

Historical climatology in Norway - update

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Introduction

- In 2004, the Norwegian Meteorological Institute, started a digitization project of old weather observation in Norway.
- The routine of digitization weather data began in 1957 at the institute, all observations before 1957 is only on paper.
- In 2004 we started to digitize weather observation older than from 1957.
- In 2011, it went from being a project to an activity in the department.
- There have been 20-30 people involved in the project for 9 years.
- Today there are 5 in the permanent staff and 3 part-time employees (students) who is working on the project.

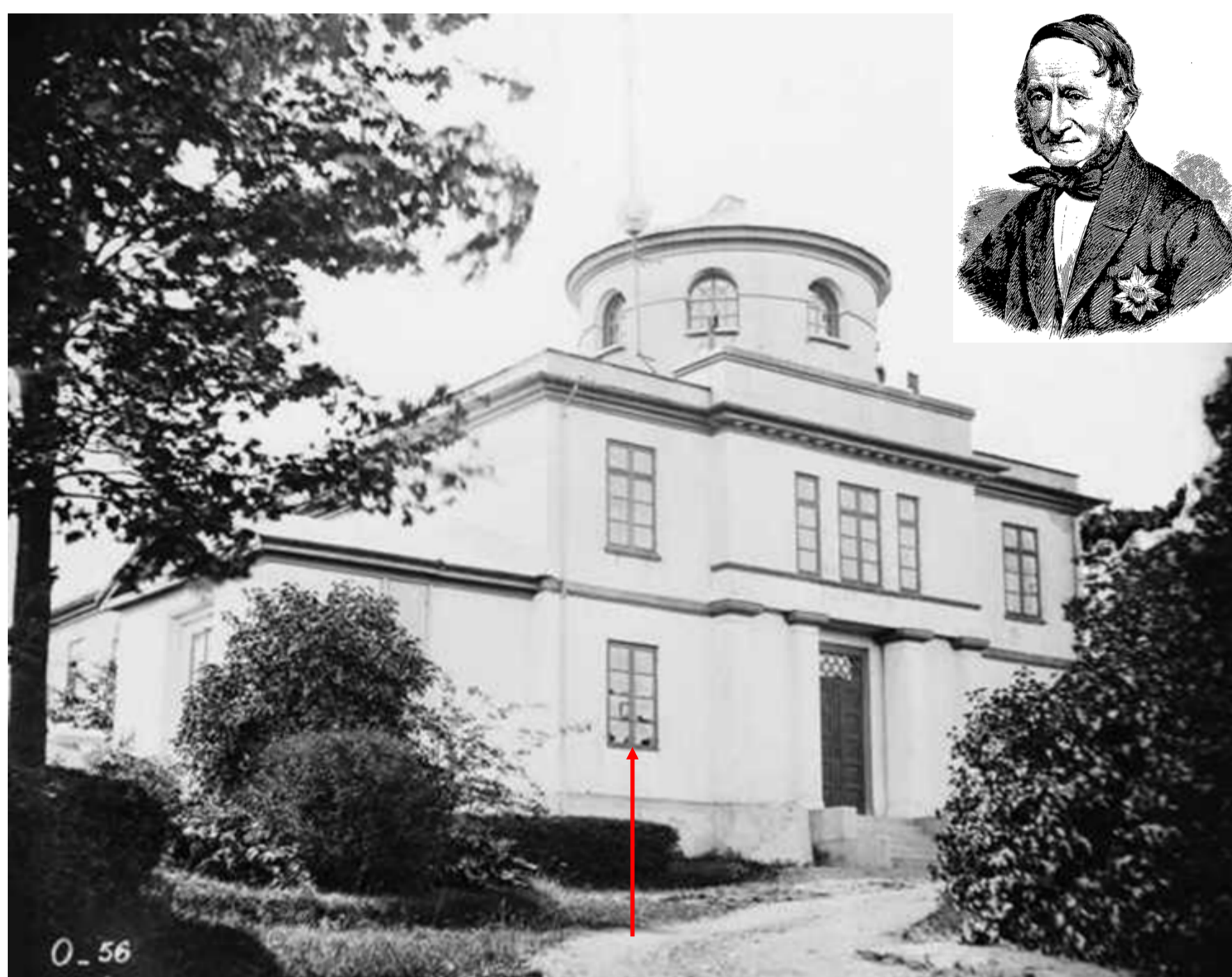


Fig 1. The Astronomical Observatory, Oslo. C. Hansteen started observation here in 1837 (unbroken temperature serie for almost 100 year): The Oslo-serie.

The HistKlim project

- All these old station are in the Histklim activity.
- Now 70 % is finished.



Fig 2. Herdis is digitizing Isfjord radio, Svalbard.

The method

- Digitization into a table in the database where the original observations are preserved.
- Control programs developed by the Department: Formal control (max. and min temperature), outliers detection, erroneous data columns, checking generated monthly sums against old monthly sums manually digitized (Pro*C).
- Converted values (Reaumur -> Celsius, mm -> hPa, Beaufort scale -> m/s, cloud cover (1/8->1/10) stored in a separate table.
- The data is stored in eklima.met.no, an open access database.

