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PROCESSES OF TRANSPORTATION AND SEDIMENTATION OF DUST AEROSOL

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Physic-geographical and climatic conditions of the deserts of Middle Asia and of the mountain ranges of Tyang-Syang and Pamiro-Alai have tied together the system of deflation processes in the desert landscapes and of deposition of dust matter at mountain foothills. During the dust storm in a Middle Asian desert the dust aerosol is distributed throughout the troposphere almost uniformly up to the top of convective layer (velocities of both the horizontal and vertical eddy fluxes reach tens of meters per second then). The air mass loaded with aerosol enters the Tajikistan area and fills the closed valleys lying below that convective layer. Meeting the hardly penetrable barriers of mountain ranges the air stagnates, its eddy mixing weakens, and the aerosol starts to precipitate to ground. Part of these air masses overflows the ridges. To substitute it new portions dusty air arrive. A continuous feeding of the area by dusty air masses takes place during such dust episodes. That explains the overall duration of haze.

Starting from such a picture of the processes of aerosol transport and introducing the initial data available we may calculate the amount of precipitated aerosol as described below. The actual data on periodicity and duration of dust haze, combined with the data on actual site height above the sea level were used as the basis for calculations of the rate of aerosol precipitation in Tajikistan. Variability of the depth of convective layer during the year was also accounted for, calculated, as it were, following the technique developed elsewhere (Finaev, 1987, 1988, 1994). It varied from 950 m above sea level in January to 4850 m in June. Calculations of precipitated depths were conducted for each month separately at every station recording haze episodes. The analysis of data in conjunction with physic-geographical situation at station testifies to a dependence of deposit depth on the absolute height of station above the sea level, on the local climatic features at station, and on the distance from dust storm origin centers. Depth of the layer precipitated during the year varies from 0.04 mm/yr to 0.683 mm/yr. The averaged rate of accumulation of sediments over the Republic is 0.2 mm/yr. Approximately the same data were obtained for the early Holocene when calculating the depth of soil horizons, corresponding to that temporal cross-section (0.17 to 0.26 mm/yr) (Lomov, 1991). A layer less than 0.1 mm thick is most probably completely eroded and does not take part in accumulating sediments. The annual trend of material accumulation is not homogeneous and depends on climate variability.

Global Analysis, Interpretation, and Modeling: First Science Conference 25-29 September 1995, Garmisch-Partenkirchen, Germany (IGBP GAIM). P-22.