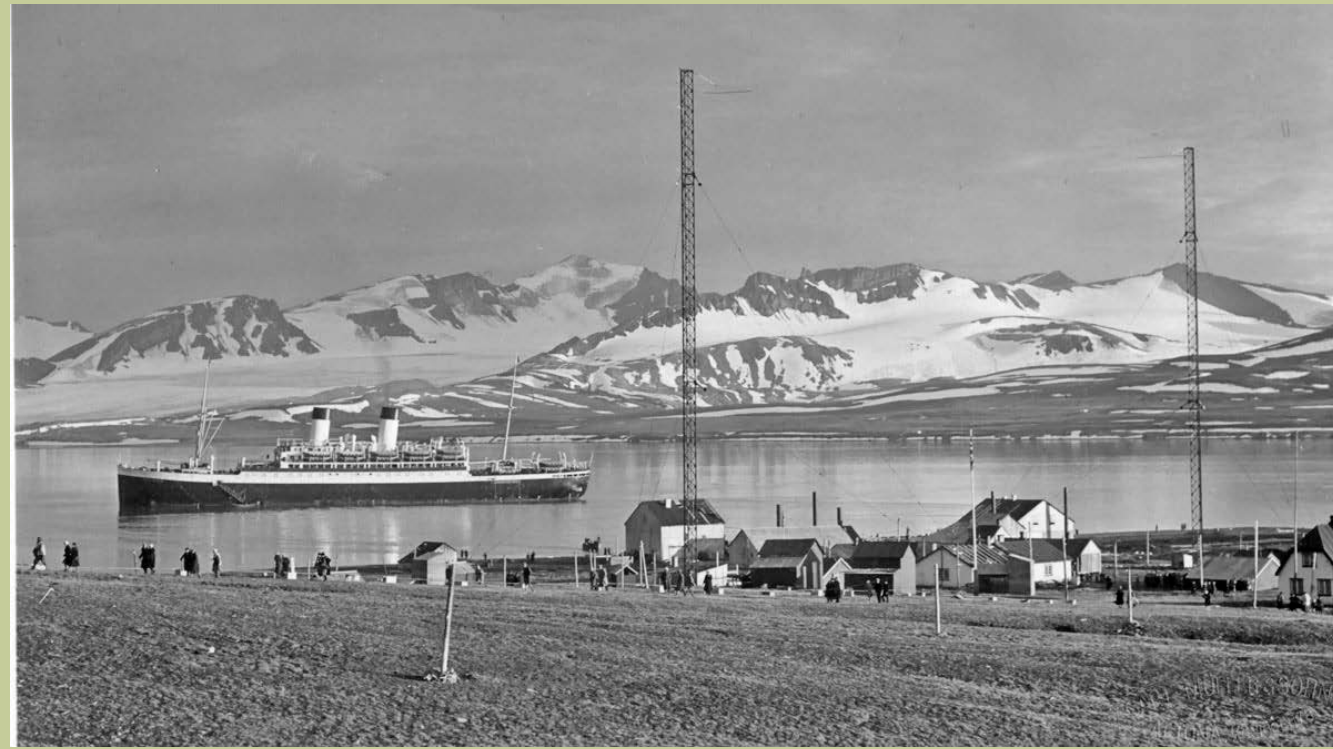