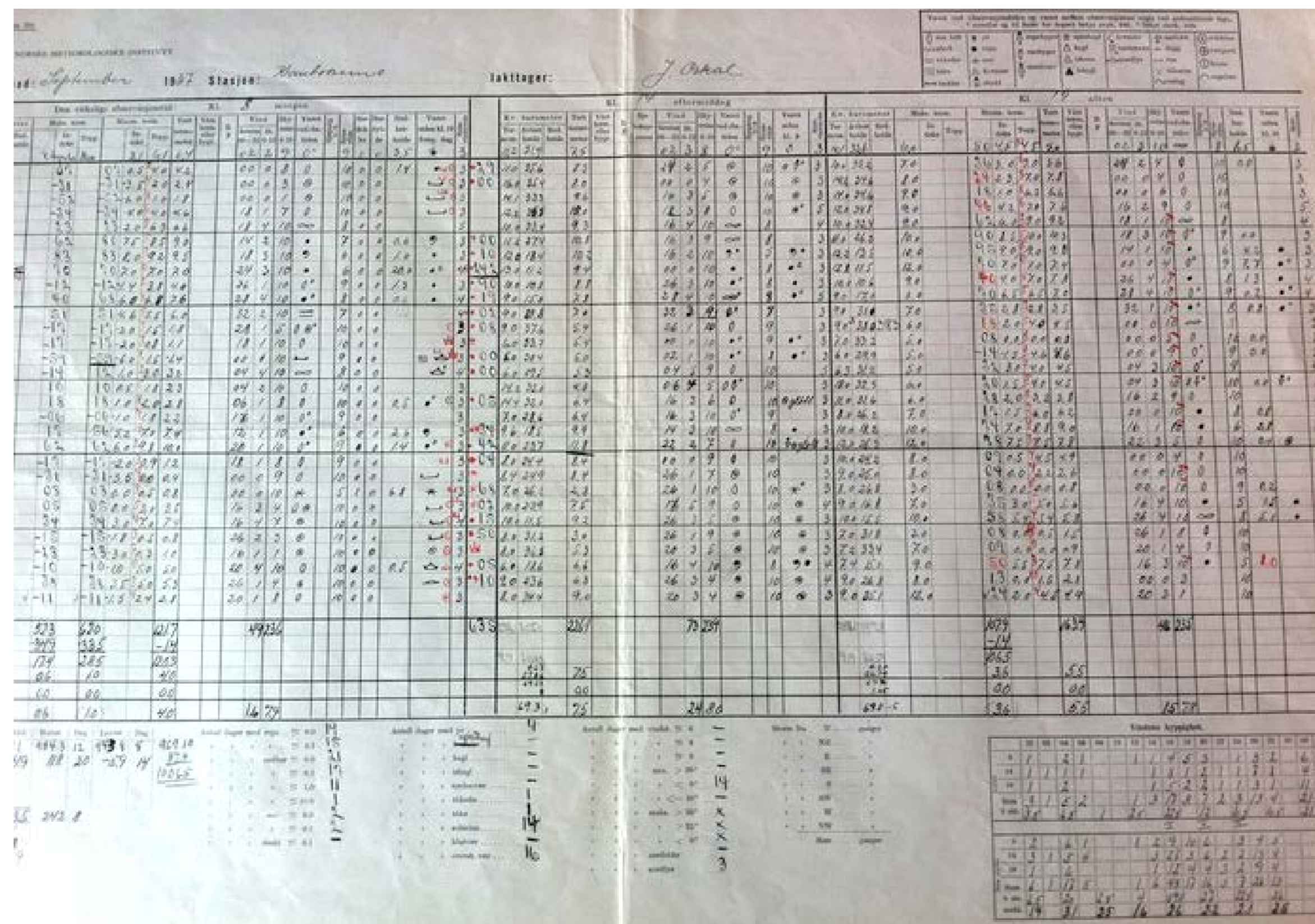


Fig 3. Old weather observation form from Kautokeino in 1937, will be digitized.

Homogenized long-term series

- The Oslo serie (1837-2012)
- The Svalbard serie (1898-2012)

