



Scale-by-scale statistical evaluation of satellite precipitation products

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Analysis of ≈ 1000 orbits of the TRMM VIRS, TMI and PR instruments over the range of $\approx 4 - 20,000$ km shows that they are quite accurately scaling over most of the range, i.e. that their statistical properties depend on their resolution in a strong, power law manner. This opens up new possibilities for evaluating satellite rain products : a necessary condition is that their statistical properties be the same as those of rain at all scales, not only at the calibration scale (usually taken as the finest available). We present a scale by scale evaluation of three TRMM precipitation products: the 2B31, (a pure radar reflectivity base rain rate with relatively realistic statistics), the 2A12 product (essentially a pure passive microwave based product) and the operational 3B42 product which uses many passive microwave sensors as well as infra red data. We show that although the data can have reasonable good statistics at the calibration scale, and – even if it has an accurate climatological mean – that its large scale statistics can still be poorly determined. This means that both the large scale statistics of the rain/ no rain regions, but also the large scale statistics of the extremes can be poorly estimated. We discuss the implications of this and the possibility of developing algorithms statistically accurate at all scales.