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Developing a remotely sensed rainfall retrieval algorithm using multi-spectral information

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Improving infrared-based rainfall retrieval algorithms using satellite-based multi-spectral infrared (IR) and microwave (MW) is the main objective of this study. Estimating accurate precipitation from remote sensing information is still a challenge, particularly, for remote and mountainous regions where ground-based gauge networks and radar coverage leave behind. A multi-sensor algorithm based on an artificial neural networks system is been developing for estimating more accurate rainfall using cloud-top IR from Geostationary Operational Environmental Satellite (GOES) in conjunction with microwave from Advanced Microwave Sounding Unit (AMSU). Remotely sensed infrared provides brightness temperature only from the cloud top, but microwave spectrum can penetrate deeper and provide properties from inside the clouds. Therefore, using multi-sensor IR and MW information is expected to improve the accuracy of precipitation estimates. NEXRAD stage IV data is used to train the ANN model and rain gauge observation is used to validate this algorithm. Warm season storms over the western United States are considered for this study. Preliminary investigation indicates that the higher frequency microwave (AMSU-89 GHz and -150 GHz), which is more correlated with rainfall, is an appropriate source of information to be combined with the GOES infrared channel 4 and used as model input for rainfall estimation. Preliminary results shows an average correlation coefficient of about 0.55 using GOES data as input in the model, and about 0.76 using the combination of MW and GOES data (about 0.81 for AMSU-89 GHz and, about 0.71 for -150 GHz).