Oslo

Astronomisk observatorium og Blindern

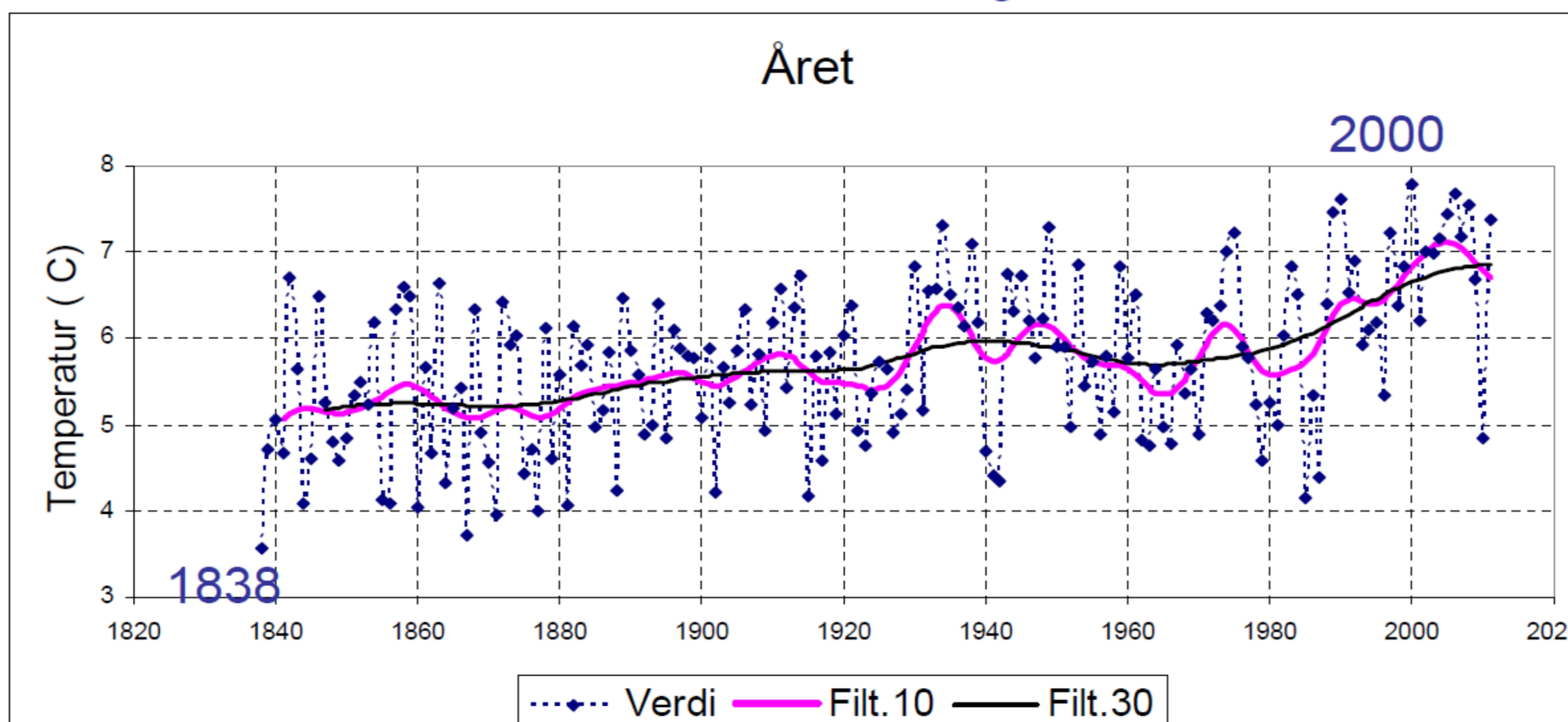


Fig 4. The Oslo serie, an annual homogenous temperature serie (1837-2012).

Conclusions: Oslo series

POSITIVE

- Large stability of the series.
- In the same location for 97 years.
- The same thermometers used for 85 years.
- Parallel measurements for 57 years.
- Only one relocation.
- Until recently: a rural environment.

NEGATIVE

- One instrument correction of +0.3°C detected in 1921.
- Uncertain starting year.

