Progress Report No. 1-2009

for

Norwegian National Seismic Network

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1. Introduction

This progress report, under the project Norwegian National Seismic Network (NNSN), covers the first half of 2009. The purpose is to describe the current technical operation of the stations and the data recorded for the first half of 2009.

2. Operation

The operational stability for each station is shown in Table 1 and Figure 1 shows the station locations. At some of the stations particular problems have caused large downtime.

The seismic station at Florø was stopped March 19th, 2009 due to rehabilitation of the house where the station is located. The station is planned to be running from October 2009.

At the arctic island Hopen the climatic conditions as well as access (i.e. limited transportation) to the station, made it impossible to fix and even to exactly identify the cause of problems. The frost had to disappear from the ground before any action could be taken. For some earthquakes, P- and S- onset times could be read from the data transferred to Bergen.

Konsvik is one of four stations in the Mo i Rana area in Nordland. The stations are installed to register small local earthquakes, and are given low priority regarding maintenance. When the local contact person is not available the station might be down for long time, as was the case for this reporting period. Attempt is made to find additional contact persons.

The University of Oslo is housing the seismic station OSL. After building work the station was disconnected but attempt is now made to reinstall and update it to a standard 3-component station.

A new seismometer and digitizer were installed at Sulen, and the ISDN line was replaced by ADSL. Various problems have resulted in large downtime. However, the problems were resolved and the station than started operating normally.

Table 1a. Downtime in % for the period 1/1-30/6 2009 for all stations of the NNSN.

Station	Downtime in %
Askøy (ASK)	0
Bergen (BER)	0
Bjørnøya (BJO)	0
Blåsjø (BLS)	0
Dombås (DOMB)	0
Espegrend (EGD)	0
Florø (FOO)	0
Flostrand (FLOS)	0
Homborsund (HOMB)	0
Hopen (HOPEN)	100
Høyanger (HYA)	11
Jan Mayen SP (JMI)	0
Jan Mayen (JNE)	0
Jan Mayen (JNW)	0
Karmøy (KMY)	0
Kautokeino (KTK)	0
Kings Bay (KBS)	0
Kongsberg (KONO)	4
Konsvik (KONS)	44
Lofoten (LOF)	0
Mo i Rana (MOR8)	5
Molde (MOL)	2
Namsos (NSS)	4
Odda (OOD1)	0
Oslo (OSL)	100
Rundemanen (RUND)	1
Snartemo (SNART)	0.5
Stavanger (STAV)	0
Steigen (STEI)	1
Stokkvågen (STOK)	0
Sulen (SUE)	57
Tromsø (TRO)	0

