Synthetic Comparisons of Snow Observation Constellation Configurations

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ABSTRACT

Obtaining an accurate, global picture of snow mass has proven to be a challenge, in part because no single type of observation or retrieval algorithm works for all types of snow under all conditions. One solution is to combine different observation types – passive microwave, active microwave, passive optical, and active thermal – and to merge those observations with a land surface model in order to synthesize a global snow mass product. Sensors already in orbit, plus sensors planned to be launched in the future, can be merged to explore a multitude of different information mixes, including LiDAR, RADAR, and radiometry. Within this mix of different sensors is a complex tradespace involving swath width, repeat interval, orbit inclination, footprint size, footprint spacing, observation accuracy, and error characteristics.

The study presented here utilizes NASA's Land Information System (LIS) in conjunction with the Tradespace Analysis Tool for Constellations (TAT-C) to explore potential combinations of existing and future sensors. For a given orbital configuration and mix of sensors, these simulations help quantify how much of the seasonal snow world can be observed, how often, with what footprint size and spacing and with what swath width. Such information will be highly valuable for informing discussions on future snow mission concepts. It will also highlight where modeling efforts can provide the greatest impact and perhaps indicate the parameters needing the greatest improvements in accuracy or precision. The results of the simulations will help make progress toward accurate global snow products.

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