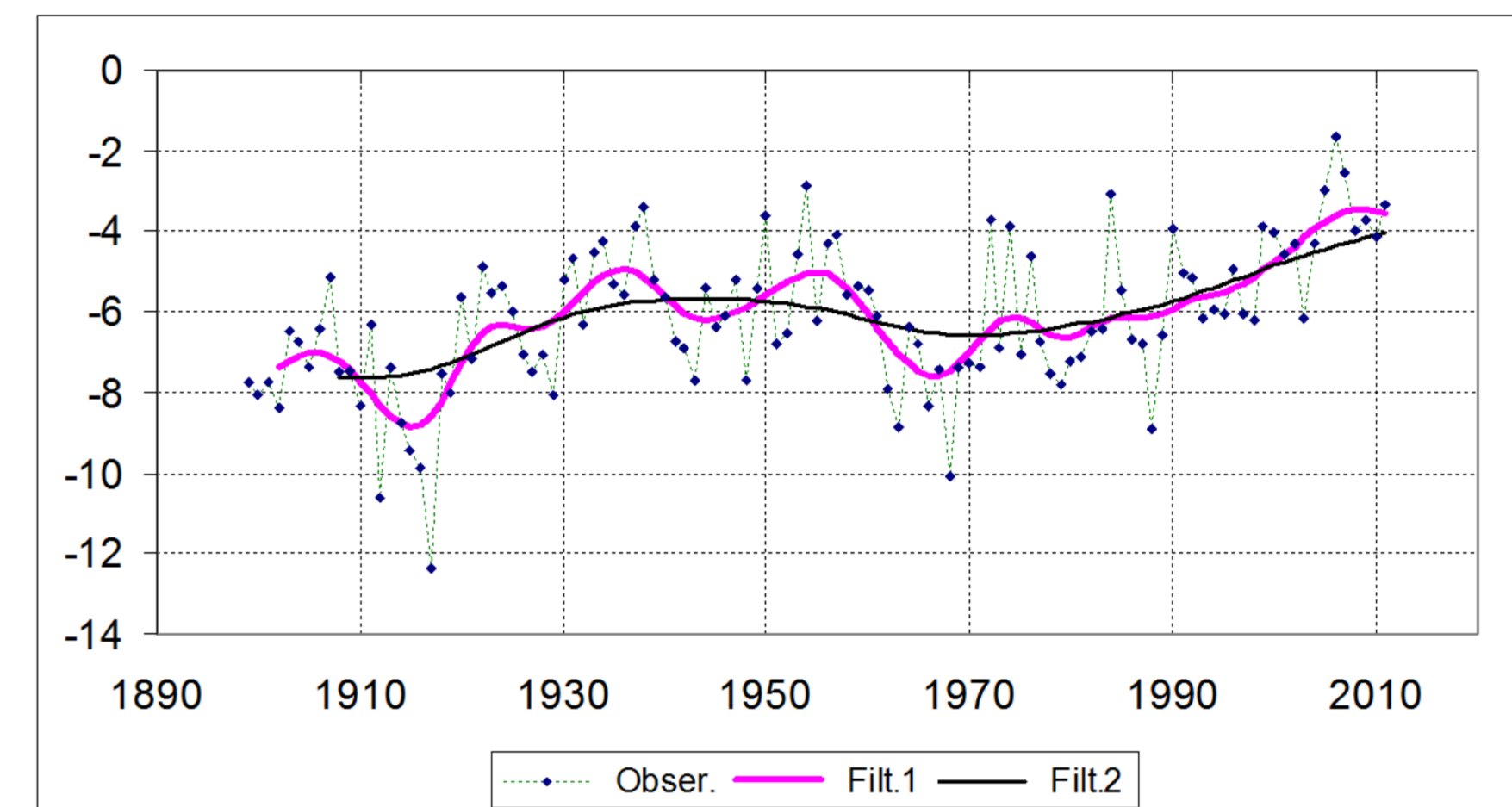


Fig 5. The Svalbard temperature time serie 1898-2012.

Svalbard

- Measurements by over-wintering hunters and scientists at shifting sites (1898-2012).
- Ordinary measurements at permanent sites from 1912 on Spitsbergen.
- The data are incorporated in a composite series homogenized to the present station Svalbard Airport.

