

CS1 Winter tourism centers in Northern Finland

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This case study focuses on providing relevant predictions on snow cover for a partner ski resort to allow preparation for the winter season. Ruka is a Northern Finnish ski resort that welcomes around 400,000 skiers annually.

RUKA needs

RUKA's needs are the following:

- Winter: Both short (daily/monthly/seasonal) and long term (5-year intervals) are interesting, but especially long term. If exact data is not available, even patterns and estimates can help. Temperature, wind, humidity, cloudiness, snow fall amounts, changes in winter season length and when winter starts/ends.
- Summer: Temperature, rainfall, sunshine, humidity, how the changes in weather/climate affect nature in general.
- Scale: Ideally a 'micro-forecast', i.e. focusing on the ski resort and immediate area.
- Global trends: El Nino/La Nina and how they affect the weather and climate conditions in their area.

The first workshop with RUKA was held in Spring 2017: The results of this workshop are highlighted in the Deliverable D5.1 "CS1 End User Needs Report"¹ and its contents won't be reported in here. From the initial list of end-user knowledge needs, the co-design process has continued as learning cycles during more a case study meeting and workshop in RUKA in Winter 2018. While in the earliest stages of the case study co-design process, RUKA staff was not entirely sure of the usefulness of for instance hindcasts, hindcasts are used for validating the climate service **SnowApp**.

Variables to be looked at:

- Temperature
- Humidity
- Wind speed.

RUKA location is 66°09'N 29°09E.

¹ <https://www.zenodo.org/record/1164104>

Data source Nr. 1

Provider: UHAM/DWD

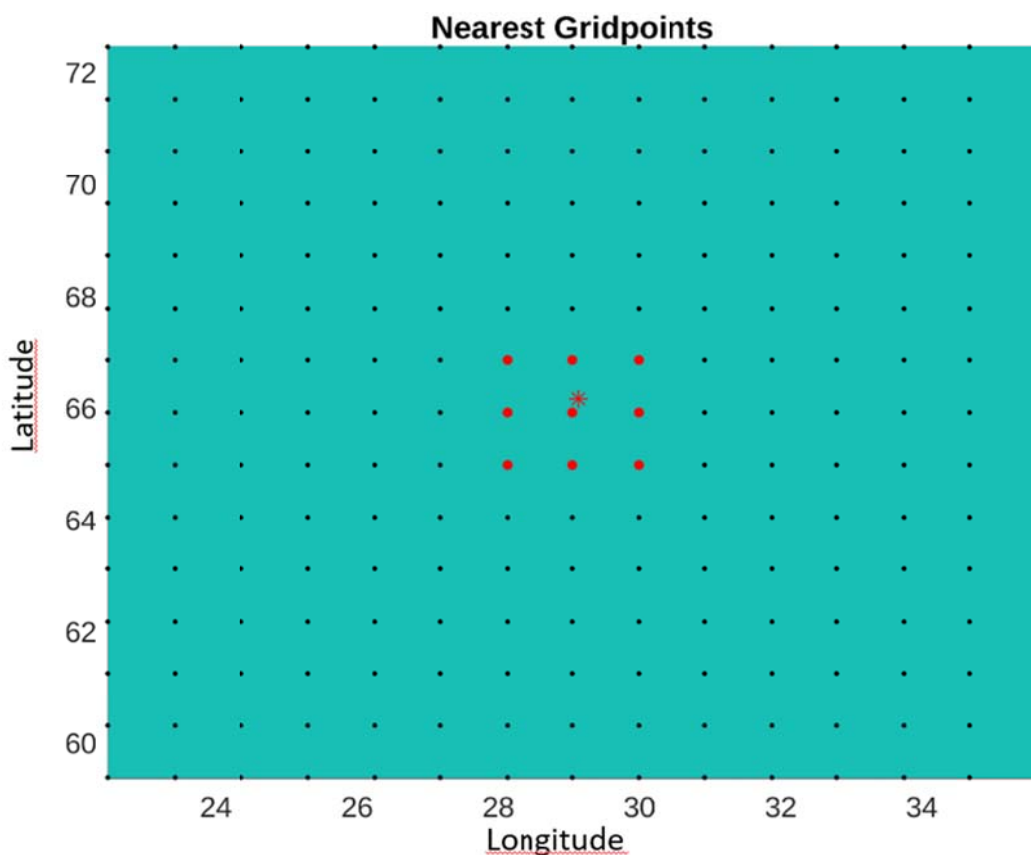
What has been provided:

a) Hindcasts

- Hindcast data have been made available since the summer 2019 from GCF52.0. A manual related to the model GCF52.0 was made available in April 2020.
- Surface temperature and at 2 meters; specific humidity files 1000hPa; wind speed.
- 6 months hindcast simulations are available starting every May/Nov between 2014 - 2018 with 20 ensemble members each, in netCDF format. As a reference data set, the Univ. Hamburg uses the ERAinterim reanalysis for the meteorological data.
- Earlier, we had a set of hindcast simulations covering other time periods.

b) Forecasts

- Forecasts: 10 Ensemble members from the October 2019 forecast onwards.. Length of 6 months. Provided monthly by DWD and added to the SnowApp by CS1.
- Spatial resolution: The data consists of 9 grid cells between 22.5° to 35.6°E and 59.4° to 72.5°N around Ruka (66°09'N 29°09'E).



Climate data from GCFS2.0 are provided to Blue-Action WP5 CS1 by WP1 / DWD (Deutsche Wetterdienst) according to a pre-defined list of specifications:

- 1) All data are six months
- 2) All data is 6 hourly
- 3) Each dataset has a grid 15 x15 (225) geographic cells centered on RUKA – i.e. cell(8,8) contains the lat. and lon. of RUKA 66° 11'N 29° 06'E
- 4) For each cell we have:
 - Surface temp,
 - 2m temp,
 - 100kPa humidity
 - windspeed (as two orthogonal vectors \vec{u} \vec{v})
- 5) each of these comes as an ensemble of 10

No long-term data will be incorporated in the climate service co-designed by CS1, but focus will be on seasonal forecast as described above.

Data availability: Currently we have a 250 GB SFTP server in use for the case study, e.g. for transferring and storing the monthly data sets we receive from DWD. We get 6 month forecast data with the agreed specifications from DWD each month, so there are already quite a few of data sets.

We are planning to move these data sets from our server to the Blue-Action community in Zenodo² for storage and compliance with the FAIR principles and open access, as soon as we receive permission from DWD.

² <https://www.zenodo.org/communities/blue-actionh2020>

Data source Nr. 2

Provider: Finnish Meteorological Institute (FMI)

What has been provided: More data related to **real temperature** have been provided by the Finnish Meteorological Institute. Data from two stations located in Northern Finland have been collected: temperature, pressure, moisture, wind. The data provided by the Finnish Meteorological Institute correspond to the interval 04.11.93 - 23.05.2017, from the stations Kuusamo Rukatunturi and Kuusamo Ruka Talvijärvi.

Data availability: These data belong to FMI and are available at <https://en.ilmatieteenlaitos.fi/download-observations#!/> under the Creative Commons Attribution 4.0 International license.

Additional remarks

Ruka uses weather forecast from FMI, Foreca, Yr.no and other similar services as additional information sources to the SnowApp in their decision-making on snowmaking, also during the test round 2019/2020, as foreseen and planned in D5.1-D5.3.

In the future, for this case study, more data can be obtained from the Norwegian Meteorological services.