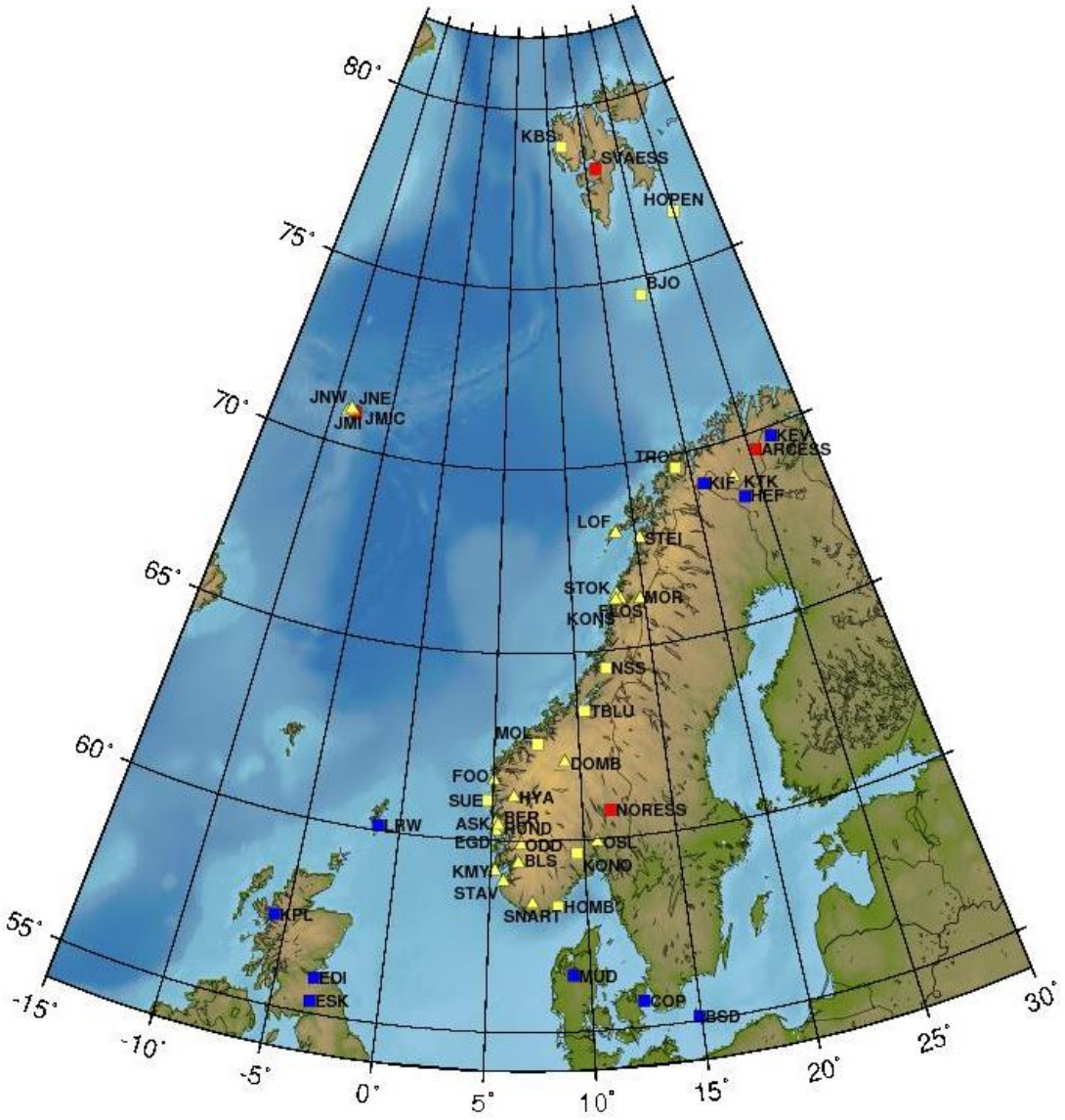

Figure 1. Stations contributing to the NNSN database. Stations marked with squares are BB sensors and triangles SP sensors. NNSN stations are yellow, NORSAR stations are marked in red and blue are British, Danish and Finnish stations.

3. Field stations and technical service

The technical changes for each seismic station are listed below. When a station stops working, tests are made to locate the problem. Sometimes the reason cannot be found and the cause of the problem will be marked as unknown.

Bjørnøya (BJO1)

Industrial PC installed. Seislog for Windows.

Blåsjø (BLS)

22.06.09. Communication changed from ISDN to fibre optic => realtime data transfer to Bergen.

Blussvoll (TBLU)

No visit or technical changes.

Dombås (DOMB)

No visit or technical changes.

Florø (FOO)

19.03.09. Station stopped due to construction work in the area. It will be reinstalled during October 2009.

Flostrand (FLOS)

04.06.09. Local operator installed industrial PC with Seislog for Linux.
06.06.09 – 11.06.09. Seedlink problem.

Homborsund (HOMB)

22-23.04.09. Visit. Attempt to recenter mass. Not successful.

Hopen (HOPEN)

01.01.09-31.06.09. The station was not working. No action could be made to fix problems since the ground is frozen. The box containing the sensor had filled with water and then frozen. The ice inside the box was melted in August using an electric oven, and the sensor sent to Bergen. Attempt will be made to reinstall the station in October 2009 which is the first possible chance after receiving the sensor in Bergen and the last boat this year.

Høyanger (HYA)

15.01.09. Visit. Industrial PC with Linux, new digitizer and GPS antenna installed.
03.06.09. Visit. Guralp digitizer was replaced with Sara SR04.

Jan Mayen (JMI)

No visit or technical changes.

Karmøy (KMY)

No visit or technical changes.

Kautokeino (KTK)

02.06.09. BB sensor replaced by three SS-1 sensors after being part of data acquisition by University of Oulu. Visit by Finish technician.

Kings Bay (KBS)

No visit or technical changes.

Kongsberg (KONO)

29.03.09. Station down, unknown reason.
29.04.09 – 05.05.09. Problem with ADSL connection, data lost.

Konsvik (KONS)

03.03.09. PC stopped since 31.12.09.
01.04.09. Industrial PC installed.
20.05.09 – 04.06.09. Defect GSM router
03.06.09. Communication down since 20.05.09. No data lost.

