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The correlation analysis between the dust storm in Far East Asia and the dynamic local roughness in northwest China sandy desert by remote sensed data

Jungrack Kim (2), Jiye Yun (1), Yunsoo Choi (3), and Hyewon Yun (4)

(2) Department of information System Engineering, Hansung University, Seoul, Korea (kjrr001@gmail.com), (1) Department of Geoinformatics, University of Seoul, Seoul, Korea (cutequf26@naver.com), (3) Department of Geoinformatics, University of Seoul, Seoul, Korea (choiys@uos.ac.kr), (4) Department of Geography, Sungshin University, Seoul, Korea (long0551@hanmail.com)

The increasing occurrences of mineral dust storm become a serious threat in human activities as well as public health over Far East Asian area. The attempts to identify mineral dust source have been performed with a variety of approaches such as remote sensed data analysis, particle trajectory modeling and ground based tracing networks. It identified the sandy deserts in northwest China as the primary source of mineral aerosol (Zhang et al., 2007). However, the detail contributions of mineral aerosol in the potential source areas are still under investigation. In this research, the significances of potential aerosol source areas in the total dust storm flux are measured in two ways.

Firstly the trails of the dust storm over Far East Asia were evaluated by multi sensor data and numerical model. MODIS (Moderate Resolution Imaging Spectrometer) imagery was employed to discriminate the extent of dust storm. Combining with the aerosol profile from CALIOP (Cloud-Aerosol Lidar with Orthogonal Polarization), the heavy dust storm has analyzed and compared with the particle trajectory from HYSPLYT (HYbrid Single-Particle Lagrangian Integrated Trajectory) simulation. It gave a reliable estimation of the main dust emission source.

Since the sand dune activity in the decertified terrain has been recognized as an essential indicator of the mineral aerosol generation, it is important to formulate the desert dune activity quantitatively and find its correlation with the dust storm. As the first approach to measure the intensity of dune activity, interferomatric SAR analysis wasn't successful because that the spatial and time coverage of SAR imagery are not sufficiently enough. Aerodynamic roughness lengths Zo which is the well verified parameter to characterize dune mobility relevant to the threshold wind velocity (Laurent et al., 2005) is not available in this research epoch because of the limited time span of POLDER (POLarization and Directionality of the Earth's Reflectances) data set that is indispensible for the aerodynamic roughness estimation. Instead, MISR (Multi angle imaging Spectro Radiometer) was employed to extract NDAI (Normalized Difference Angular Index) representing the local roughness of target topography. The variation of NDAI of potential dust source area coincident with trajectory analysis was extracted and investigated compared with the dust storm frequency. The results showed a correlation between the intensities of sand dune activities in the aerosol source areas and the dust storm.
In the next stage, the local roughness extracted from MISR data analysis will be compared with the topographic information from high resolution stereo satellite imagery, hence it will correctly evaluate the suitability of MISR NDAI as a dune activity indicator.