Improving Surface Mass Balance Over Ice Sheets and Snow Depth on Sea Ice

Surface Mass Balance and Snow on Sea Ice Working Group (SUMup); Greenbelt, Maryland, 20–21 September 2012

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Surface mass balance (SMB) over ice sheets and snow on sea ice (SOSI) are important components of the cryosphere. Large knowledge gaps remain in scientists' abilities to monitor SMB and SOSI, including insufficient measurements and difficulties with satellite retrievals. On ice sheets, snow accumulation is the sole mass gain to SMB, and meltwater runoff can be the dominant single loss factor in extremely warm years such as 2012. SOSI affects the growth and melt cycle of the Earth's polar sea ice cover. The summer of 2012 saw the largest satellite-recorded melt area over the Greenland ice sheet and the smallest satellite-recorded Arctic sea ice extent, making this meeting both timely and relevant.

Although the two communities studying SMB and SOSI often work and publish separately, the physical processes influencing their mass budgets are held in common. The Surface Mass Balance and Snow on Sea Ice Working Group (SUMup) brings together modelers, remote sensors, and field practitioners to improve monitoring and modeling efforts over both the ice sheets and sea ice.

The inaugural meeting of SUMup was sponsored and hosted by NASA and took place at NASA's Goddard Space Flight Center. The meeting had approximately 30 attendees representing multiple universities, international collaboration, and two government agencies. The inaugural meeting focused on answering the questions, What is the current state of knowledge of SMB and SOSI, and where is further research needed?

The working group discussed the current knowledge of SMB and SOSI from the perspective of modeling and reanalysis, remote sensing, and field measurements. Noteworthy presentations highlighted discontinuities in reanalysis products, caused by changes in ingested satellite data. The discontinuities make trend predictions of precipitation over the Arctic and Antarctic unreliable. This issue emphasized the need for ice cores across the ice sheet and measurements of SOSI for trend analysis. The severe lack of information on SOSI and precipitation over the Southern Ocean was identified as the major limitation for studies of Antarctic sea ice. Other key areas identified by meeting members included the need for additional process studies of blowing snow and water vapor mass flux and quantifying meltwater volume, meltwater retention, and routing.

Recommendations from the working group include additional comparisons of field measurements to modeled parameters and remote sensing derivations as well as running regional atmospheric models over both ice sheet and sea ice domains. Additional recommendations include improving albedo retrievals and conducting model runs to determine the sensitivity of ice sheets to changes in surface mass balance.

SUMup wrote and delivered a bulleted list of the key science questions and recommendations to the NASA Cryospheric Sciences Program. The working group will continue collaborating openly with community members to provide a standardized set of field measurements of accumulation over the ice sheets, snow depth over sea ice, and snow density measurements for easier use within the modeling and remote sensing communities. Anyone wishing to contribute to these data sets or read the summary list can do so at the SUMup Web site at http://neptune.gsfc.nasa.gov/csb/index.php?section=267.

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