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Developing a gridded high-resolution gauge based precipiation product for Bolivia

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Sound water resource decision making requires accurate knowledge of the water balance and its related parameters among which precipitation plays a key role. The Gridded Meteorological Ensemble Tool (GMET), developed by the National Center for Atmospheric Research (NCAR), enables generation of station-based high spatial and temporal resolution (0.05 degree, daily) gridded precipitation and temperature datasets which can be used for more accurate hydrological and water resource model applications. As part of the National Water Balance study of Bolivia (1980-2016) the GMET tool was employed for the first time in the tropics. What distinguishes GMET from traditional interpolation methods is that it uses geophysical attributes (e.g. elevation, slope and aspect) as predictors for climate parameters through a probabilistic approach. GMET initially predicts the occurrence, amount, and uncertainty of precipitation over the pixels, and then generates an ensemble of realizations to incorporate the inherent uncertainty of interpolating sparse point measurements to a complex terrain. After the implementation of GMET over Bolivian territory, we evaluated its performance against the local rain-gauge network and Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) data set, through a systematic process by using statistical, categorical, random or systematic error types, and time series evaluation metrics. The results of our analysis revealed that GMET was able to accurately represent precipitation over most parts of Bolivia with less uncertainty than CHIRPS, especially at monthly scale. However, GMET under-performs in areas with inadequate station density, particularly areas with high rainfall values in the Madre de Dios Basin at the border of Peru in Northwestern Bolivia. In the development of a next version of the GMET tool we anticipate integration of useful satellite-based information for precipitation estimations, and evaluating its performance over shorter time periods for which more station data may be available. The framework used for statistical analysis and evaluations, also constitutes a contribution for organizing the process of evaluating the validity of GMET and similar precipitation estimation products.