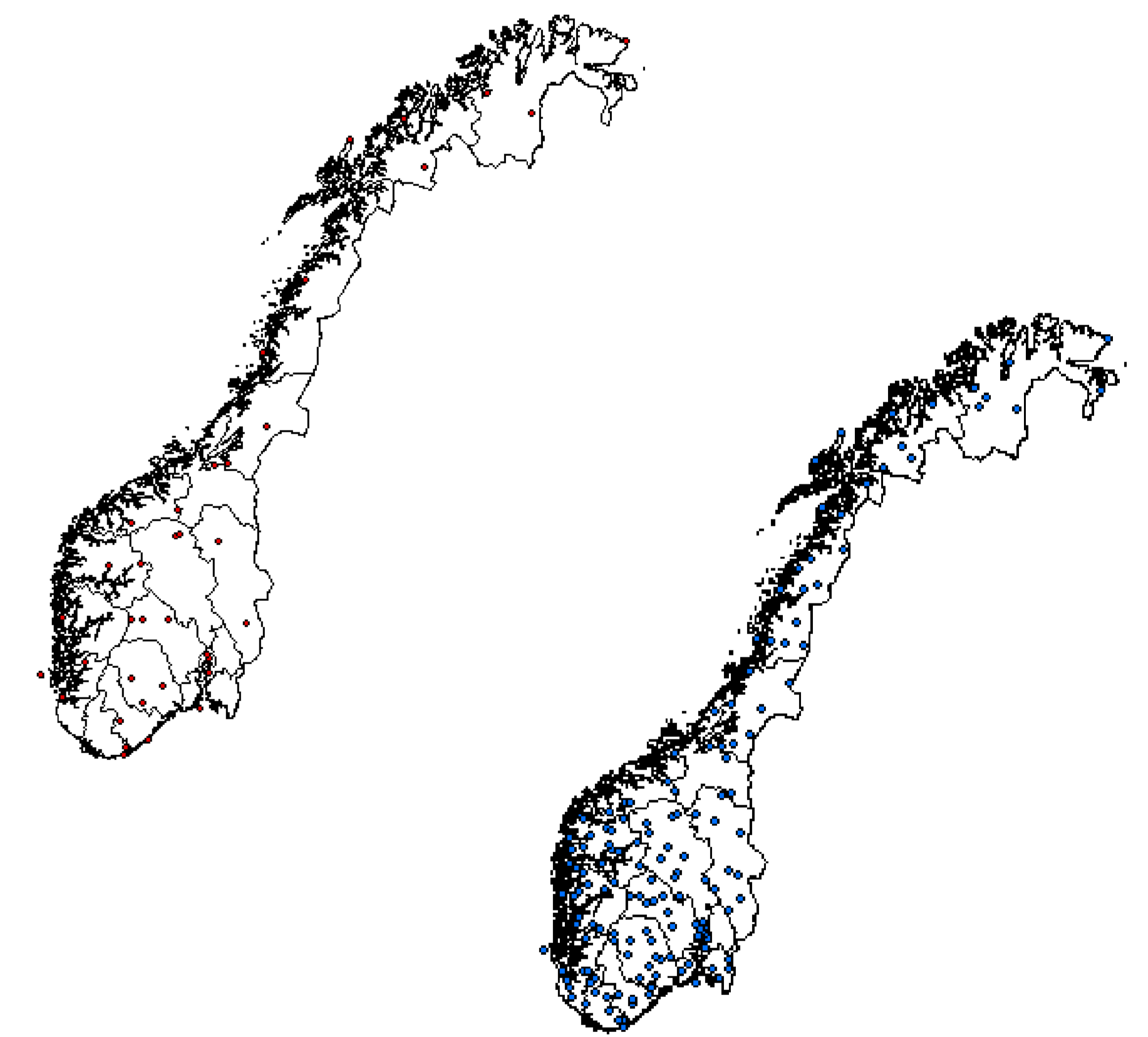


Fig 6. Overview of stations that are digitized in Norway for temperature (red) and precipitation (blue).

Instrumental Observation History

WEATHER STATIONS

- 1866: The Norwegian Meteorological Institute was established
- The oldest systematic weather observations in Norway started in 1861 from six weather stations: Kristiansund, Ålesund, Skudenes, Mandal, Sandsøysund and Dombås (1864).
- Skudenes was a part of a international storm warning network.
- It was already established observations at the places: Oslo (1816), Bergen (1818), Trondheim (1762) and Vardø (1829).
- 1867: Bodø, Tromsø and Vardø were established.
- 1873: 51 stations were operational
- The subsequent development of stations were in 1919: 579 and in 1953: 642 stations.

PRECIPITATION STATIONS

- In May 1894, funding was allocated by the Parliament to create 263 rain gauge stations to plan the development of hydroelectric power supply.
- The Norwegian meteorological institute was responsible for this.
- Before 1900 there were over 300 rain gauge stations in operation and 433 in 1953.

Conclusions

- Knowledge of old observation procedures is of paramount importance
- Effective control programs are needed for detection of errors
- Professional archives should be used for data rescue
- HistKlim data series have already shown important for research

References

- Nordli, Ø., Tveito, O.E. 2008: Calculation of monthly mean temperature by Köppen's formula in the Norwegian station network, met.no Report 18/2008
- Nordli, Ø., Przybylak, R., Ogilvie, AEJ., Isaksen, K. 2013: Long-term temperature trends and variability on Spitsbergen: The extended Svalbard Airport Temperature Series 1898-2012. *Polar Research*, (accepted)