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The impact of the Arctic Oscillation on annual to seasonal dust emission in East Asia during 2009∼2017

Haijiao Liu (1,2), Youbin Sun (1), and Yan Yan (3)

(1) Institute of Earth Environment, Chinese Academy of Sciences, China (liuhj@ieecas.cn), (2) University of Chinese Academy of Sciences, China, (3) Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, China

Abstract: Mineral dust originated in East Asia plays a significant role in affecting regional-to-hemispheric environment changes from natural past to anthropogenic future. However, understanding the dust-climate interaction remains challenging due to uncertainties in the data-model comparison. Here we present weekly-resolution flux variability over the Chinese Loess Plateau (CLP) during 2009 to 2017 to assess the link between Asian dust emission and high-latitude climate change. Dust fluxes at the central and southern CLP exhibit significant seasonal variations, characterized by highest flux in springs and lowest flux in autumns. At the seasonal scale, dust flux is highly correlated with monthly-averaged maximum windspeed and the Arctic Oscillation. Comparison of dust fluxes with the atmospheric indices of the Siberian High, North Atlantic Oscillation, and Arctic Oscillation reveal that Asian dust emission is more likely linked to the AO oscillations. Our results suggest that when winter AO index is extremely negative can lead to enhanced Siberian High and intensified wind and dust emission in the following spring season in East Asia. In the context of global warming, the AO will act as a key modulator weakening the Asian dust emissions.
Key words: East Asia, dust flux, Siberia high, AO