# USE OF SATELLITE RADIANCES IN REGIONAL REANALYSIS

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The Copernicus Arctic Regional Reanalysis (CARRA) is a regional climate reanalysis covering the years 1991 until close to real-time. It is freely available as part of the Copernicus Climate Change Service (C3S). C3S is managed by the European Centre for Medium-Range Weather Forecasts (ECMWF) on behalf of the European Commission. It is produced with a non-hydrostatic mesoscale numerical weather prediction (NWP) model, HARMONIE-AROME, on a grid mesh with 2.5km spacing and upper-air observations are assimilated with a 3D-Var technique.

Reanalysis system configuration

- Two domains, areas of interest in the European sector of the Arctic
- HARMONIE-AROME NWP model
- 3D-Var upper air analysis
- 3 hour cycling, i.e. an analysis is done every 3:rd hour at:
- 00, 03, 06, 09, 12, 15, 18 and 21 UTC
- 2.5km horizontal resolution
- Hourly ERA5 analyses as lateral boundary conditions
- Satellite radiances used:
- Microwave Satellite Unit (MSU), Advanced Microwave Sounding Unit (AMSU) A and B, Microwave Humidity Sounder (MHS), Infrared Atmospheric Sounding Interferometer (IASI)
- Other satellite based observations used:
- Atmospheric Motion Vectors (AMV), Scatterometer and Radio Occultations (GNSS-RO)
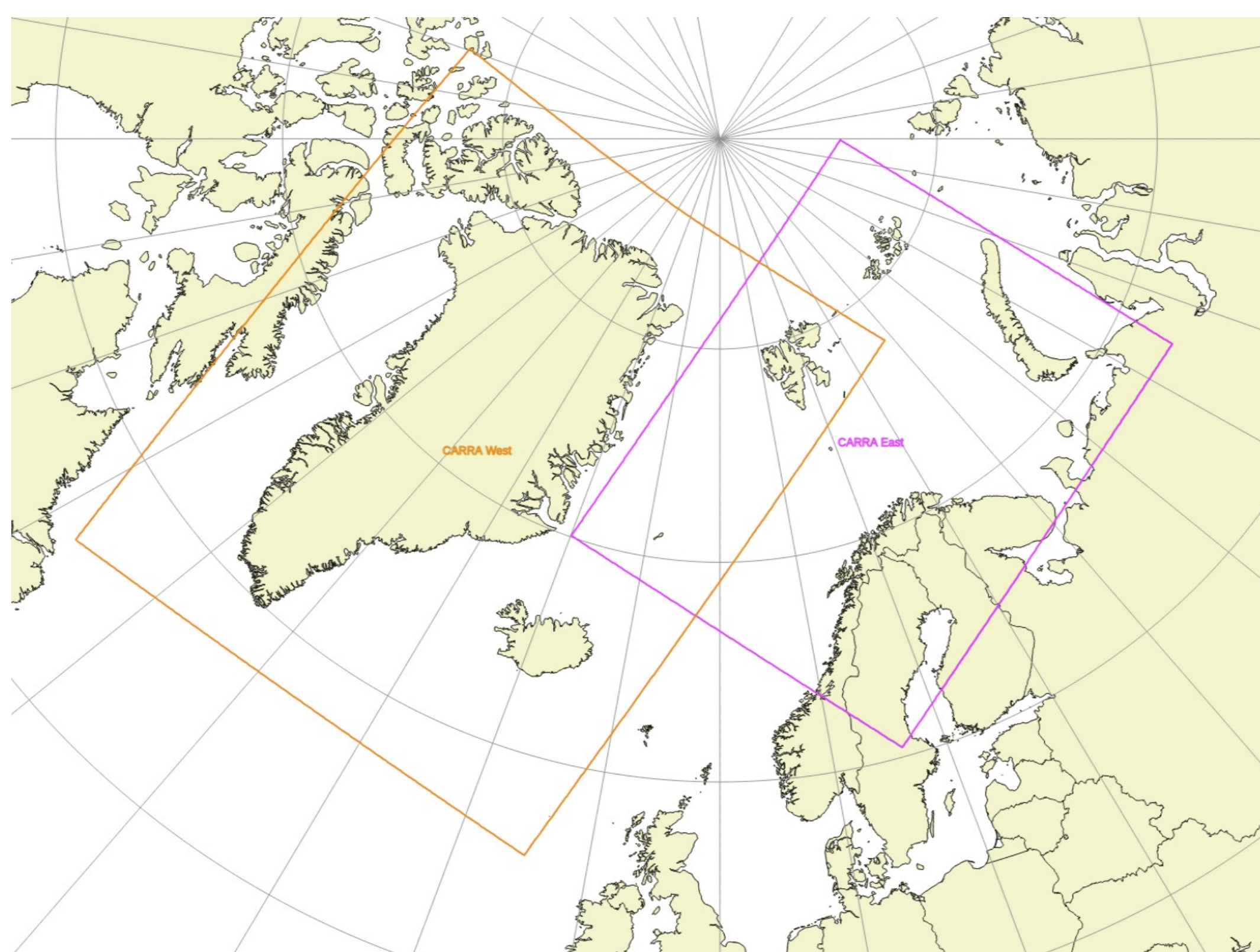
We present here a comparison between CARRA and ERA5 for the full reanalysis period in their use of microwave temperature sensing radiances (MSU channel 3 and 4 + AMSU-A channel 7 and 9). The ERA5 data has been geographically screened so that only data covering the CARRA domains are used for a clean comparison. These are the first publicly presented statistics of first guess fit to radiances in CARRA for the full reanalysis period.

