Global Snow from Space: Development of a Satellite-based, Terrestrial Snow Mission Planning Tool

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ABSTRACT

A global, satellite-based, terrestrial snow mission planning tool is proposed to help inform experimental mission design with relevance to snow depth and snow water equivalent (SWE). The idea leverages the capabilities of NASA’s Land Information System (LIS) and the Tradespace Analysis Tool for Constellations (TAT-C) to harness the information content of Earth science mission data across a suite of hypothetical sensor designs, orbital configurations, data assimilation algorithms, and optimization and uncertainty techniques, including cost estimates and risk assessments of each hypothetical permutation.

One objective of the proposed observing system simulation experiment (OSSE) is to assess the complementary – or perhaps contradictory – information content derived from the simultaneous collection of passive microwave (radiometer), active microwave (radar), and LIDAR observations from space-based platforms. The integrated system will enable a true end-to-end OSSE that can help quantify the value of observations based on their utility towards both scientific research and applications as well as to better guide future mission design. Science and mission planning questions addressed as part of this concept include:

1. What observational records are needed (in space and time) to maximize terrestrial snow experimental utility?
2. How might observation be coordinated (in space and time) to maximize this utility?
3. What is the additional utility associated with an additional observation?
4. How can future mission costs be minimized while ensuring Science requirements are fulfilled?

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