



GRACE: A unique tool to advance precipitation estimation over cold regions

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Abstract: Here we show that GRACE can advance precipitation estimation in high latitudes and high altitudes, where the uncertainties in the current precipitation products are highest. With the lack of high quality precipitation estimates in cold regions and the growing need for more spatiotemporally comprehensive precipitation estimates, GRACE (and in near future GRACE-FO) can provide unique and independent information that has been underutilized for the improvement of precipitation analysis. This is especially timely with significant advancements in the refinement of the GRACE gravity solution. More specifically, by performing case studies over Eurasia and two Endorheic basins in the Tibetan plateau, we demonstrate how GRACE can help constrain precipitation products. GRACE estimates suggest that the global precipitation climatology project (GPCP) likely overestimates precipitation over Eurasia, consistent with CloudSat observations, and underestimates precipitation in winter in the Tibetan plateau. Furthermore, we demonstrate that GRACE is extremely useful to select a proper gauge undercatch correction factor, commonly applied to rain-gauges. The impact of this study is significant as all of the global precipitation products use in-situ data for bias correction.