Operational weather prediction for Greenland with high resolution NWP forecast system HARMONIE-arome

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Weather forecasting for Greenland is a great challenge for the NWP community. Associated with a huge icecap and a steep and complex orography in coastal regions, Greenland suffers frequent weather events with many extremes in small scales. While the island is the largest in the world, its surface observation network is extremely sparse and inadequate. At Danish Meteorological Institute (DMI), the responsible authority for routine weather forecast in Greenland, recent years have seen significant progresses in its skills and capability in forecasting of Greenland weather. With implementation of the mesoscale non-hydrostatic forecast system Harmonie-arome, it becomes possible to make high resolution weather forecast and warnings for hazardous and extreme weather associated with complex orography near Greenland coasts. Especially, operationalisation of hectometric scale Harmonie-arome setup with a grid scale of 750 m for southern Greenland and southeast coast regions brings to local community with forecast and warnings with unprecedented accuracy, especially for small scale weather extremes such as Piteraq (cold katabatic wind storm) , which has been hard to achieve with coarser resolution forecast models. Meanwhile, the overall forecast skills for Greenland regions in general lag significantly behind those for other regions, many work remains, such as resolution improvement and quality control about orographic and physiogeographical databases, utilisation of observation data in an area with sparse surface observation, handling of arctic type climate with snow, ice and permafrost, physical parameterisation for small scale processes. In this presentation, we review main characteristics of the present system configuration, discuss various known deficiencies and performance issues with the models, as well as challenges and ongoing efforts about various aspects of the model including those for sub-km applications.