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The Gravel Parameterization Schemes on Tibetan Plateau and Its Assessment Using RegCM4

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In this paper, the impact of gravel is taken into account in regional simulations on the Tibetan Plateau (TP). The differences of ground surface and soil hydrological processes in the TP are compared when the gravel parameterization schemes and the original soil hydrothermal parameterization schemes are respectively adopted in the regional climate model version 4.7 (RegCM4.7), which is driven by the EIN15. Moreover, the performances in simulating the liquid soil moisture (LSM) by using the two schemes are also assessed. When the impact of gravel is considered, the changes of ground hydrological processes are consistent with those of liquid precipitation and snow meltwater except the infiltration, indicating the dominance of liquid precipitation and snow meltwater in ground hydrological processes. The lower gravel content will facilitate the downward transportation of LSM. However, in the case of high gravel content, the roles of gravel content are completely opposite in the western and central TP. The most obvious change is that the simulated LSM by the gravel schemes is lower at most soil depths compared with that by the original schemes, which is beneficial in most cases. For instance, the mean absolute errors of the reference data with the simulations by the gravel schemes and original schemes at the soil depth of 0.1 m in the southeastern TP are 0.026 and 0.101, respectively. Besides the southeastern TP, the performance in simulating the temporal variation of the LSM below the middle soil layers still needs to be improved.