

The Norwegian Tide Gauge Network

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INTRODUCTION

The Norwegian Tide Gauge Network is operated by the Norwegian Mapping Authority, Hydrographic Service (NHS). There are 22 digital tide gauges along the Norwegian coast (see Figure 1) and one gauge in Ny-Ålesund at Svalbard. In addition there is an analogue tide gauge at Mausundvær north of Heimsjø (not shown in the map) operated by the Norwegian Mapping Authority, Geodetic Institute (GI)

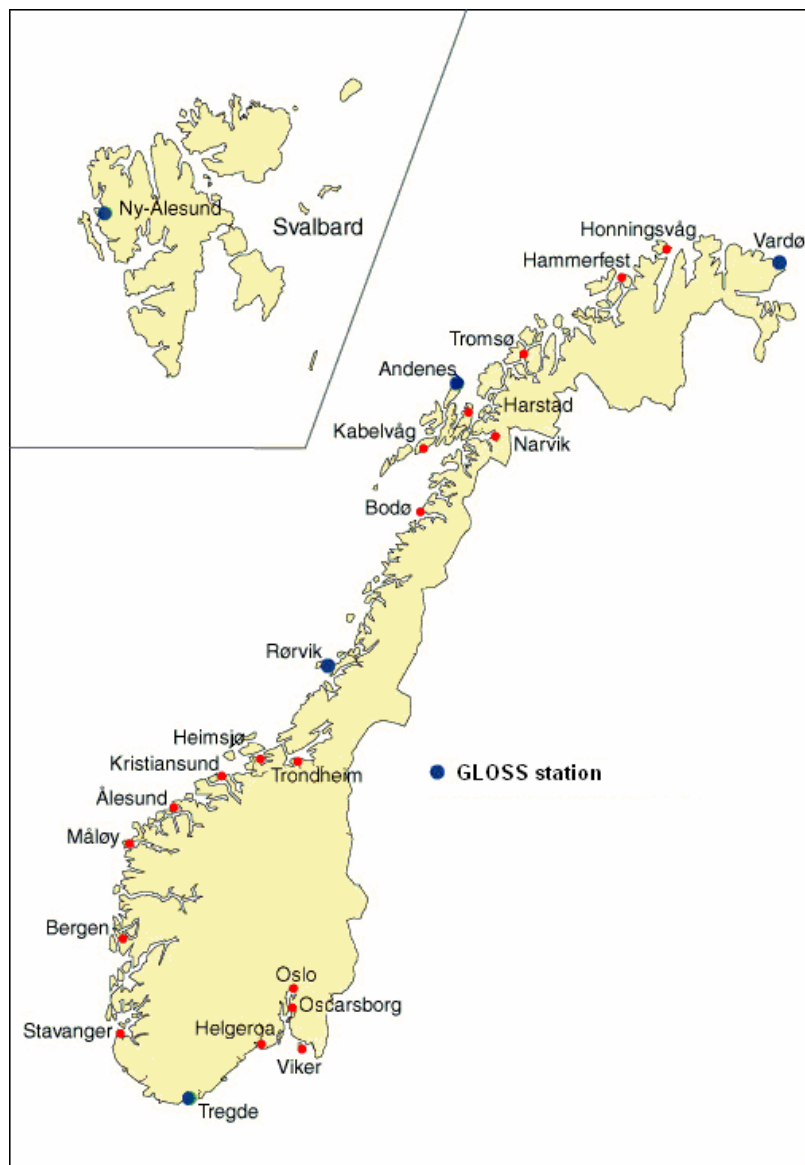


Figure 1. The Norwegian Tide Gauge Network as at June 2007.

