Geophysical Research Abstracts
Vol. 18, EGU2016-14229, 2016
EGU General Assembly 2016

The Glaciers of HARMONIE

Ruth Mottram (1), Emily Gleeson (2), and Kristian Pagh Nielsen (1)

(1) Arctic and Climate Research, Danish Meteorological Institute, København, Denmark (rum@dmi.dk), (2) Met Éireann, Glasnevin Hill, 9 Dublin D09 Y921, Ireland

Developed by the large ALADIN-HIRLAM consortium, the numerical weather prediction (NWP) model system HARMONIE is run by a large number of national weather services and research institutions in Europe, the Middle East and North Africa for weather forecasting. It is now being adopted for climate research purposes as a limited area model in a form known as HCLIM. It is currently run for a number of domains, mostly in Europe but also including Greenland, at a very high resolution (∼2.5 km). HARMONIE is a convection permitting non-hydrostatic model that includes the multi-purpose SURFEX surface model.

By improving the characterization of glacier surfaces within SURFEX we show that weather forecast errors over both the Greenland ice sheet and over Icelandic glaciers can be significantly reduced. The improvements also facilitate increasingly accurate ice melt and runoff computations, which are important both for ice surface mass balance estimations and hydropower forecasting. These improvements will also benefit the operational HARMONIE domains that cover the Svalbard archipelago, the Alps and the Scandinavian mountain glaciers. Future uses of HCLIM for these regions, where accurately characterizing glacial terrain will be crucial for climate and glaciological applications, are also expected to benefit from this improvement.

Here, we report the first results with a new glacier surface scheme in the HARMONIE model, validated with observations from the PROMICE network of automatic weather stations in Greenland. The scheme upgrades the existing surface energy balance over glaciers by including a new albedo parameterization for bare glacier ice and appropriate coefficients for calculating the turbulent fluxes. In addition the snow scheme from the SURFEX land surface module has been upgraded to allow the retention and refreezing of meltwater in the snowpack. These changes allow us to estimate surface mass balance over glaciers at a range of model resolutions that can take full advantage of the high resolution non-hydrostatic dynamical scheme within the Harmonie system.