Atmos. Chem. Phys. Discuss., 7, S3081–S3083, 2007
www.atmos-chem-phys-discuss.net/7/S3081/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sand/dust storms over Northeast Asia and associated large-scale circulations in spring 2006" *by* Y. Q. Yang et al.

Anonymous Referee #1

Received and published: 13 July 2007

1 General comments

In recent years, as the paper mentioned, studies show that there is a complicated and subtle interaction between dust storms and climate. It is found that the feedback between sand-dust and climate can be a modulator to monsoon climate, through the radiation of sand-dust, including hydrologic cycle. It is shown the variation of sand-dust concentration in the atmosphere can be a trigger to the variation of large-scale climate processes. This implies a sensitive trend: the impact of sand-dust, may possibly find its expression in the variations of marine and continental temperatures, which allows sand-dust to produce an impact on atmospheric circulations and precipitations. So a big scientific question within the scope of ACP has been discussed in this paper.

From this study, the new idea of this paper for raising the operational capability of monitoring and earlier warning of sand/dust storm weathers is very important. It shows that for developing of sand/dust storms over Northeast Asia, the general circulations prevailed through both winter and spring, especially the 3-D structure of the polar circulation are very important. It is found in the paper that a significant difference, compared with a normal year, especially the year enjoying less occurrences of sand/dust storms. Abnormal 3-D structures of general circulation produced a range of corresponding weather phenomena, including circumpolar vortices at the upper troposphere, mid-level westerly jets, and lower zonal winds, which were attributed to the increased invasions of sand/dust storms in 2006. The study also reveals a fact that comparing with a normal year, or 2003, a year enjoying less occurrences of sand/dust storms.

2 Specific comments

As we know that for an improved understanding of the genesis, development, and long distance transport of sand/dust storms to give a "*Classifying sand/dust storm processes*" is a scientific question that need to be discussed. In this paper a concept of "affected areas with sand/dust storm features" is applied, based on WMO's surface and upper air data, the surface data collected by 2,456 Chinese surface stations, and NCEP-NCAR reanalysis data. In an attempt to classify sand/dust storm processes, authors have followed the concept of "affected areas with sand/dust storm features", or σ, and the approach to define the intensity. Objective means is used to analyze sand/dust storm processes, with due consideration to both WMO's standard for observation density and the practical standards applied to intensive observations at major sand-dust monitoring sites. So, paper provided a good idea for classifying sand/dust storms scientifically.

The Summary and discussion in the paper has provided a reasonable conclusion that the comparison between the years having most and least occurrences of sand/dust storms shows that the frequency of sand/dust storms bears a significant correlation with the maintenance and evolution of large-scale circulation structures at the lower,

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mid, and upper levels of troposphere. It means the results are sufficient to support the conclusions of the paper.

3 Technical corrections

A suggestion is to add some of references for describing of the better understanding and studying the footprints of global circulations associated with activities of sand/dust storms. To describe the effort benefits an improved understanding of the genesis, development, and long distance transport of sand/dust storms.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 9259, 2007.