Numerical simulations of precipitation in high altitude Himalaya mountainous area by using JMA-NHM

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Precipitation over high altitude Himalaya mountain area has a large influence to the mass balance of glaciers and the water discharge of rivers originating from there, which is an important factor not only in the water resource management but also the disaster mitigation for the countries in the watersheds. Although efforts have been made to reveal the temporal and spatial change of precipitation, its hydrological impacts, and related processes, they are not yet fully understood.

The authors have performed simulations to estimate annual precipitation amount in Himalaya's high altitude and the surrounding areas by using Japan Meteorological Agency Non-Hydrostatic Model (JMA-NHM), and additional simulations to examine the sensitivity to a topography smoothing technique, horizontal resolution and turbulence parameterization scheme. At first, we tested to relax the limitation of land surface slope angle to allow it to be up to 30 %, while the original threshold is 10 %, which is one of topography smoothing techniques for numerical stability of simulation. This did not much affect the simulation results. The simulations with the 5 km horizontal resolution tended to displace the major precipitation area toward the mountainside and to underestimate the precipitation on the plane in the summer season, compared with the observed precipitation amount provided by the Global Satellite Mapping of Precipitation (GSMaP), while the simulations with the 1 km horizontal resolution showed better agreement with the observation. Regarding the turbulence parameterization, Deardorff's scheme produced more precipitation on the plane than Mellor-Yamada's scheme in the summer season. In the presentation, we will also show the simulation results on annual and seasonal precipitation amounts in the several glacier catchments.

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