Title:	Evaluating Winter Precipitation over the Western Himalayas in a High-Resolution Indian Regional Reanalysis Using Multisource Climate Datasets
Authors:	Nischal (/jspui/browse?type=author&value=Nischal) Attada, Raju (/jspui/browse?type=author&value=Attada%2C+Raju)
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Abstract:	Considerable uncertainties are associated with precipitation characteristics over the western Himalayan region (WHR). These are due to typically small-scale but high-intensity storms caused by the complex topography that are under-resolved by a sparse gauge network. Additionally, both satellite and gauge precipitation measurements remain subject to systematic errors, typically resulting in underestimation over mountainous terrains. Reanalysis datasets provide prospective alternative but are limited by their resolution, which has so far been too coarse to properly resolve orographic precipitation. In this study, we evaluate and cross compare Indian Monsoon Data Assimilation and Analysis (IMDAA), the first high-resolution (12 km) regional reanalysis over India, with various precipitation products during winter season over WHR. We demonstrate IMDAA's efficiency in representing winter precipitation characteristics at seasonal, diurnal, interannual scales, as well as heavy precipitation associated with western disturbances (WDs). IMDAA shows closer agreement to other reanalyses than to gauge-based and satellite products in error and bias analysis. Although depicting higher magnitudes, its fine resolution allows a much closer insight into localized spatial patterns and the diurnal cycle, a key advantage over other datasets. Mean winter precipitation over WHR shows a significant decreasing trend in IMDAA, despite no significant trend in the frequency of WDs tracked in either IMDAA or ERA5. The study also exhibits the potential use of IMDAA for characterizing winter atmospheric dynamics, both for climatological studies and during WD activity such as localized valley winds. Overall, these findings highlight the potential utility for IMDAA in conducting monitoring and climate change impact assessment studies over the fragile western Himalayan ecosystem.
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