Geophysical Research Abstracts,
Vol. 11, EGU2009-12457, 2009
EGU General Assembly 2009

Trans-Continental Transport of Air Pollution from Central Asia

I. Granberg (1), B. Chen (2), G. Carmichael (3), P. Solomon (4), M. Sofiev (5), S. Sitnov (1), K. Rubinstein (6), L. Maximenkov (1), M. Artamonova (1), and F. Pogarski (1)

(1) A. M. Obukhov Institute of Atmospheric Physics, RAS, Moscow, Russian Federation (igranberg@gmail.com), (2) Kyrgyz-Russian Slavic University, Bishkek, Kyrgyz Republic, (3) University of Iowa, Iowa City, USA, (4) US Environmental Protection Agency, Office of Research and Development, Madison, USA, (5) Finnish Meteorological Institute, Helsinki, Finland, (6) Hydrometeocenter of Russia, Moscow, Russian Federation

In the frames of ISTC project #3715 for an overview of the year evolution of aerosol in Central Asia the analysis of aerosol optical thickness (AOT) was producing. Monitoring of AOT was making on the base of AOT satellite observation by MODIS devices, located on board of the Terra and Aqua satellites. The region was 34-51 N, and 54-96 E for the year 2007. The analysis revealed that AOT in the region is characterized by pronounced annual pace with the rapid growth of AOT winter, spring peak ($\sim$ 0,4), the slow decline of ALO spring to autumn and autumn minimum ($\sim$ 0,2). In August a weak secondary maximum of AOT took place. In mid-June and in the first decade of July and August in the region had increased the value of AOT, accompanied by significant increase in AOT volatility. In particular, 8 and 9 August, the average for the region AOT exceeded 0.6.
Diagnosis of aerosol emissions was based on an analysis of the spatial and temporal changes of AOT field. Obviously, the spatial scale of data and data discretization in time determines the emissions of power can be diagnosed. The spatial AOT distribution shows that aerosol plumes from the area of the Aral Sea in 2007 were carried out mainly by southeastern and eastern fronts. In the region, there are two major sources of aerosol emissions: one of them located in the south of the Aral Sea and the Kara-Kum desert, and a second, more powerful – over Taklamakan desert.
Particularly, data were obtained on the dust storms occurrence of December 15, 2007 in the southern Aral Sea region. In order to detect its influence on the Kyrgyzstan stations dust measurements, simulations of the dust plume from the area of Aral Sea were produced by SILAM model of Finnish Meteorological Institute. Two sets of runs have been performed: forward simulations for estimation of the area affected by the dust elevated by the wind during the storm from the area of Aral Sea. The model has evaluated 5-day dispersion of the plume. The second run was made in adjoint mode, aiming at evaluation of the footprint of the two observations sites – Bishkek and Lidar stations. Here the footprint is the area, which sources affected the observations within the selected period. The analysis of carry of aerosol particles on Central Tien-Shan and further on the basis of construction 4- day time back and direct trajectories is carried out, which were calculated for all days of realization of lidar measurements. The resulting trajectory air mass and density distribution of impurities, which is regionally polluted continental (RPC) air masses transported from Western air flow from Central Asia contributed significantly to the level of pollution at Japanese station Happo. Measuring the content of aerosols in the atmosphere in Central Asia held in a small number of items, and currently available data are insufficient to specify the initial conditions and / or verification of long-range transport models.
It should be noted that the main source of aerosol in Central Asia is Taklamakan desert. Average value and AOT variability over it several times higher than corresponding AOT values over the rest of the region. The greatest variability aerosol over Taklamakan observed from late March to mid-May. For example, on April 22, 2008 average of the AOT in cell 5° x 5° over the western part of Taklamakan – value reached 3,171. AOT virtually throughout the region positively correlated with AOT over Taklamakan desert. The most noticeable effect makes an aerosol of Taklamakan found in the south-east Kyrgyzstan, Tajikistan in the east and north of the Tibetan highlands. The impact of the Aral Sea area is restricted significantly less. In doing so, AOT in the central part of the region reveals a weak negative correlation with the AOT over the Aral Sea.