West domain

East domain
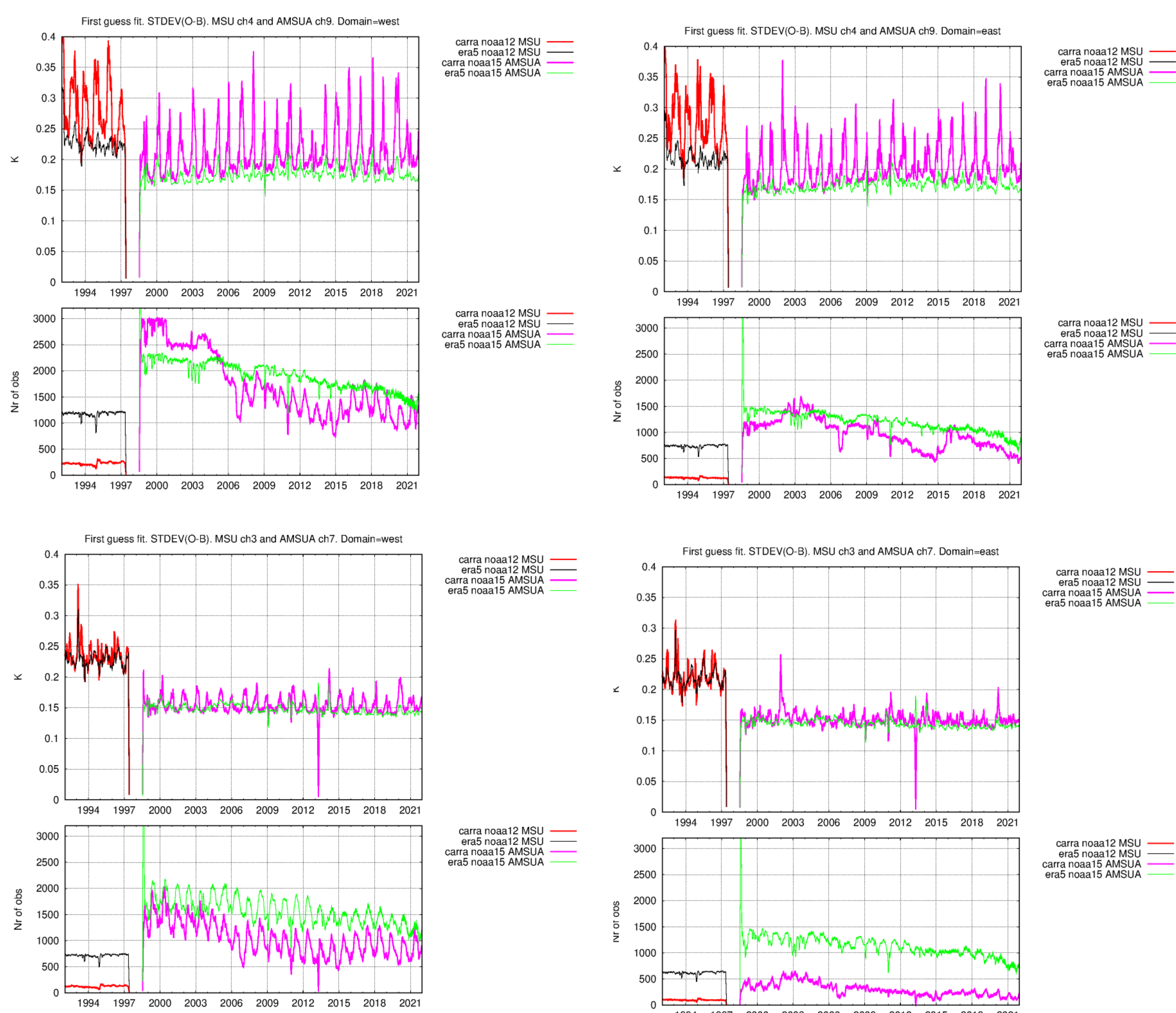
First guess fit (top figures) and number of observations used (bottom figures) of ERA5 (red and magenta) and CARRA (black and green). A 30 day moving average has been applied. **MSU channel 4 and AMSU-A channel 9**. ERA5 has a slightly better first guess fit and CARRA has a very large seasonal variation (top figures).

Same as above but here it is **MSU channel 3 and AMSU-A channel 7**. ERA5 and CARRA have similar first guess fit and the seasonal variation in CARRA is much less pronounced compared to channel 9.

The project team

The project was led by the Norwegian Meteorological Institute. Partners were the meteorological services in the Nordic countries (DMI from Denmark, FMI from Finland, IMO from Iceland and SMHI from Sweden) and Météo-France.

Norwegian Meteorological Institute | DMI | SMHI | Icelandic Met Office | METEO FRANCE | FMI