Lofoten (LOF)

No visit or technical changes.

Mo i Rana (MOR8)

No visit or technical changes.

Molde (MOL)

No visit or technical changes.

Namsos (NSS)

06.02.09. New industrial PC installed by local operator.
20.03.09. ADSL installed

Odda (ODD1)

No visit or technical changes.

Oslo (OSL)

No visit or technical changes.

Rundemanen (RUND)

No visit or technical changes.

Snartemo (SNART)

06.01.09. Restart by local operator. Down 1 day
06.04.09. Installed industrial PC with Seislog for Linux
26.06.09. New industrial PC installed after heavy lightning. Station down between 19-25.06.09.

Stavanger (STAV)

No visit or technical changes.

Steigen (STEI)

19.06.09. Local operator installed industrial PC with Seislog for Linux.

Stokkvågen (STOK)

04.06.09. Local operator installed industrial PC with Seislog for Linux.

Sulen (SUE)

10.03.09. Visit. A Industrial PC with Seislog for Linux, Guralp CMG-DM24 S6 digitizer, Guralp GPS were installed. 3.9K Damping resistance installed on ch. 1-3
02.04.09. Visit. Trillium sensor installed. Acceleration sensor removed. ADSL communication replaced ISDN.

29.04.09. Visit. Installed new digitizer, GPS and cable to GPS
04.04.09 – 06.05.09. Seislog problem. Spikes in data => data lost

Tromsø (TRO)

No visit or technical changes.

WNN network: Bergen (BER), Espegrend (EGD), Ask (ASK), Rundemanen(RUND)

No visit or technical changes.

4. Data

Figure 2 shows earthquakes and explosions recorded during the first half of 2009 and located within the shown area.

