

EGU24-3981, updated on 19 Mar 2025

<https://doi.org/10.5194/egusphere-egu24-3981>

EGU General Assembly 2024

© Author(s) 2025. This work is distributed under the Creative Commons Attribution 4.0 License.



How dust sources affect downstream regions in East Asia during a dust storm event

Yanyu Li^{1,2,3} and Qizhong Wu^{1,2}

¹Beijing Normal University, Faculty of Geographical Science, Beijing, China (liyanyu@mail.bnu.edu.cn)

²Beijing Normal University, College of Global Change and Earth System Science, Beijing 100875, China

³Institute of Meteorological Science of Shanxi Province, Taiyuan 030002, China

Dust storms are severe and disastrous weather events that typically occur in arid and semi-arid desertification areas. The frequent occurrences of spring dust storms in East Asia in recent years have drawn widespread attention in the context of the significant achievements in ecological management and sand prevention. Identifying the source and transport of dust storms in East Asia is key to comprehending the ecological environment and climate. In this study, the MODIS annual product MCD12C1 is used as labels to classify the land cover of Landsat 8/9 images using the Random Forest method in order to obtain the dynamic distribution of dust source areas. The land cover results are processed to the WRF model to provide the meteorological field, after which a Lagrangian transport model FLEXPART-WRF is used to simulate the horizontal and vertical transport of particles from five dust source regions in East Asia during the March 22, 2023 dust storm event. The source apportionments for regions on the transmission path of different dust sources are revealed by an online tracer-tagged of air quality model NAQPMS. The results show that the total area of the East Asian dust source regions in March 2023 is 1.5×10^6 km². Cold high pressure from Siberia and the Mongolian cyclone are key synoptic situations for dust emission and transport from dust source areas. The Taklimakan Desert and the Tarim Basin mainly affect northwestern China. The Badain Jaran Desert and Horqin Sandy Land have a greater impact on northern China, with longer transmission distances, and can even affect southeast and Northeast China. The Gobi Desert affects northern China by influencing the dust source areas in Inner Mongolia. The vertical transport height is up to 500m from the ground. The PM_{2.5} source apportionments show that the Badain Jaran Desert contribution of Beijing-Tianjin-Hebei and its surrounding areas accounted for 45.5 %, while the Gobi Desert accounted for 1.4 %.