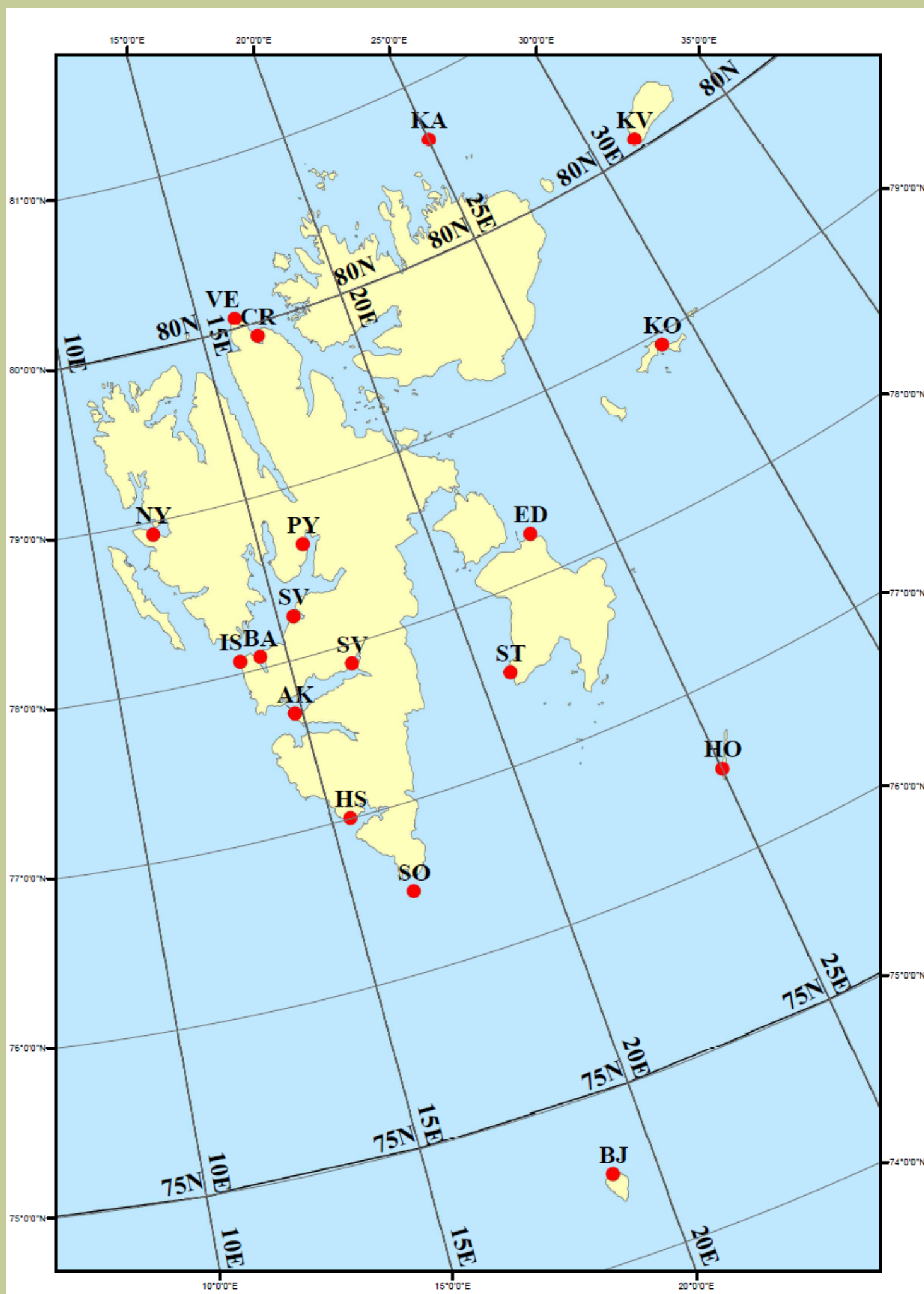


