

GCW Snow-Watch Workshop, Toronto, January 28-30, 2013

Summary of Recommendations and Action Items (20/02/2013)

Environment Canada hosted a first workshop on implementing a Snow-Watch component of the World Meteorological Organization Global Cryospheric Watch programme at Downsview from January 28-30, 2013. Twenty-eight scientists from nine countries (Austria, Canada, Finland, Italy, France, Norway, Switzerland, United Kingdom and USA) participated in this initial workshop to determine the current state of global snow monitoring, to identify critical issues affecting the ability to provide authoritative information on the current state of snow cover, and to initiate GCW Snow-Watch projects to address priority areas. The workshop presentations, list of participants, participant questionnaire responses and rapporteur summaries are provided online at WMO http://www.wmo.int/pages/prog/www/polar/index_en.html.

The final recommendations for priority areas and potential GCW projects are provided below based on the questionnaire responses and workshop discussions:

1. Improve real time flow and access to in situ snow measurements

This was rated as one of the highest priority items for GCW in the questionnaire. Specific issues raised related to in-situ data included the lack of zero-depth reporting on the GTS network, non-reporting of snow depth observations by some countries, small numbers of US snow depth reports on SYNO messages, a need for standardized QC of snow depths from autostations, and the development of a global historical in situ snow data archive to support climate monitoring, model evaluation and process studies.

Action: Eric Brun (Meteo-France) agreed to lead a team to improve data exchange on the GTS, to demonstrate the advantages to NWP of zero-snow depth reporting, and to brief EC-PORS and get their support. Jay Lawrimore (NCDC), Sean Helfrich (NCDC) and Patricia De-Rosnay (ECMWF) agreed to contribute to this effort.

Action: Barry Goodison agreed to lead a data rescue project to identify paper and digital snow data that were not readily available in an existing archive. Julie Friddell (U. Wtaerloo), Jay Lawrimore (NCDC) and Kari Luojus (FMI) volunteered to assist Barry.

2. Initiate a satellite snow products evaluation/intercomparison activity

There was widespread agreement amongst workshop participants that a comprehensive evaluation/intercomparison of snow cover products was a high priority for GCW given the increase in the number of products in recent years and the need to provide

uncertainty estimates for assimilation of data into operational snow analysis schemes. For example, Drew Slater provided results of an intercomparison of gridded SWE products that revealed serious problems with SWE estimates obtained solely from SSM/I and AMSR-E brightness temperatures (SWE values unrealistically high over Siberia). These data have been used to evaluate climate models with erroneous conclusions published in the literature.

Action: Bojan Bojkov (ESA) agreed to lead a GCW intercomparison project of SE and SWE algorithms and products that followed well defined, and community accepted, protocols both for the generation of datasets and for the validation/intercomparison. He proposed an algorithm *round-robin* approach following the ESA CCI Programme using independent *in situ* validation datasets of quantified quality. The results would be formally reviewed by independent reviewers. Drew Slater (NSIDC), Chris Derksen (EC), Ross Brown (EC), Richard Fernandes (CCRS), Kari Luojus (FMI), Thomas Nagler (Enveo IT GmbH) and Dorothy Hall (NASA) agreed to participate in this project.

Action: Richard Fernandes (CCRS) proposed a parallel initiative for a PI self-assessment of snow cover products to provide quick feedback on the strengths and weakness of current snow cover products to the user community. This may help avoid situations such as that described above where products with known weaknesses contribute to misleading conclusions. Kari Luojus (FMI) and Dorothy Hall (NASA) agreed to participate in developing this project.

3. Development of hemispheric "snow anomaly trackers" for SE and SWE

Kari Luojus (FMI) presented a prototype anomaly tracker for near real-time monitoring of SWE and SE anomalies at global to continental scales following the sea ice anomaly tracking at NSIDC. These could be highly visible GCW tools for identifying and monitoring the development of snow cover anomalies e.g. below-normal winter snow accumulations, advanced snow melt. This information can be used to inform decision makers and the public, and also to promote media interest in snow cover. In order to be "authoritative" tracker products will need to be based on multiple products and be supported by a credible team of experts.

Action: Kari Luojus (FMI) agreed to lead a project to develop this concept with Ross Brown (EC), Chris Derksen (EC), Dave Robinson (Rutgers U) and Stefan Wunderle (U. Bern).

4. Develop inventory of existing snow datasets

The development of a baseline inventory of snow-related datasets was considered an important priority for GCW. This would contribute to several of the activities mentioned above.

Action: Ross Brown (EC) and Julie Friddell (U. Waterloo) agreed to take the lead on pulling this together.

5. Initiate activity to standardize snow-related nomenclature, and promote standards and best practices as a contribution to CryoNet

The standardization of observing practices and snow-related nomenclature was considered a high priority activity in the questionnaire particularly for snowfall and solid precipitation where practices vary widely between countries. This activity will contribute to the GCW CryoNet activity which aims to establish a network of cold region reference sites with sustained, standardized observing programmes for climate and cryospheric variables.

Action: Barry Goodison agreed to lead an activity with Thomas Nagler (Enveo IT GmbH). Jeff Key (NOAA) volunteered to compile a list of snow measurement-related manuals and reference material.

6. Follow-up meetings

It was agreed that the GCW Snow-Watch community needed to meet regularly and that it also needed to respond to snow monitoring issues in the Southern Hemisphere and Asia e.g. through regional meetings and regional initiatives.

Action: Stefan Wunderle (U. Bern) invited the GCW Snow-Watch workshop participants to meet in Bern in February 2014 as part of the 7th EARSeL Snow and Ice Workshop.

Action: Sean Helfrich (NOAA) indicated he was interested in hosting a small, focussed North American snow cover monitoring working group meeting in the fall of 2013.