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Precipitation Estimation from Multi-Satellite Measurements using Machine Learning Methods

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Satellite remote sensing techniques provide a unique way to monitor precipitation at a global scale, especially for regions where ground measurements are limited. Effective integration of information from various sensors and platforms is essential for making reliable precipitation estimation. In this study, our recent development using machine learning approaches for precipitation estimation will be presented. The proposed methods use multi-spectral images from infrared, water vapor, and passive microwave sensors and platforms from geostationary and low earth orbits at high spatial and temporal resolutions (hourly & $0.04° \times 0.04°$ lat-long). Case studies are demonstrated through (1) effective processing large amount of satellite data, (2) applying feature extraction for satellite image classification, and (3) using artificial neural networks for precipitation estimation. Ground precipitation observations from Stage IV radar measurements are used for algorithm calibration and validation. Examples for near real-time monitoring extreme precipitation events from tropical storms and mesoscale convective systems (MCS) causing major floods will be evaluated using ground radar and gauge observations.