# Reconstruction and homogenisation of long-term Arctic temperature series

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The first regular observations on Spitsbergen started 1. Dec. 1911 at Green Harbour (photo) in Grønfjorden, near Barentsburg). This station was closed in 1930, but measurements continued at various sites on Spitsbergen.

(Photo probably from the 1920s, unknown photographer, Norwegian Polar institute's archive).

Location of weather stations in the Svalbard region. For station ID, see table below

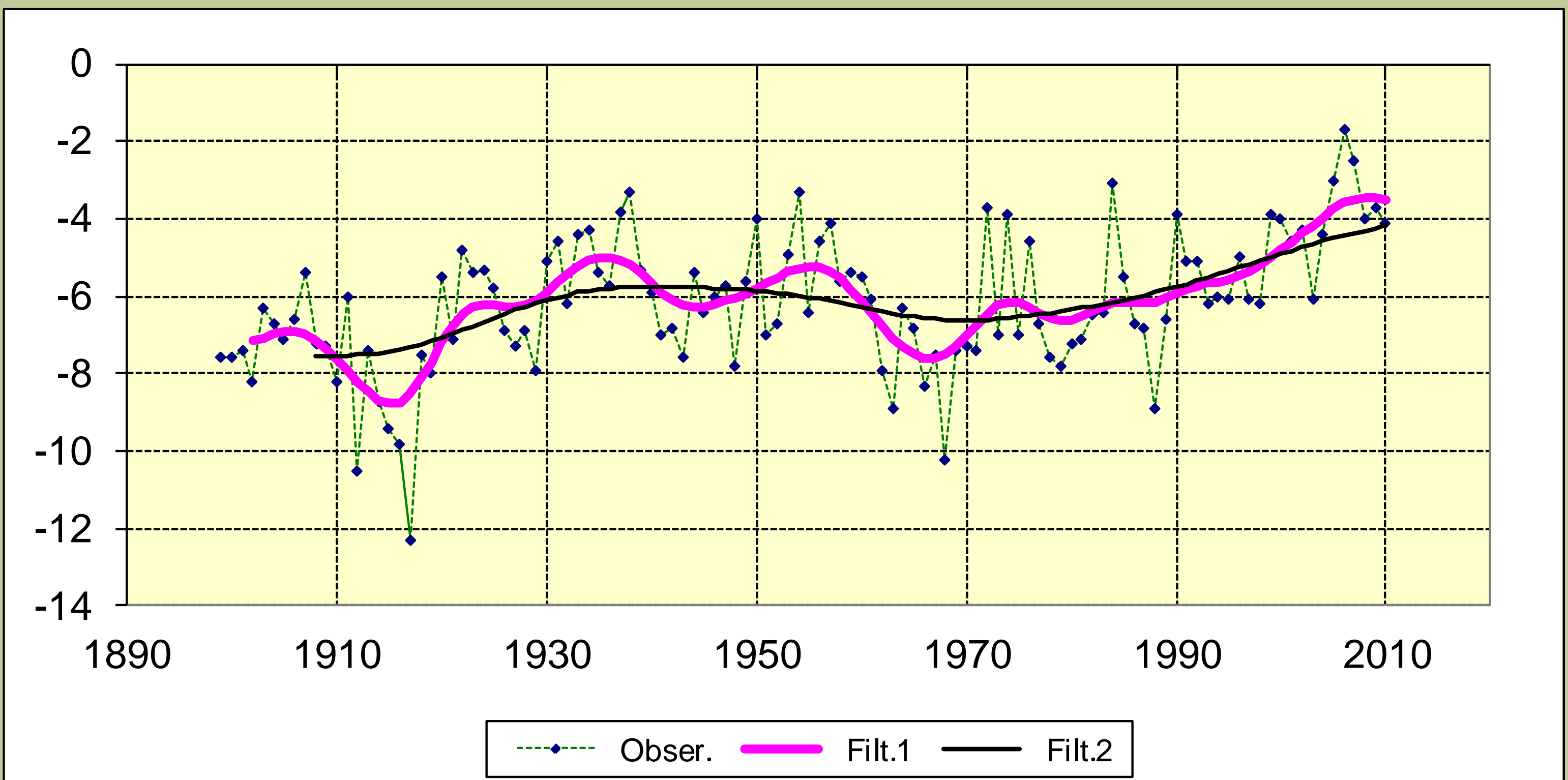
Station	ID	PRESENT SERIES	OLD SERIES	Comments
BJØRNØYA	BJ	01.1922 - dd		
HOPEN	HO	11.1945 - dd		
EDGEØYA	ED	03.2007 - dd		
SVARTTANGEN	ST	09.2010 - dd	11.1904 - 06.1909	AWAKE [2]
KONGSØYA	KO	09.2010 - dd		
SØRKAPPØYA	SO	10.2010 - dd	09.1908 - 08.1915	AWAKE [2]
HORNSUND	HS	06.1985 - dd		Polish st.
SVEAGRUA	SG	05.1978 - dd		
AKSELØYA	AK	09.2010 - dd	09.1898 - 05.1911	AWAKE [2]
ISFJORD RADIO	IR	10.1996 - dd	09.1934 - 06.1976	
BARENTSBURG	BA	01.1933 - dd		Russian st.
SVALBARD AP.	SV	08.1975 - dd	09.1911 - dd	Composite [1]
PYRAMIDEN	PY	07.2011 - dd	12.1947-12.1957	NO-RU [4]
NY-ÅLESUND	NY	08.1974 - dd	01.1969 - 08.1974	
VERLEGENHUKEN	VE	10.2010 - dd		
CROZIERPYNTEN	CR	09.2010 - dd	08.1899 - 07.1900	AWAKE [2]
KARL XII ØYA	KA	05.2007 - dd		
KVITØYA	KV	09.2011 - dd		



