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A wide evaluation of surface flux parameterization schemes for bare soil surfaces

K. Yang and T. Koike

Department of Civil Engineering, University of Tokyo (yangk@hydra.t.u-tokyo.ac.jp)

Bare soil is a major landscape in arid and semi-arid regions. Heat flux parameterization for bare soil surfaces plays a crucial role in modeling land-atmosphere interactions in this region. These schemes are also a basis for developing sparse-canopy heat transfer schemes. A number of schemes have been proposed in literature while their parameterized results can be quite different; therefore it is very important to identify a universally applicable scheme, if possible. For this purpose, this study evaluated the performance of six schemes using a number of data, which were collected at eight flux stations in arid and semi-arid region of China. These stations represent a variety of surface conditions: they were located at the Tibetan Plateau, Gobi, desert, cropland, and degraded grassland, their altitudes range from near-sea surface up to several kilometers, surface roughness from less than 1 mm up to 1 cm, and sensible heat fluxes from -50 W m-2 up to more than 400 less than W m-2. The results show that two schemes among the six perform well at most of stations, while other four schemes systematically and significantly over-estimate or under-estimate fluxes. We also discussed the effect of flux parameterization schemes on surface temperature and energy partition.