Quantifying errors and uncertainties in satellite precipitation estimates

Chris Kidd\(^1\) and Viviana Maggioni\(^2\)

\(^1\)UMD-ESSIC/NASA-GSFC, Code 612.0, Greenbelt, United States of America (chris.kidd@nasa.gov)
\(^2\)Sid and Reva Dewberry Dept. of Civil, Environmental & Infrastructure Engineering, George Mason University, Fairfax, VA. United States of America (vmaggion@gmu.edu)

The utilization of satellite observations in the estimation of global precipitation is now well established. However, quantifying the errors and uncertainties associated with such estimates is very much in its infancy. While many validation studies have been undertaken, these tend to provide case-specific or longer-term/large area measures of the performance of the precipitation products: statistical performance has largely taken precedence over an assessment of errors and uncertainties within such products. As the requirements for finer spatial and temporal resolutions increase, the assumptions made on the bulk large area/long time-frame products are no longer appropriate: careful assessments of the apportionment of the errors and uncertainties within the precipitation products needs to be made.

The premise of this study is that to truly understand the errors and uncertainties in the final precipitation product it is essential to quantify these within the elements that make up each individual satellite sensor and precipitation retrieval scheme or algorithm. Thus, we start with two fundamental categories: the observation capability of the sensor and the ability of the retrieval scheme. Each sensor provides different observations resulting from the engineering aspects of the sensor itself through to the sampling regime once the sensor is taking measurements: the observation capability is fixed and will be the same for all the subsequent retrieval schemes. The retrieval schemes themselves have a number of assumptions, both in terms of what the sensor actually observes and in the observation-to-rainfall relationships. While many of the errors and uncertainties associated with these assumptions cannot be easily quantified, the relative magnitude of each can be assessed. Initial results are presented here that quantify the effects of the spatial and temporal sampling of sensors, together with the impact of channel selection upon the final products. These results provide an insight into ability of such techniques to retrieve precipitation from the local to global scales, and how such techniques may be improved in the future.
