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Deutscher Wetterdienst
Wetter und Klima aus einer Hand

A new dataset for climate change studies in complex alpine terrain *(in the making)*

Katrin Sedlmeier[1], Annette Lotz[2], Oliver Nitsche[1], Sebastian Heiser[1], Ivan Paunovic[1], Lothar Bock[1], Gudrun Mühlbacher[1]
[1]German Meteorological Service (DWD), Munich, Germany
[2] Berchtesgaden National Park, Berchtesgaden, Germany

Goal

High resolution gridded dataset for temperature, relative humidity, precipitation and temperature for the Berchtesgaden National Park for climate change studies and model verification.

Motivation

The Berchtesgaden National Park, located in the Bavarian Alps in Southeastern Germany, is a highly interesting study field due to its extreme topography (~ 600 - 2700 m.a.s.l.) and climate conditions.
Ground measurements of temperature, relative humidity, precipitation and wind go back as long as the 1980s with stations in different altitudes covering the complex terrain. However, up to now, there is no unified dataset and the data lack a stringent quality control.
The German Meteorological Service (DWD) and the National Park Administration (NPV) have therefore now joined forces for the following efforts:

- Compilation of all available data and metadata
- Quality control of station data
- Homogenization of data
- Assessment of uncertainties
- Possibly gridding of station data.

Data

Station data in the National Park and its surroundings mostly stems from measurements conducted by the German Meteorological Service (DWD) and the Berchtesgaden National Park Administration (NPV). Further measurements include stations by the avalanche warning service (LWD-Bayern) and the Bavarian state institute of forestry (LWF-Bayern):

Active stations:	21
Historical stations:	~100: 83 temperature/humidity, 23 precipitation, 13 wind
Measurement time:	between 1 year and 30 years

Additionally, data from the operational networks of the German and Austrian Meteorological Networks are available



Challenges

- Data format and storage not uniform
- Metadata is not readily available for all stations
- Measurements in complex terrain:
  - Accessibility of stations is difficult (especially in winter)
  - Disruption of measurements due to avalanches or heavy snowfall
- Uncertainties:
  - Measurement devices
  - Semi manual digitalization of thermohygrograph stripes



Fig. 2: weather station at the Funtensee



Fig. 3: weather station covered in snow after an avalanche

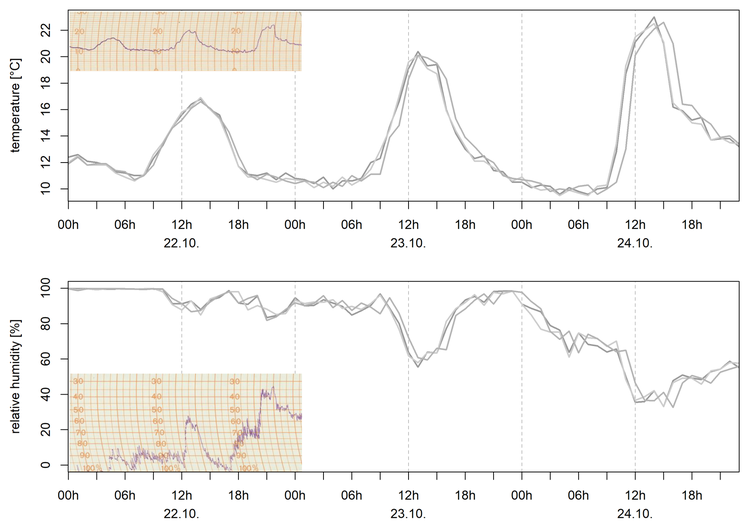


Fig. 4: Example of uncertainty of digitalization for temperature (top) and relative humidity (bottom) for 22.10.-24.10.2004. The insets show the thermohygrograph stripes which were digitized three times, each by the same person, using the same methodology. Differences in temperature/humidity are up to 6.3K / 16.6% (both 24.10. 11:00) for this example.

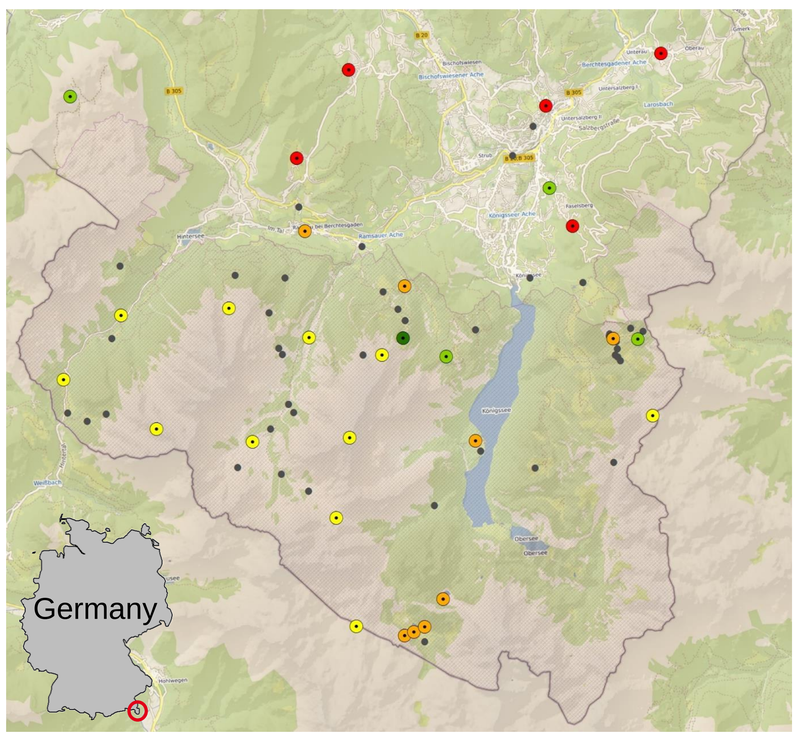


Fig. 1: Active and historical measuring network in the Berchtesgaden National Park located in the southeastern corner of Germany (red circle in inset)

Conclusion & Outlook

high density station network in complex terrain is very valuable, however data preparation is very time consuming and involves some challenges

⇒ Work in progress: data preparation and quality control
⇒ Next step: homogenization and assessment of uncertainties
⇒ Final dataset will be openly available to research community

katrin.sedlmeier@dwd.de