Station	Latitude	Longitude	CGPS	Digital data available from
Viker	59°02' N	10°57' E	No	1990
Oslo	59°54' N	10°44' E	No	1914
Oscarsborg	59°41' N	10°37' E	No	1953
Helgeroa	59°00' N	09°52' E	No	1965
Tregde	58°00' N	07°34' E	Yes, since 2001	1927
Stavanger	58°58' N	05°44' E	No	1919
Bergen	60°24' N	05°18' E	No	1915
Måløy	61°56' N	05°07' E	No	1943
Ålesund	62°28' N	06°09' E	No	1961
Kristiansund	63°07' N	07°45' E	No	1952
Heimsjø	63°26' N	09°07' E	No	1928
Mausundvær (analogue gauge)	63°52' N	08°40' E	Yes, since 2007	1988
Trondheim	63°26' N	10°24' E	No	1989
Rørvik	64°52' N	11°15' E	No	1969
Bodø	67°17' N	14°23' E	No	1949
Kabelvåg	68°13' N	14°30' E	No	1988
Narvik	68°26' N	17°25' E	No	1931
Harstad	68°48' N	16°33' E	No	1952
Andenes	69°19' N	16°09' E	Yes, since 2000	1991
Tromsø	69°39' N	18°58' E	No	1952
Hammerfest	70°40' N	23°41' E	No	1957
Honningsvåg	70°59' N	25°59' E	Yes, since 2006	1970
Vardø	70°20' N	31°06' E	Yes, since 2005	1947
Ny-Ålesund	78°56' N	11°57' E	Yes, since 1993	1976

Table 1. List of stations in the Norwegian Tide Gauge Network.

THE TIDE GAUGE NETWORK

Until 1985 there were two tide gauge networks in Norway, but between 1986 and 1992 they were modernized and merged into one network operated by the Norwegian Mapping Authority, Hydrographic Service (NHS). The new system used stilling wells and sampled the

water level with 15 second intervals. These data were filtered and decimated to 10 minute values and automatically transferred to NHS.

A new modernization was completed in 2002. The data loggers were changed to Sutron 8210 and the 10 minute values were obtained by making 3 minute averages of one second samples.

In spring 2007 we have changed the sampling and filtering procedures. The sampling frequency is 1 Hz and one minute averages are stored in the data logger. These one minute data are transferred to NHS at regular intervals (one hour at the moment) and stored in an Oracle database. They are converted to ten minute values and goes through an automatic quality control. We will soon implement a new automatic quality control that works on the one minute data, remove spikes and interpolate in gaps. Ten minute values (filtered and decimated one minute data) are presented on the internet. Software developed at NHS is used for manual editing on the data.

A radar gauge (Miros SM-094) has been tested for a while in Hammerfest and will be the primary sensor there.

The majority of the gauges is mounted on solid rock and is levelled with three year intervals. A few gauges are located on slightly unstable ground and are levelled more frequently. The Norwegian Mapping Authority, Geodetic Institute (GI) is responsible for the levelling.

GPS MEASUREMENTS

By May 2007 continuous GPS receivers (CGPS) are installed at six Norwegian tide gauges. In Vardø, Andenes and Tregde the antennas are installed directly at the tide gauge, on the other stations the GPS receivers are some hundred meters away, see comments below. In Ny-Ålesund the GPS receiver is installed near the VLBI-station (Very Long Baseline Interferometry), which is located about 1.5 km from the tide gauge.

In October 2006 a new Permanent geodetic station were established in Honningsvåg, located at Klubben Lighthouse, approx. 450 m SSW of the Tide Gauge.

In May 2007 a new Permanent geodetic station will be established in Mausundvær, located approx. 550 m SSE of the Tide Gauge.

In June 2007 the GPS receiver and antenna in Andenes will be renewed.

Station	GPS Receiver Type	Serial number	Firmware version	Sampling rate	Antenna Type	Radome
Tregde	AOA SNR12RM ACT	207U	3.3.32.5	30 sec.	AOAD/M_T	None
Andenes	AOA Rouge SNR-8000 Trimble NetR5	128 ---	3.3.32.11 3.30	30 sec. 1 sec.	AOAD/M_T Trimble Zephyr TRM55971.00	None
Ny-Ålesund	AOA Benchmark ACT	2023	3.3.32.2	30 sec.	ASH 701073.3	Snow
Ny-Ålesund	AOA Benchmark ACT	2020	3.3.32.2	30 sec.	AOAD/M_B	Dome
Vardø	AOA Benchmark ACT	2022	3.3.32.2	30 sec.	AOAD/M_T	None
Mausundvær	Trimble NetR5	---	3.30	1 sec.	Trimble Zephyr TRM55971.00	None
Honningsvåg	Trimble NetRS	4439239119	1.1-5	1 sec.	Trimble Zephyr TRM41249.00	Dome

Table 2. An overview of the GPS receivers.

