

## NVE's Lake and river ice reference datasets for climate change studies

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### 3.6.1 Available data

Available data on ice conditions in NVEs Hydra II database are freeze-up and break-up dates code=5100, ice thickness code=1005, ice map code=5101 and ice notes code=5102. Only active stations with code=5100 (lake ice 19 stations and river ice 1 stations) will be considered in this report. Data for the other codes are sparse and sporadic in Hydra II.

### Selection of lake and river stations

When selecting reference stations the general criteria in chapter 2 were considered. Criteria 2 (Absence of significant regulation that could affect freeze-up and break-up dates) 3 (record length) and 4 (active data collection) were used to select the available reference dataset for ice duration. According to the evaluation of the Norwegian data, the ice duration series were categorized into the following two usability categories:

A series can be used for all kind of climate change related studies:

1. *based on freeze-up, break-up data*
2. *based on season (ice duration) data,*

#### 1. Absence of significant regulations, diversions, or water use

The 19 (lake) and 1 (river) potential reference stations are classified as “unregulated” or regulated rivers or lakes with insignificant or small impact on freeze-up and break-up dates. Personal contact with the responsible group leader and people at NVE with long experience in using the ice data, helped to clarify most of the uncertainties. Further background information was obtained from previous reports on NVE's network of hydrological stations in Norway (Pettersson, 2003) and the station comments. The effect of regulations is assumed to decrease when the distance increase between ice station and point where water are transferred or added to the river/lake or lakes. However, the degree of detail in this available information varies between stations, and it is likely that not all intervening activity is documented, in particular not older ones.

#### 2. Record length

Due to the natural multi-year and decadal variability in the climate system, climate change related studies and studies on trends should in general use records with at least 30 years of data.

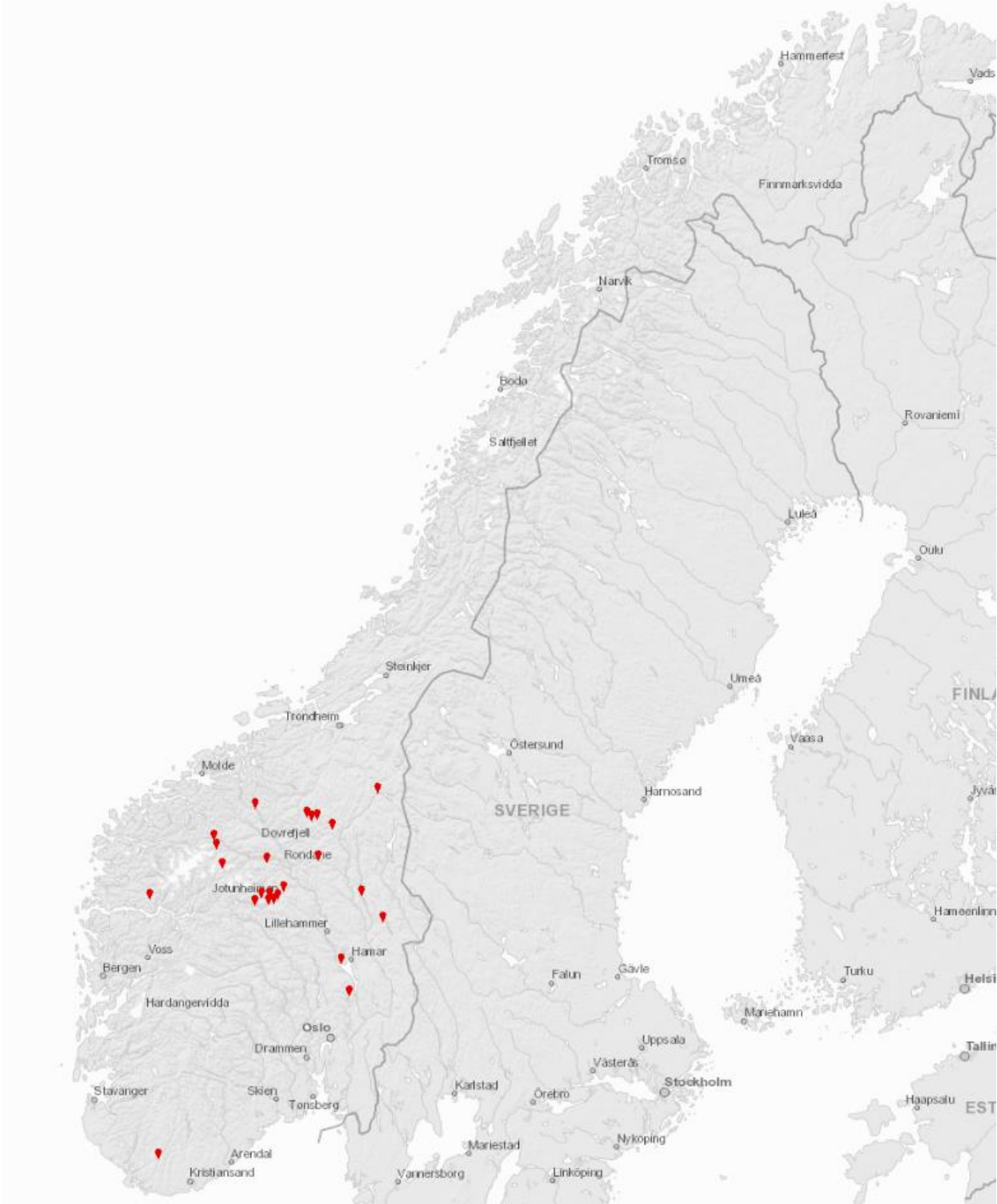
The selection of stations with sufficiently long series was made based on the time period with expected good data quality rather than on the complete record. Series with short periods of missing data are included in the reference dataset. Long periods of missing data (>1 year) are accepted only if there are few stations with good quality records in the region or for stations where it is possibility to fill in missing data.

#### 3. Active data collection

All stations which are currently active (2021) are considered as potential reference stations. However, several stations were lacking data or quality control in recent years.

## Reference series

Applying the HRD stations criteria to active lake and river ice stations in Norway resulted in a Norwegian reference dataset (RD) including 19 (lake ice duration) and 1 (river ice duration) series (Table 1, Figure 1). All the series are longer than 20 years.



**Figure 1** The ice duration series selected as reference stations. All series are situated in southern Norway.

**Table 1** Lake and river ice reference series.

Reg no	Main no	Point no	Station name	Start	Ref start	RegGrad	Lake/river
2	835	4	Breidalsvatnet	1950		2	R
2	79	0	Tessevatn	1908		1	L
2	82	0	Osen	1967		0	L
2	89	0	Savalen	1919		1	L
2	111	0	Aursunden	1902		1	L
2	162	0	Bygdin	1967		1	L
2	167	0	Vinsteren	1950		2	L
2	257	0	Heimdalsvatn	1975		1	L
2	342	0	Fundin	1970		0	L
2	395	0	Elgsjø	1976		0	L
2	397	0	Marsjø	1976		0	L
2	824	4	Hurdalssjøen v/Haraldvangen (14)	1981	1990	0	L
2	825	39	Mjøsa, Kise-Kapp	1865		1	L
2	831	2	Øvre Heimdalsvatnet v/Osbui (11)	1969	1995	0	L
2	836	0	Rauddalsvatnet	1967		1/2	L
2	841	0	Storsjøen	1968		2	L
2	843	10	Atnsjøen v/Sør-Neset (12)	1950		0	L
2	1108	0	Kaldefjorden	1967		1	L
24	13	13	Lygne, sørenden	1925		0	L
104	3	0	Aursjø	1967		1	L