The Norwegian Meteorological Institute equipped hunting expeditions with meteorological instruments. Photo above shows old hunting cottage on Svarttangen, Edgeøya. At this site observations were carried out 1904-1909. The station was re-opened in summer 2010 by the AWAKE project [2] (Photo R. Brækkan, met.no)



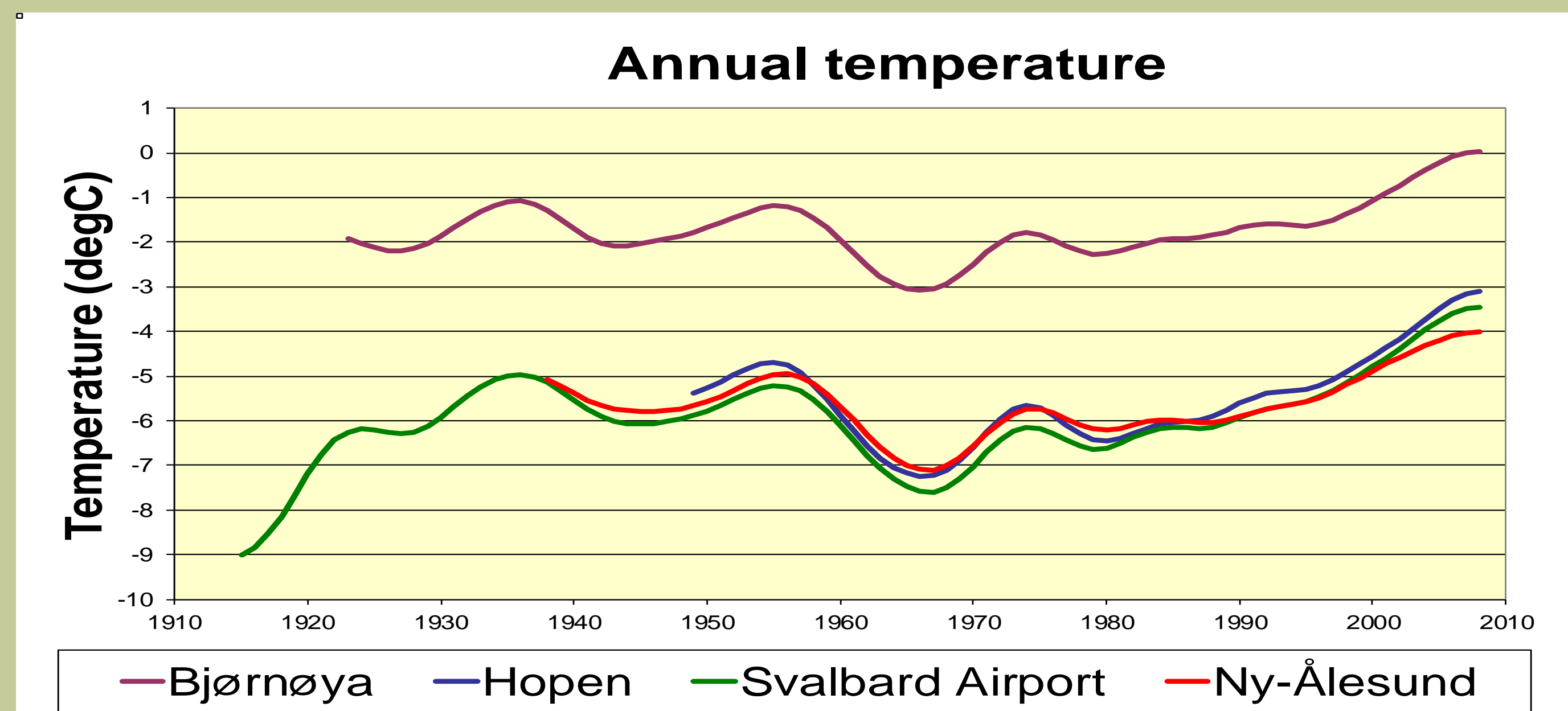
Left: A regular weather station was operated by Russia 1947-1957 in the old Russian settlement Pyramiden. A simple AWS was established at the old measuring site in summer 2011 (Photo: B. Ivanov, AARI). The AWS will be expanded summer 2012 [4]



