 mcm) desert aerosol outflux under the assumption that the mechanism of air mixing in the atmospheric near-surface layer at a large vertical temperature gradient (surface temperature 50-60C, relative humidity 20-30%, wind speed 2-3 m/s) almost does not differ from the mechanism of free convection, the following empirical formula is proposed to estimate the outflux of fine-dispersed (less than 0.4 mcm) desert aerosol at relative humidity $<$ 0,3 and cloud amount $\leq$ 2:

F=k*[T(2)-T(0.5)]$^{1/2}$*(dC/dz),

where F is the vertical flux of fine-dispersed particles from an arid surface, k_0 = 0,0325m^2/(K*s), (relative humidity at a height of 1,5 m, in %,), T is temperature (at heights of 0,5 m and 2 m), and is the mass concentration of fine-dispersed particles ($<$2 ìêì at heights of 0,5 and 2,5 m).

With the use of this formula, a quantitative estimate of the outflux of fine-dispersed arid aerosol is obtained: F = 0.2 mcg/(mˆ2*s) for a vertical flux of particles from an arid surface. The lower atmospheric boundary layer has been sounded (in the

Tsimlyansk region) with the acoustic locator — Latan-3 sodar developed at the A.M.Obukhov Institute of Atmospheric Physics, RAS — under the conditions close to those of desert areas in Kalmykia. Under convection, the diameters of the horizontal sizes of intermittent heterogeneities at a height of 50 m above the underlying surface are between 10 and 500 m. The vertical velocity of floating structures ranges between 0.5 and 2 m/s. A special system with the use of an aerosol chamber with a laser aerosol counter LAS (an automatic instrument) measuring mass concentrations of aerosols has been developed to carry out laboratory experiments on fine-dispersed arid aerosol emissions. A qualitative chemical analysis of samples is made with the use of an X-ray unit for a spectral analysis (SPEKTROSKAN MAKS-G).

The investigations were supported by the ISTC project 3032, RFBR grants RF 05-05-90596-NNS_a, 06-05-65270-à, 06-05-08086-ofi-a, and 06-05-65216-a.