Uncertainty Quantification in Satellite-based Precipitation Measurements

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Data assimilation depends on uncertainty quantification. For satellite-based precipitation measurements, uncretainty originates from many error sources, including systematic errors and random errors. This presentation summarizes our efforts to quantify these errors in six different TRMM-era precipitation products (3B42, 3B42RT, CMORPH, PERSIANN, NRL and GSMaP). For systematic errors, we devised an error decomposition scheme to separate errors in precipitation estimates into three independent components, hit biases, missed precipitation and false precipitation [1]. This decomposition scheme reveals more error features and provides a better link to the error sources than conventional analysis, because in the latter these error components tend to cancel one another when aggregated or averaged in space or time..

For the random errors, we calculated the measurement spread from the ensemble of these six quasi-independent products, and thus produced a global map of measurement uncertainties [2]. The map yields a global view of the error characteristics and their regional and seasonal variations. More recently, we have developed a multiplicative error model to predict the uncertainties when ground validation data are not available [3], and have shown that this model is superior to the commonly-used additive error model in describing and predicting the uncertainty in precipitation measurements.

References

[1] Tian, Y., C. Peters-Lidard, J. Eylander, R. Joyce, G. Huffman, R. Adler, K.-L. Hsu, F. J. Turk, M. Garcia, and J. Zeng (2009), "Component analysis of errors in satellite-based precipitation estimates," *J. Geophys. Res.*, *114*, D24101, doi:10.1029/2009JD011949.

[2] Tian, Y. and C. D. Peters-Lidard (2010), "A global map of uncertainties in satellite-based precipitation measurements." *Geophys. Res. Lett*., 37, L24407, doi:10.1029/2010GL046008.

[3] Tian, Y**.,** G. Huffman, R. Adler, L. Tang, M. Sapiano, V. Maggioni, and H. Wu, 2013: "Modeling errors in daily precipitation measurements: additive or multiplicative?" *Geophys. Rev. Lett.*, DOI: 10.1002/grl.50320.