

Dynamic Factors Associated with the Occurring Trend of Mainland Dust Storm

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Asian dust storms occur mainly in China and Mongolia and are centered near Minquin, in the Gansu Corridor; Hetian, at the southern edge of South Xingjiang Basin; Guaizihu, at the west Inner Mongolia; Yikwusu and Zhurihe, in the middle Inner Mongolia. In this paper, we have performed backward air parcel tracing from these five centers on each major dust-storm (MDS) occurring days, and found that in most events air parcels are coming from the western side of each center while descending rapidly from upper troposphere, which is typically associated with a southeastward advancing of an intensified Siberia cold air mass. Furthermore, we have traced air parcels for each spring during 1950 \sim 2003 from these centers and noted that in springs of more MDS more than 90% of air parcels are from the western side of Minquin two days earlier, while in springs of less MDS the probability is down to 50%. The fact is more than 30% of air parcels stayed in the vertical column over Minquin in springs of less MDS for two days, while it is less than 10% in springs of more MDS. By checking carefully the trend variation, we found that before 1976, increasing trends of both the MDS days and the probability of air parcels coming from the western side of Minquin two days earlier exist, while it is reversed after 1976. Even though the fluctuation is getting larger after 1995, but so far the decreasing trend continues. The dynamic factors that can possibly cause this evolution have been analyzed and found that the geopotential height over Mongolia also have a dramatic change around 1976 and is in general negatively correlated with the change of MDS days.