Homogenised annual temperatures (°C) at Svalbard Airport / Longyearbyen  
Filt.1 and Filt.2 show smoothed values on a 10 resp. 30-year time scale

The homogenised Svalbard Airport temperature series (1898-present) is a composite series from various sites (incl. Green Harbour, see left photo) near Isfjorden [1].

Values before 1912 are preliminary extrapolations performed by the AWAKE-project [2]

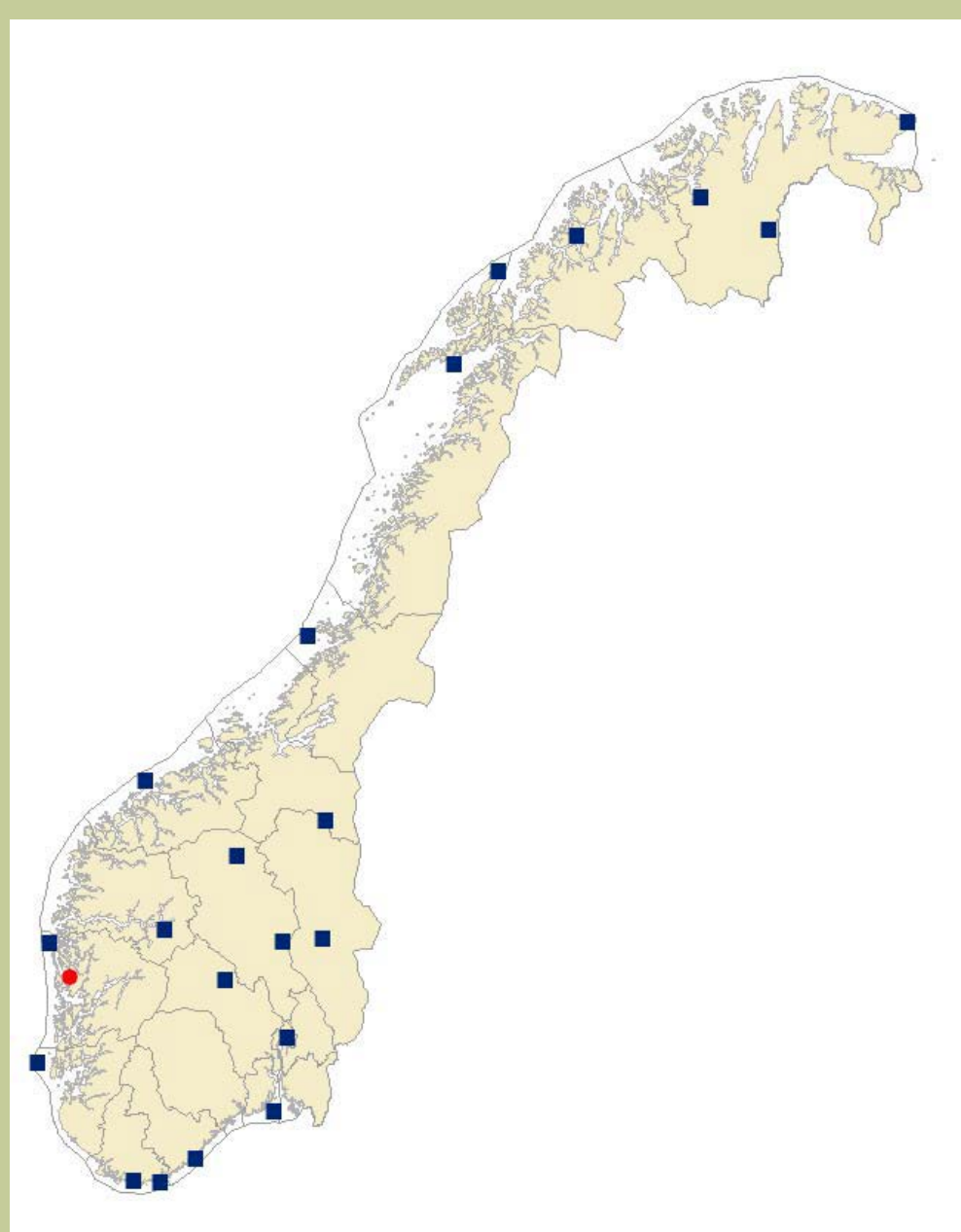


