

## Introduction

The Norwegian Meteorological Institute (met.no) has the national responsibility for issuing weather warnings to the general public in order to protect life, health and property. The forecasting and warning support is partly of a general nature and partly in connection with the occurrence of specific meteorological and oceanographic events. Supplying weather warnings to the Norwegian public is a core service and does not include special warnings to commercial customers. Warnings are issued on three levels according to defined criteria.

## General Preparedness/awareness Measures

**Hazardous Weather Conditions** – Warnings of extreme (or hazardous) weather conditions will be issued according to specific criteria. Criteria and procedures for issuing and distribution are organised through a specific National Plan of Preparedness Measures.

**Flooding** – Organised in agreement with the NVE (Norwegian Water Resources and Energy Administration) in the National Plan of Preparedness Measures.

**Nuclear Accident** – Alert Messages from IAEA (International Atomic Energy Agency), WMO (World Meteorological Organisation) and others. met.no will notify and cooperate with Statens Strålevern (National Radiation and Protection Authority).

**Oil spill** – Forecasts of current and wind. Calculations of drift and dispersion. Agreement with SFT (State Pollution Control Authority) and NOFO (Norwegian Clean Seas Association for Operation Companies).

**Accidents during transport and industrial processing causing discharge of gases dangerous to health** – Monitoring and forecasting of relevant meteorological parameters.

**Search and Rescue** – Monitoring and forecasting of relevant meteorological and oceanographic parameters. Calculation of drift e.g. on request from the Main Rescue Centres (HRS).



## The three levels of warning defined at met.no

### LEVEL III Warnings - Hazardous Weather

Definition - Warnings of extreme (hazardous) weather conditions. Issued when the event can cause extensive damage and disruption to the general public over a large area (e.g. a county or part of the country), and there is an obvious danger to life. The warnings are sent as special messages to the Main Rescue Centres (HRS Sor and HRS Nord, to Governmental Agencies and Authorities).

**Wind** – Warnings of extreme conditions issued for:

Coastal districts from Lindesnes to Kirkenes (Russian Border) when storm force 10 is expected, and the general wind direction is onshore. Violent storm force 11 or higher with any wind direction. Coastal districts from Lindesnes to the Swedish border and adjacent inland districts when severe gale force 9 and/or above is expected, and the general wind direction is onshore. Storm force 10 and higher with any wind direction.

**Storm surge** – Warning of storm surge is issued when it is expected that the total height of the high tide water level above mean sea level will be equal to or more than listed values for specified coastal districts (see Table 1).

**Avalanche** – Forecast is issued when the weather situation indicates a great danger of avalanche over a large area (part of the country, county).

**Weather conditions that will cause flooding** – Alert message is sent to NVE (Norwegian Water Resources and Energy Administration) in accordance with the National Plan of Preparedness Measures if the weather situation suggests that a certain threshold for precipitation amount will be exceeded, and/or change in temperature conditions that NVE should consider to issue a Flood Warning Message.

Oslo	210 cm
Helgeroa/Nevlunghavn	160 cm
Stavanger	155 cm
Bergen	220 cm
Kristiansund N	300 cm
Trondheim (Heimsjø)	385 cm
Rørvik	350 cm
Bodø	380 cm
Narvik	425 cm
Tromsø	355 cm
Hammerfest	365 cm
Honningsvåg	355 cm
Vardø	400 cm

### Level II Warnings - Forecasts/Messages issued when specific significant criteria are met.

Definition – Warnings of Gale and Storm, Critical Water Levels (Storm surge) and Air Quality, distributed to users via the Coastal Radio Stations and/or direct by fax and/or e-mail to Governmental Agencies, Coastal Administration Agencies, Rescue Centres and others.

**Gale/Storm warning** – issued by met.no and sent to Coastal Radio Stations for further transmission on radio telephony and NAVTEX: for Norwegian Coastal districts from the Swedish border to the Russian border (Grense Jacobs elv) when wind force is expected to be greater than or equal to force 7 (Beaufort) – near gale (greater than or equal to 14m/s), and for the sea areas in the Norwegian Economic Zone and the North Sea when the wind force is expected to be greater than or equal to force 8 (Beaufort) – gale (greater than or equal to 17m/s).

**Critical Water Levels** – along the coast are sent on a routine basis to a number of Governmental Agencies, Coastal Administration Agencies, Rescue Centres and others when water levels meet specified heights over the Norwegian Sea Map Zero level. The total water level is based on the sum of the height of the actual astronomic tide (HAT) and the calculated values of water height due to the actual weather conditions. The criteria given for the issuing of warning messages for specific coastal districts are set on the basis of the (highest) recorded water levels (see Table 2).

