Merging Models with Observations to support Open Science, NASA SnowEx, and Snow Satellite Missions

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ABSTRACT

Seasonal snow accumulation and melt have a critical role in global water and energy budgets, and the 2017 Earth Science Decadal Survey recommended snow water equivalent (SWE) as an "explorer priority" for future missions. In recent years, NASA SnowEx field campaigns have tested multiple remote sensing techniques as potential mission concepts by collecting ground and airborne observations of snow across a range of land cover and snow types. However, a single sensor will not be able to provide estimates of all snow types in all conditions globally; instead, an integrative approach is required, utilizing multiple observational sources and merging them with models for complete spatiotemporal coverage.

To address the need for an observation-model merging environment for improving estimates of snow properties such as SWE, snow density, snow grain size, and albedo, we discuss plans for the upcoming 2023 SnowEx Alaska campaign. Field and modeling efforts will be brought together, including running near real-time model simulations with the NASA Land Information System (LIS) and designing assimilation experiments once field observations have been collected. We also present ongoing efforts with the NASA Earth Information System (EIS), a project focused on open science and improving the accessibility of data. Discussions will include a pilot study of extreme snowmelt flooding in the Midwest U.S. and how EIS efforts can help build an observation-model environment for snow that addresses the need for open-source science.

Such data integration approaches not only benefit field campaigns but merging model and field efforts will also be a crucial step in a future snow mission. This presentation will include a discussion on how the SnowEx model-data fusion work can inform future plans for a snow satellite mission and how such efforts should meet NASA's commitment to open science.

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