

---

# Development of kilometer scale regional data assimilation for Copernicus Arctic Regional Reanalysis

Xiaohua Yang<sup>\*†1</sup>, Jelena Bojarova<sup>2</sup>, Harald Schyberg<sup>3</sup>, Roger Randriamampianina<sup>3</sup>, Per Dahlgren<sup>3</sup>, Bjarne Amstrup<sup>1</sup>, Kristian Pagh Nielsen<sup>1</sup>, Mariken Homleid<sup>3</sup>, Bolli Palmason<sup>4</sup>, Mats Dahlbom<sup>1</sup>, and Magnus Lindskog<sup>2</sup>

<sup>1</sup>Danish Meteorological Institute – Lyngbyvej 100, 2100 Copenhagen, Denmark

<sup>2</sup>Swedish Meteorological and Hydrological Institute – SE-601 76 Norrköping, Sweden

<sup>3</sup>Norwegian Meteorological Institute [Oslo] – Meteorologisk Institutt, Henrik Mohns Plass 1, 0313 Oslo, Norway

<sup>4</sup>Icelandic Meteorological Office – Icelandic Meteorological Office, Iceland

## Abstract

Copernicus Arctic Regional Reanalysis covers the recent three decades for the European arctic at 2.5 km grid. The region is characterised by extensive areas with complex orography, cold surfaces and weather with strong local variability. It has a sparse conventional observation network. The reanalysis system is adapted from the HARMONIE-AROME NWP system, focusing on improved treatment of cold surfaces and enhancement on data input for physiographic databases, ocean and sea ice, snow and use of remote sensing data. A large amount of surface observations, including those over icecap, has been collected with quality control, resulting in significantly more use of surface data than in ERA5. High resolution, gap free albedo data over permafrost regions in the region have been used to improve physical realism. Efforts have been spent to enhance representation of the background error covariance model, and for optimal use of large scale information from the lateral boundary model in the analysis. From verification intercomparison, it appears that high resolution and the above mentioned enhancement in enhancement on data input, assimilation algorithm and treatment for cold surface have all contributed to the added values in the reanalysis. In this talk, we also discuss about weakness of assimilation system as found in some of the analysis bust cases. The work is part of the Copernicus Climate Change Service. ECMWF implements this Service on behalf of the European Commission.

**Keywords:** high resolution Km scale, regional reanalysis, Harmonie, arome system, Arctic, surface observation, large scale constraints

---

\*Speaker

†Corresponding author: xiaohua@dmi.dk