



Dynamical Impact of Parameterized Turbulent Orographic Form Drag on the Simulation of Winter Precipitation over the Western Tibetan Plateau

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Sub-grid orographic drag directly acts on wind and impacts the regional water cycle through control of atmospheric water vapor (AWV) transport. The effect of turbulent orographic form drag (TOFD) on wind and precipitation is investigated in this study using the WRF model for a winter month over the western Tibetan Plateau (TP), where solid precipitation supplies large amounts of water resources. The diurnal cycle of wind components and atmospheric circulation simulated with TOFD are consistent with observations and ERA-Interim data, whereas stronger westerlies exist in the simulation without the TOFD scheme. The latter results in more zonal AWV transport from the west and more precipitation over the western TP and surroundings. The implementation of the TOFD scheme leads to reduced biases, when evaluated with two observation-based precipitation products. It is therefore concluded that this scheme has a clear dynamical control on the regional atmospheric water recharge and thus the parameterization of the small-scale orographic drag in the model helps to improve the prediction of wintertime precipitation in the western TP region.