Annual temperature development at weather stations in the Svalbard region  
The low-pass filtered series are smoothed by Gaussian weighting coefficients and show variability on decadal scale. Curves are cut three years from start and end [3]

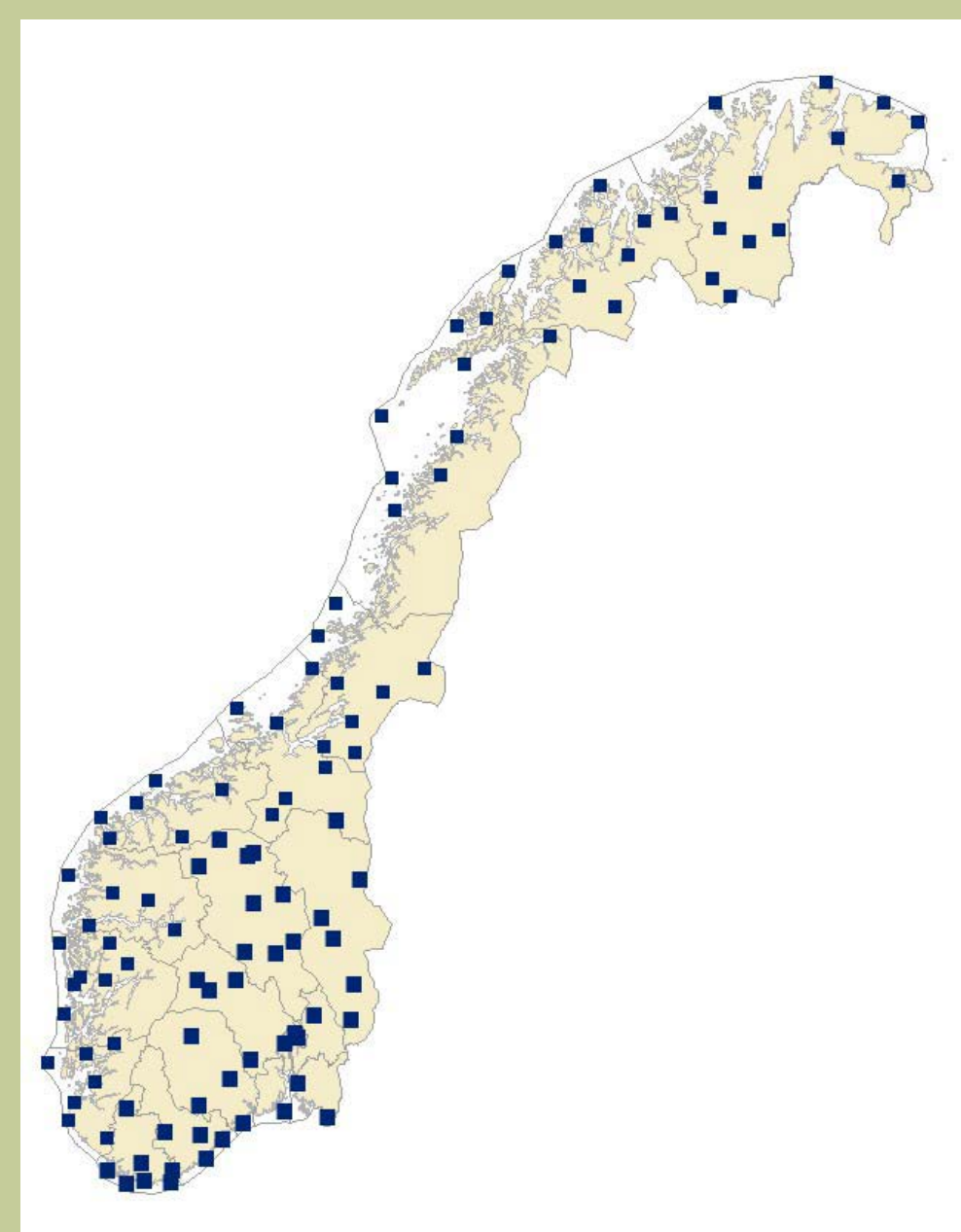
Linear temperature trends (°C per decade). Bold: Trends significant at 95% level.  
\*The Svalbard Airport and Ny-Ålesund series are homogenised. Before 1975 these series are based on composites from other series

