Evaluation of forest snow process models (SnowMIP2)

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OVERVIEW

Huge areas of the Northern Hemisphere are both forested and have seasonal snowcover (see Figure 1). As a consequence, understanding the influence of forest snow processes on a changing climate, and the response of forest snow processes to a changing climate, is important for understanding climatic and land-use change, as well as weather forecasting and water resources.

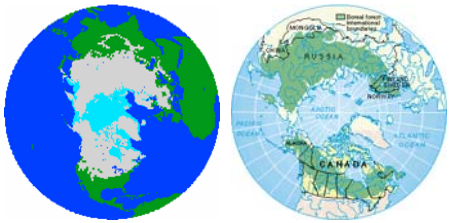


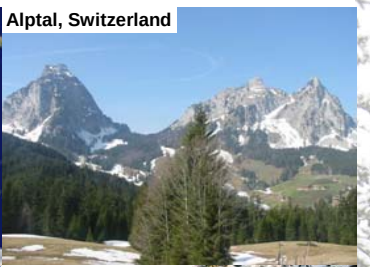
Figure 1. *Northern hemisphere snowcover extent in January 1995 (image from NSIDC) and the distribution of boreal forests (image from Natural Resources Canada).*

Current land-surface models either neglect or use highly simplified representations of physical processes controlling the accumulation and melt of snow in forests. To improve these representations we have been commissioned by the IUGG Commission for the Cryospheric Sciences to coordinate an intercomparison of uncoupled simulations of snow in forest environments, i.e. the Snow Model Intercomparison Project 2 (SnowMIP2), and this project has been adopted as an activity of the Climate and Cryosphere project (CliC) and the Global Land/Atmosphere System Study (GLASS). SnowMIP2 has been designed to (1) quantify uncertainty in simulations of forest snow processes from current land-surface models and, (2) suggest improvements and appropriate complexity for forest process models.

METHODS

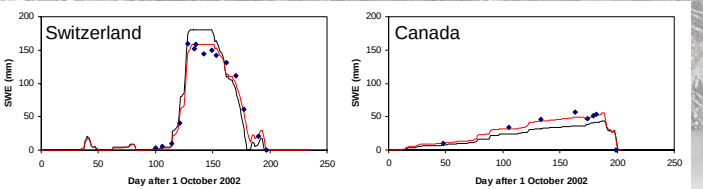
SnowMIP2 will compare results of land-surface models, over a wide range of snow and forest canopy conditions, describing snowpacks in forested and open areas that result from different climatic regimes. Meteorological driving data, other site-specific initialisation data and metadata have been gathered from five locations (see adjacent panel) in the Northern Hemisphere. Each location consists of a forested and an open site. Up to two winter seasons of data from each site will be made available to participating modellers, primarily to estimate snow depth and snow water equivalent. Comparison of modelled results with observations and further analyses of snowpack characteristics, where appropriate, will be performed by the SnowMIP2 coordinators.

SITE CHARACTERISTICS



Site	Forest type	Vegetation height (m)	Elevation (m)	Aspect	Slope Angle	Mean Air Temp	Max Air Temp	Min Air Temp	Total annual snowfall
Switzerland	85% Norway Spruce; 15% Silver Fir	25	1220	W	20	2.01	24.4	-19.42	510 mm for 2002-2003; 708 mm for 2003-2004
USA	Lodgepole Pine	30	2820	SSW	30	-2.46	23.24	-27.28	354 mm for 2003-2004; 414 mm for 2004-2005
Japan	Todo Fir	7.8	182	N	5	1.04	27.9	-20.2	188 mm for 1997-1998
Finland	Scots Pine	16	181	-	0	-0.72	25.4	-26.2	N/A
Canada	Jack Pine	15	579	-	<5	-9.27	26.3	-39.11	104 mm for 2002-2003; 184 mm for 2003-2004

PILOT SNOW WATER EQUIVALENT SIMULATIONS



SWE observations (diamonds) and MOSES simulations with default (black line) and calibrated (red line) parameters for Swiss and Canadian forested sites in 2002 - 2003.

ANALYSES

Initial analyses will focus on:

- Comparison of model results with observations of snow accumulation and ablation and energy fluxes at individual locations.
- Comparison between simulations for different years and between different sites at each location for individual model.

Further analyses will compare process observations with model algorithms to investigate the sensitivity of snowpack models to canopy processes through two alternative, yet complementary, methods:

- Isolation of individual processes represented within models, and comparison of process observations with these model algorithms.
- Use of a bespoke, complete surface energy- and mass-balance model (currently under development) that allows adjustable and interchangeable process representations spanning the range used by models participating in SnowMIP2.

CALL FOR PARTICIPATION

For SnowMIP2 to be as successful as possible, we would like a wide range of models that include forest-snow interactions to be involved. Conclusions from this study will be discussed and published in co-authored papers by all the data providers and modelling participants. We currently welcome any interested parties to participate in SnowMIP2. Further information can be obtained from the SnowMIP2 web site:

http://users.aber.ac.uk/rie/snowmip2.html

As driving and initialisation data will be disseminated in the early summer of 2006 we strongly encourage any interested parties to contact us at:

snowmip2@aber.ac.uk

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