

Radar-based Snowfall Estimates at Marquette, Michigan

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Level-I science requirements of the NASA's Global Precipitation Measurement (GMI) mission include the detection of falling snow by dual-frequency precipitation radar and GPM microwave imager within effective resolution of 5 km and 15 km, respectively. Both sensors are capable of quantifying the snow water equivalent (SWE) at their lowest clutter free bin after determining the precipitation phase. Considering validation of these products, the GPM ground validation program has been operating a field site at Marquette, Michigan (MQT) for the past two winters. The site consists of 10 Pluvio weighing bucket gauges and one of the Pluvios were collocated with autonomous PARASIVE² disdrometer unit (APU), precipitation imaging package (PIP), Micro Rain Radar (MRR), and this supersite was adjacent to the MQT National Weather Service (NWS) building.

This study aims to construct the radar-based SWE mapping utilizing the MQT radar and in-situ measurements. Event based reflectivity –SWE (Z-S) relationships will be derived employing collocated APU, PIP, and Pluvio measurements. APU has a built in algorithm to determine the precipitation phase and PIP provides the more accurate particle size distribution and snow depth. Pluvio outputs SWE at one-minute resolution but is more reliable for integration periods 20 minutes or longer. Bulk density will be determined from the ratio of event snow depth and event SWE total. The NWS measures the snow depth and SWE independently and the comparison of these measurements between the two sources will be included in this study. The study will include the comparison of radar SWE that are based on selected Z-S relationships from the literature. Pluvio gauges outside the NWS site will be used evaluation of radar SWE products.

Keywords: snowfall mapping