TRANSFERRING ERROR CHARACTERISTICS OF SATELLITE RAINFALL DATA FROM GROUND VALIDATION (GAUGED) INTO NON-GROUND VALIDATION (UNGAUGED) REGIONS

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Abstract

Understanding the error characteristics of satellite rainfall data at different spatial/temporal scales is critical, especially when the scheduled Global Precipitation Mission (GPM) plans to provide High Resolution Precipitation Products (HRPPs) at global scales. Satellite rainfall data contains errors which need ground validation (GV) data for characterization, while satellite rainfall data will be most useful in the regions that are lacking in GV. Therefore, a critical step is to develop a spatial interpolation scheme for transferring the error characteristics of satellite rainfall data from GV regions to Non-GV regions. As a prelude of GPM, The TRMM Multi-satellite Precipitation Analysis (TMPA) products of 3B41RT and 3B42RT (Huffman et al., 2007) over the US spanning a record of 6 years are used as a representative example of satellite rainfall data. Next Generation Radar (NEXRAD) Stage IV rainfall data are used as the reference for GV data. Initial work by the authors (Tang et al., 2009, GRL) has shown promise in transferring error from GV to Non-GV regions, based on a six-year climatologic average of satellite rainfall data assuming only 50% of GV coverage. However, this transfer of error characteristics needs to be investigated for a range of GV data coverage. In addition, it is also important to investigate if proxy-GV data from an accurate space-borne sensor, such as the TRMM PR (or the GPM DPR), can be leveraged for the transfer of error at sparsely gauged regions. The specific question we ask in this study is, "*what is the minimum coverage of GV data required for error transfer scheme to be implemented at acceptable accuracy in hydrological relevant scale?*" Three geostatistical interpolation methods are compared: ordinary kriging, indicator kriging and disjunctive kriging. Various error metrics are assessed for transfer such as, Probability of Detection for rain and no rain, False Alarm Ratio, Frequency Bias, Critical Success Index, RMSE etc. Understanding the proper space-time scales at which these metrics can be reasonably transferred is also explored in this study.

Keyword: Satellite rainfall, error transfer, spatial interpolation, kriging methods.

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