

Evaluating Fourteen Gridded SWE Products using Airborne Gamma Radiation SWE and Snow Course Transects

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ABSTRACT

Snow-related research in hydrological and climate sciences at continental and global scale typically rely on spatially distributed snow water equivalent (SWE) products. Recently, many gridded SWE datasets have been developed from climate, snow, hydrological sciences community, which must be validated with independent and reliable observations in various environments. Such validation is challenging due to limited spatial coverage of available reference data (e.g., snow course transects, and airborne flight lines) particularly in complex terrains, thus validation with multiple sources of reference data is required. In this study, we quantify 1) the spatial representativeness of SWE estimates from airborne gamma radiation measurements through comparisons at different distances from snow course transects and 2) the performance of fourteen gridded SWE products using gamma and snow course reference datasets over the continental U.S. and southern Canada.

Results show strong agreement between the gamma measurements and snow course transects at distances up to at least 50 km in the northeastern U.S. However, there is limited agreement beyond 5 km in the western U.S. likely due to more limited spatial representativeness of the gamma observations in complex topography. Among fourteen gridded SWE products, ERA5-Land and University of Arizona SWE showed the best performance with both reference SWE observations. This work supports global SWE evaluation efforts within the European Space Agency (ESA) Satellite Snow Product Intercomparison and Evaluation Exercise (SnowPEX), by providing guidance on integrating different sources of reference data.

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