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Uncertainty Structures in High Resolution Satellite Precipitation Products.

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Most modern satellite precipitation products combine information from multiple satellites and sensors in an attempt to minimise point retrieval uncertainties. However, these uncertainties remain substantial and moreover display complex spatial and temporal structures. These structures result from a combination of indirect sensor/rain-rate relationships, especially (but not exclusively) associated with geostationary sensors, and complex spatiotemporal sampling patterns associated with constellations of Low Earth Orbiting (LEO) platforms. These structures can operate over spatial and temporal scales that differ significantly from those of the precipitation field itself. In some cases they also display problematic features such as discontinuities (typically associated with coverage boundaries.) For precipitation studies incorporating small local areas, these larger uncertainty structures will likely be of limited significance. However, they become important for regional studies and are particularly significant when precipitation morphology is being quantified – including, for example, studies of storm life cycles and the determination of spatiotemporal scaling relationships required for downscaling.

This paper will look at the uncertainty structures associated with a range of satellite precipitation products, including CMORPH, 3B42 and PERSIANN and will consider the implications of these structures on the scaling and morphological properties of their associated precipitation fields, including their influence on point error distributions at a range of spatial and temporal resolutions. Uncertainty structures will be studied using both geostatistical and spectral approaches. A principal aim of the presentation will be to demonstrate that effective use of a particular precipitation product in a given application may require a detailed understanding of that product's composition.