ICSU International Polar Year 2007/08

STATEMENT of INTENT by
NASA Cold Land Processes Working Group

Pan Arctic Snow Observation and Modeling:
A leap-ahead in understanding Arctic terrestrial snowpack dynamics

Overview:
The NASA Cold Land Processes Working Group (CLPWG) proposes to coordinate implementation of a
tiered system for monitoring the Pan Arctic dynamics of the terrestrial snowpack, particularly in regards
to its effects on fresh water supply to the Arctic Basin and its significant coupling to the atmosphere. The
system of monitoring Arctic terrestrial snow will include three categories of ground measurements: long-
term research areas, field campaigns associated with the IPY, and cooperative measurements by
educational institutions. These will be tied together using remote sensing and modeling in an analytical
framework to provide complete spatial coverage. The objective will be to provide a complete and
consistent spatial and temporal baseline analysis of terrestrial snow dynamics over a 2-season period
beginning with the IPY, and a basis for repeating this analysis at regular intervals thereafter to assess
variability and change.

Contacts for this proposal:

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Rationale:
Fresh water inputs to the Arctic Basin have become increasingly important to research assessing the
effects of global climate change. A significant proportion of fresh water discharge to the Arctic Basin
derives from snow melt. Understanding of Pan Arctic snowpack dynamics and its effects is hindered by
sparse and inconsistent in situ snow observations, by limitations of optical remote sensing in this region,
and by questions regarding passive microwave remote sensing in this region. There is a dramatic decrease
(both spatially and temporally) of ground-based snow observations poleward of about 50° North latitude.
Various long-term research programs operating in the region provide snow measurements, but these are
typically spatially, temporally and methodologically inconsistent. Optical remote sensing of snow cover
extent at high latitudes is limited by solar illumination during the winter and early spring, and frequently
by extensive cloud cover. Passive microwave remote sensing of snow water equivalent exhibits well-
known but unexplained anomalies in areas from the northern boreal forest northward of the tundra-taiga
transition to the edges of the arctic basin. The proposed monitoring system will address these issues by
coordinating consistent in situ snow observations with long-term research projects and cooperative
researchers, by targeting IPY field campaigns to address areas of significant uncertainty, and by
implementing an analytical modeling framework to tie snow observations together. It is currently
accepted that modeling the components of the pan-arctic terrestrial hydrology, including snow has more
credibility than gridded fields produced by measurements alone.