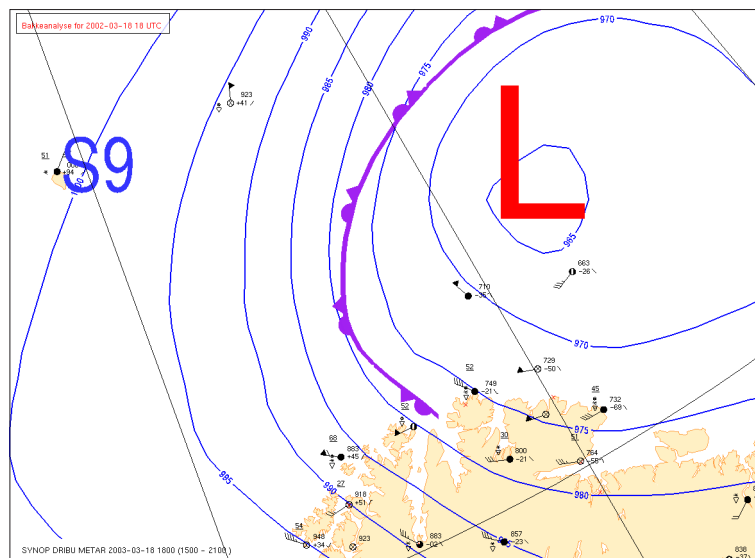
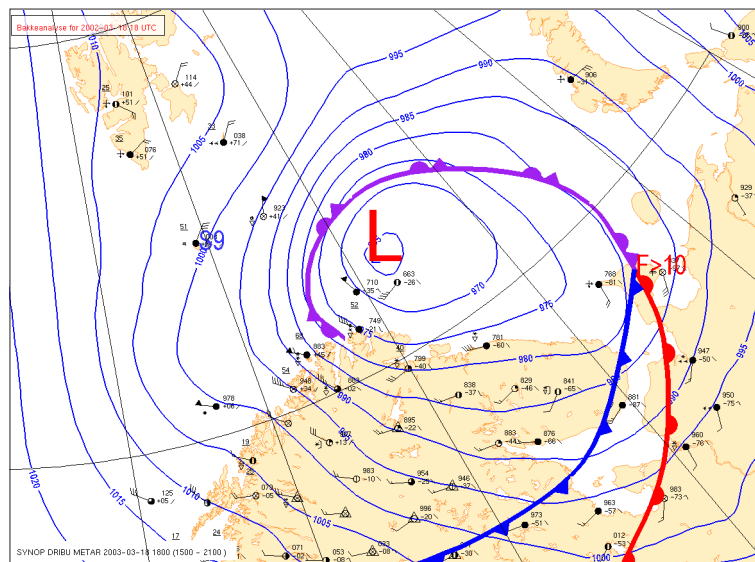
Table 2 - Critical Water Levels – highest recorded water levels		
<b>Oslo</b>	160 cm	(highest level rec. 255 cm in 1987)
<b>Helgeroa/Nevlunghavn</b>	135 cm	(highest level rec. 183 cm in 1990)
<b>Stavanger</b>	125 cm	(highest level rec. 175 cm in 1994)
<b>Bergen</b>	195 cm	(highest level rec. 239 cm in 1990)
<b>Kristiansund N</b>	275 cm	(highest level rec. 324 cm in 1993)
<b>Trondheim (Heimsjø)</b>	355 cm	(highest level rec. 419 cm in 1971)
<b>Rørvik</b>	315 cm	(highest level rec. 424 cm in 1971)
<b>Bodø</b>	350 cm	(highest level rec. 404 cm in 1979)
<b>Narvik</b>	390 cm	(highest level rec. 459 cm in 1932)
<b>Tromsø</b>	330 cm	(highest level rec. 467 cm in 1978)
<b>Hammerfest</b>	340 cm	(highest level rec. 479 cm in 1961)
<b>Honningsvåg</b>	335 cm	(highest level rec. 465 cm in 1973)
<b>Vardø</b>	380 cm	(highest level rec. 414 cm in 1993)

**Air Quality** (winter season only) – meteorological parameters are input data to numerical models for the calculation of air pollution indexes. Results from calculations are sent on a routine basis to project partners – municipal and others. The end user forecast for Air Quality in Bergen and Stavanger is conducted direct by met.no’s Regional Centre – Vervarslinga på Vestlandet).

**Level I - Warnings and messages included in standard weather forecasts to the public.**

Definition – Special warnings and/or messages issued through met.no’s ordinary media channels as integrated parts of the general weather forecast. Gale/storm warnings are also distributed as specific messages to the Coastal Radio Stations for further transmission on radio telephony and NAVTEX).

**Gale/storm warnings** – included in “Været til sjøs” – e.g. the general forecasts for the fishing banks and the sea areas:



- for the Norwegian coastal districts from the Swedish border to the Russian border (Grense Jacobs elv) when wind force is expected to be greater than or equal to force 7 – near gale (14m/s).
- for sea areas included in the message when wind force is expected to be greater than or equal to gale force 8 (17m/s).

**Forecasts of weather parameters causing road traffic disruption (slippery roads)** – forecasts are issued during the winter season. The forecasts are subjective, based on reports and assessment of the general weather situation. The parameters involved are temperature, precipitation and wind. Geographical location is also taken into consideration.

**Forest fire** – warnings for risk of forest fire are issued on a regular daily basis during the “summer season” when the surface is free from snow (from April). The warnings are based on calculation of the forest fire index (WBKZ).

**Avalanche** – forecasts of weather conditions expected to create an increasing danger of avalanches are based on a combination of an assessment of snow depth, expected amount of precipitation, wind and temperature conditions.

**Fog that can cause traffic disruption on roads or at sea** – forecasts of occurrence of fog are elements in the general forecasts. Special warnings are not issued.

**Frost** – forecasts of risk of frost are included in the general forecasts during the vegetation season. Special warnings are not issued.

**Icing at sea** – issued for moderate and severe icing and included in the general forecasts for fishing grounds and sea areas. The forecast is based on an algorithm using wind speed, air temperature and sea surface temperature (“Mertins Chart of Icing”).

## Warning Procedures for Level III warnings

Sequence of events in extreme weather situations:

Phase A – Early Warning of possible hazardous weather, 36-72 hours in advance of extreme weather situations occurring. Warnings issued if considered relevant.

Phase B - Hazardous Weather Warning, 0-36 hours in advance of expected extreme weather situations. Warnings issued and updated every 6 hours.

Phase C – Extreme weather taking place. Warnings issued and updated frequently (3-6 hourly intervals).

Phase D – Extreme weather situation over. “Danger over” message sent. Reports issued as soon as possible.

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