The Norwegian Mapping Authority, Geodetic Institute is responsible for the CGPS measurements and analyses of the data.



Figure 2. Tide gauge and GPS receiver at Tregde.



Figure 3. Tide gauge and GPS receiver at Andenes.

DATA AVAILABILITY

By the end of 2006 the Norwegian water level database contained about 1390 years with digital water level observations. All data have been through a quality control, and all corrections are flagged and documented. Figure 4 gives an overview of the available time series from the permanent tide gauges that are operated today.

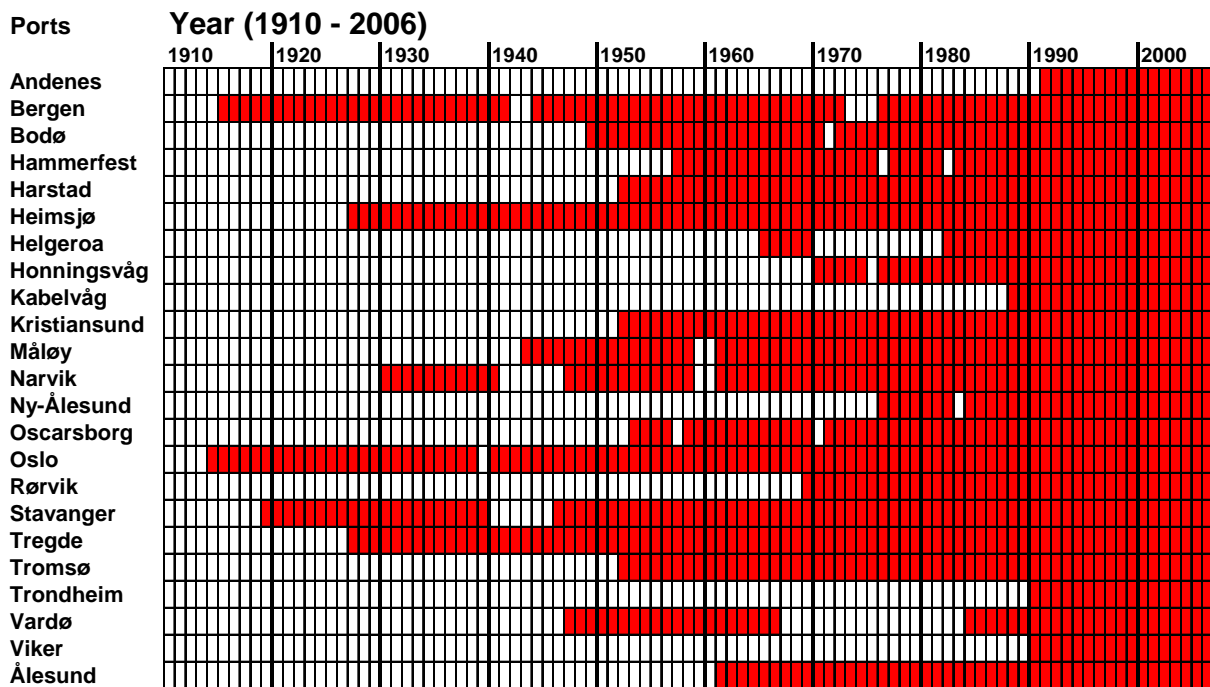


Figure 4. An overview of available digital time series from the stations in the network..

INTERNATIONAL DATA EXCHANGE

Quality controlled sea level data are routinely made available through the following international programmes:

- PSMSL : Monthly and annual means
- GLOSS : Fast delivery data to UHSLC
Delayed mode data to BODC
- ESEAS : 10-minutes sea level observations

INTERNET

The following quality checked sea level data are freely available for download on our web site:

- Water level observations
- Tidal predictions
- Residuals
- Tide tables
- Monthly means
- Annual means
- Harmonic constants
- Levelling data
- Tidal levels
- etc.

The data can be obtained via:

<http://vannstand.statkart.no/Engelsk/>