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Surface Precipitation Advection from Microwave Sensor Overpasses

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A number of satellite rainfall algorithms, most notably CMORPH, employ surface rainfall advection determined from geostationary imagery as a mechanism to interpolate rainfall between microwave sensor overpasses. Unfortunately, cloud advection and rainfall advection do not always move in lockstep. Some of this disconnection may be attributed to the rapid development of the precipitation field, especially in convective regimes, and to differences in spatial and temporal scale between precipitation and advection products. However, it is also possible for high-level cloud motion to completely obscure underlying precipitation advection. It would therefore be useful to be able to derive surface rainfall advection from microwave sensor overpass data alone.

Deriving precipitation motion from the intermittent overpasses of a low Earth orbiting (LEO) sensor presents some significant challenges. Consecutive overpasses may be relatively infrequent with respect to the development of rainstorm systems, meaning that features will have changed considerably between overpasses. Moreover, the relative narrowness of a sensor swath means that features may move into or out of view. These difficulties make both template-matching and feature-identification-and-tracking approaches difficult to implement robustly. This paper describes the development of a hybrid tracking approach, specifically tailored to the problem of following evolving rainstorm structures through a microwave dataset obtained from multiple LEO platforms.