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Multi-spectral remotely sensed snowfall rate estimation

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In the last three decades, remote sensing has rapidly explored various fields of applications. One of the challenges is application of remote sensing for estimating global precipitation (rainfall/snowfall) particularly over regions where traditional observation technique cannot cover. In this project, satellite based multi-spectral cloud information is used for snowfall rate estimation. The developed model uses cloud-top infrared (IR) from the Geostationary Operational Environmental Satellites (GOES) in conjunction with microwave spectral bands from Advanced Microwave Sounding Units (AMSU). Ground surface information (e.g. topography and temperature) and also some meteorological information (e.g. air temperature, relative humidity, and wind speed and direction) are used, in addition to remote sensing data, to improve snowfall detection and estimation. First, snowfall pixels are distinguished from rainy pixels and then snowfall rate is estimated at daily 0.25˚ x 0.25˚ resolutions. Snowfall area is detected when the maximum daily ground surface temperature (Ts) is less than 0º Celsius. Daily snowfall observation, only for selected snowy pixels, is the difference between the SWE (snow water equivalent) from SNOTEL station for the same and the previous days. An artificial neural network (ANN) system and a Fuzzy logic approach are used in this study.