	Location	Annual	Winter	Spring	Summer	Autumn
1975 - 2011	Ny-Ålesund	<b>0,73</b>	<b>1,36</b>	0,60	<b>0,33</b>	<b>0,53</b>
1975 - 2011	Svalbard Airp.	<b>1,04</b>	<b>1,66</b>	<b>0,98</b>	<b>0,55</b>	<b>0,86</b>
1975 - 2011	Hopen	<b>1,10</b>	<b>1,76</b>	<b>1,02</b>	<b>0,43</b>	<b>1,00</b>
1975 - 2011	Bjørnøya	<b>0,76</b>	<b>1,30</b>	<b>0,59</b>	<b>0,39</b>	<b>0,62</b>
1935 - 2011	Ny-Ålesund*	0,11	-0,02	<b>0,27</b>	0,09	0,07
1912 - 2011	Svalbard Airp.*	<b>0,25</b>	0,25	<b>0,46</b>	<b>0,11</b>	<b>0,19</b>
1946 - 2011	Hopen	<b>0,31</b>	0,31	<b>0,44</b>	<b>0,22</b>	0,23
1920 - 2011	Bjørnøya	<b>0,11</b>	0,02	<b>0,29</b>	<b>0,08</b>	0,05

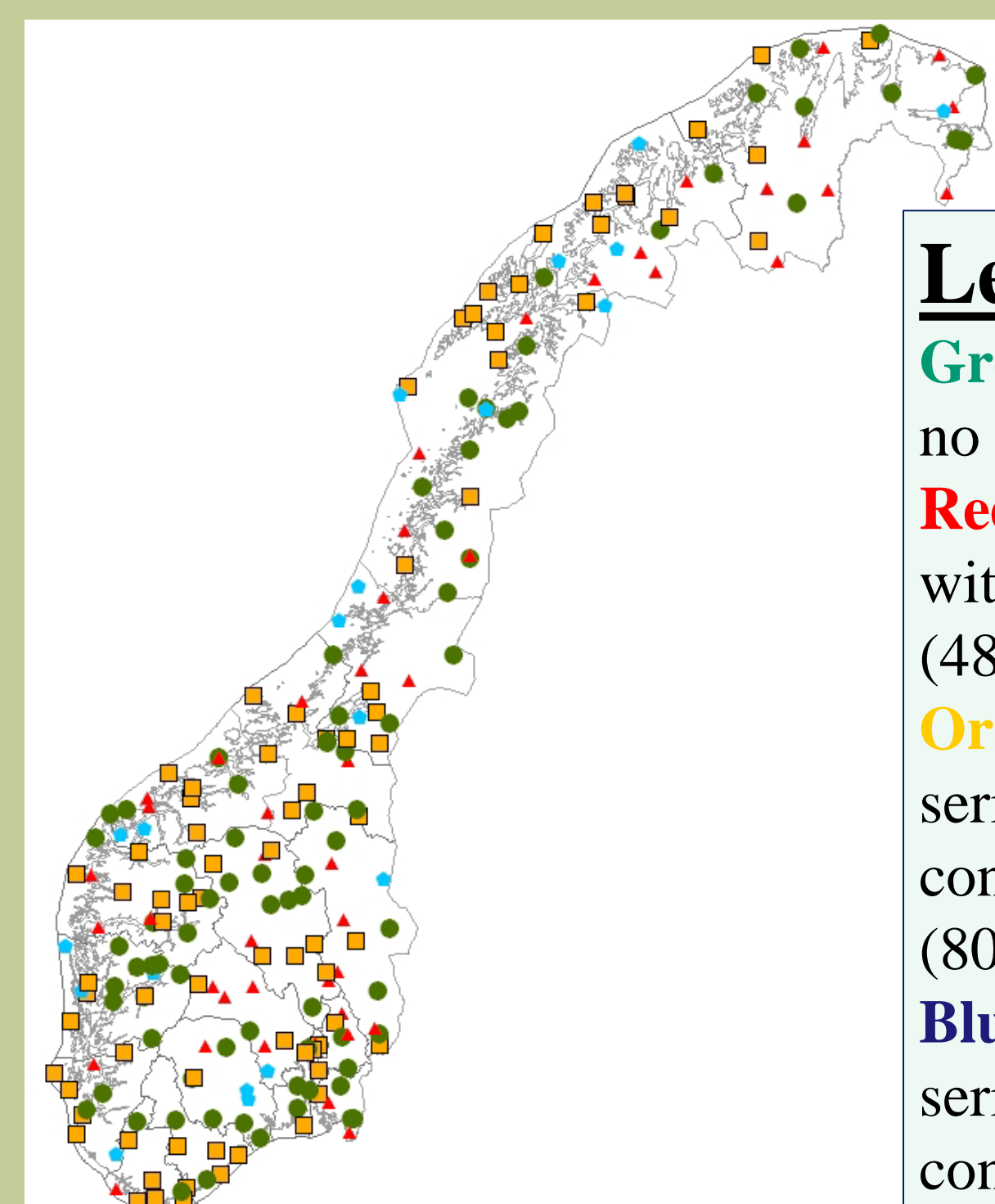
## Homogenized temperature series on the Norwegian mainland [5]



Temperature series with length  $\geq 100$  years, still running in 2007 (22 series).



Temperature series with length  $\geq 30$  years, still running in 2007 (72 series).



**Legend**  
**Green circle:** Homogeneous series, no traces of breaks (83 series)  
**Red triangle:** Homogeneous series with traces of breaks, not adjusted (48 series)  
**Orange square:** Homogeneous series after adjustments. Breaks confirmed by metadata (80 series)  
**Blue pentagon:** Homogeneous series after adjustments. Breaks not confirmed by metadata (20 series)

### References:

- [1] Nordli, Ø. 2011: The Svalbard Airport temperature series. *Bulletin of Geography, Physical Geography Series*, 3, 5-25, Toruń
- [2] Polish-Norwegian AWAKE project. Collecting and homogenizing early meteorological observations from the Arctic. On Svalbard meteorological observation sites from the late 19th and early 20th century were re-opened linking the historical observations to the present observations
- [3] Førland, E.J., R.E.Benestad, I.Hanssen-Bauer, J.E.Haugen & T.E.Skaugen, 2011: Temperature and Precipitation Development at Svalbard 1900-2100. *Advances in Meteorology*, doi:10.1155/2011/893790
- [4] Russian (AARI/Roshydromet)-Norwegian (met.no) collaboration on reconstructing the Pyramiden temperature series
- [5] Andresen, L., 2011: Homogenization of monthly long-term temperature series of mainland Norway. *Met.no Note 2, 2011*. Norwegian Meteorological Institute, Oslo, Norway