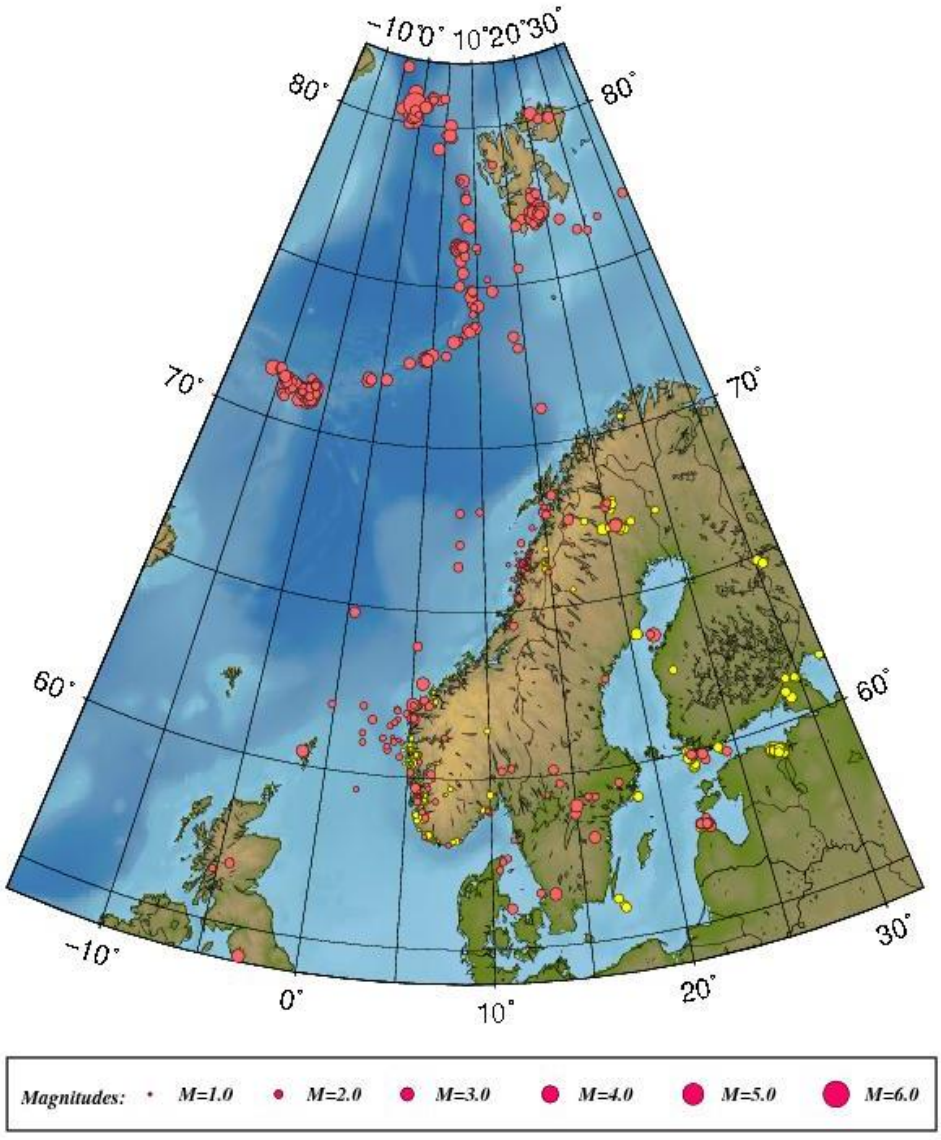

Figure 2. Epicentre distribution of located events recorded during January – June 2009. Earthquakes are plotted in red and presumed and known explosions in yellow.

On March 6th, at 10:50 GMT the largest earthquake recorded during the first half of 2009 occurred. This is the largest ever recorded earthquake on the NNSN in Norway and surrounding areas. The earthquake was located at 80.603N and 1.421W northwest of Longyearbyen, Svalbard with magnitude M_L=5.9 (NAO). USGS located this earthquake to 80.324N, 1.853W and reported a magnitude 6.5 (M_W)

The velocity-model used when locating earthquakes in areas along the midatlantic ridge and in the vicinity of Svalbard needs to be improved. Also magnitude calculations for large earthquakes in these areas using Norwegian M_L show large difference with magnitudes reported by EMSC and USGS. This is due to the propagation of seismic waves mostly in oceanic crust for these locations.

5. NNSN-plans 2009/2010

Plans for 2009

♦ UiB

- Sulen (SUE) will be upgraded with ADSL, line is ready but modem has not yet been installed. New equipment, including PC and digitizer, will be installed.
  - Progress: Done.
- Install a new broadband station in Finmark.
  - Progress: Visit has been made to find a new location in the area around Hammerfest and also in the Nordkapp area. Noise tests have been made at the two sites, and it is planned to do a preliminary installation of the station before the end of 2009.
- Karmøy KMY will get new equipment, mobile phone solution will be tested
  - Progress: Done. The station is from 19th august running with an ICE/CDMA mobile phone connection.
- Mo i Rana (MOR) will get new equipment, mobile phone solution will be tested.
  - Progress: Not done.
- Test mobile phone solution for the following stations: Høyanger (HYA), Blåsjø (BLS), Kautokeino (KTK), Karmøy (KMY), Mo i Rana (MOR)
  -Progress: HYA is updated to GSM
  BLS has a fibre optic connection
  KTK no changes
  KMY has an ICE/CMDA connection
  MOR no changes
- Minor upgrade on several stations.
- ADSL has been installed on Sulen (SUE) and Namsos (NSS)
- The GSM connection to KONS ans FLOS used to be unstable. A new configuration has improved the communication stability.

♦ NORSAR

- Develop the prototype of an event detection system to be integrated with NNSN

- Progress: Automatic detections are provided by NORSAR and integrated with the NNSN detections by UiB. NORSAR further plans to also provide the corresponding waveform data, this work is still in progress.

- Improve joint processing.

♦ NORSAR-NNSN joint analysis work

The NORSAR analyst is, on a weekly basis, merging the NORSAR local recordings into the NNSN database.

♦ Other

- Develop joint web pages
  - The details of this were discussed by UiB and NORSAR. A prototype of this page has been developed by UiB.
- Offshore stations. There is an ongoing effort to connect one sensor from Ekofisk and plans to install a new sensor at Statfjord. A noise test at Statfjord is planned for the autumn 2009 before deciding whether the data quality justifies the investment.

Plans for 2010

- Complete the installation of the station in Finnmark.
- Develop internal procedures for handling public inquiries and urgent processing in case of significant earthquakes in Norway.
- Develop a joint web-page for NNSN to be in operation by the summer of 2010. Finish the prototype for testing by the end of 2009.
- Establish written guidelines for daily routine processing between UiB and Norsar.
- Establish automated routines for event based waveform data extraction from Norsar for the associated triggers to the NNSN database.
- Continue upgrade of communication to real-time.
- Upgrade two existing stations to broadband seismometers.
- Continue with the integration of data from Ekofisk, and Statfjord if it will be installed.
- Install equipment for on-scale recording for large earthquakes on Jan Mayen through broadband seismometer or accelerometer.