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Retrieval and validation of the land surface turbulent flux parameters in semi-arid region of China

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Abstract: Arid and semi-arid regions account for about 40% of the Chinese territory. Under the background of global warming, the semi-arid region, as a transition zone between semi-humid region and arid region, is extremely sensitive to climate change and undergoing the most severe aridity trend. Results from the Regional Model Intercomparison Project of Asia (RMIP) show that the highest bias of simulated precipitation in current climate models is identified over the semi-arid region.

Based on eddy covariance observations from the degraded grassland and cropland field sites in semi-arid area of China, we retrieved aerodynamic roughness length (z_{0m}) by three methods. The results show that there is no much difference among the retrieved value of z_{0m} by different methods over cropland, while z_{0m}spreads over grassland within the reasonable range. We also calculated the excess resistance to heat transfer (kB^{-1}) using seven schemes. Seasonal and inter-annual variations of z_{0m} and kB^{-1} indicate that both parameters are larger in growing season. We also find that kB^{-1} has obvious diurnal variation. The parameters mentioned above were validated by introducing them into Common Land Mode (CoLM). The results show that the revised model performs better in the simulation of the land surface sensible and latent heat fluxes, which is expected to help the better simulation of the land-atmosphere interaction in this region.

Key words: Semi-arid region, aerodynamic roughness length, Excess resistance to heat transfer, surface fluxes, land-atmosphere interaction