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Satellite-based rainfall estimates over West Africa based on combining Morphing and the Histogram-Matching techniques

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A new methodology based on a mixture of the Morphing and the Histogram-Matching technique is implemented and applied to the rainy season 2004 for the West Africa region (latitude between 5 S and 20 N, longitude between 25 W and 25 E). For this purpose currently one of the IR window channels of the Meteosat Second Generation (MSG) and the passive microwave channels of SSM/I, TMI, AMSR are exploited. Close to overpass times of the polar orbiting satellites the rainfall estimate derives from the usual passive microwave products which are advected in time with the morphing procedure. Because of the under-sampling of polar satellites especially in the equatorial region this product is complemented by a Histogram Matching technique, with a weight increasing with the temporal distance from the closest polar satellite overpass. Rainfall rates are generated at the spatial and temporal resolution of MSG. The derived accumulated precipitation at different spatial and temporal scales is compared with gauge data by common statistical parameters (bias, rmse, correlation coefficient). Weaknesses and potentials of the methodology are discussed in detail. Particular attention is paid to semi-arid regions where typically considerable disagreement exists between rainfall estimates from the Precipitation Radar and TMI both deployed on the TRMM (Tropical Rainfall Measurement Mission) satellite.