Progress Report No. 1-2008

for

Norwegian National Seismic Network

January 1st to June 30th, 2008.

Supported by

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and

University of Bergen, Department of Earth Science

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1. Introduction

This progress report, under the project Norwegian National Seismic Network (NNSN), covers the first half of 2008. The purpose is to describe the current technical operation of the stations and the data recorded for the first half of 2008.

2. Operation

The operational stability for each station is shown in Table 1. The average downtime for all stations during this reporting period is 2.1 % compared to 1.6 % in the same time period of 2007. This is acceptable since the goal of average downtime which is below 2%.

Table 1a. Downtime in % for the period 1/1-30/6 2008 for all stations of the NNSN.

Station	Downtime in %
Askøy (ASK)	0
Bergen (BER)	0
Bjørnøya (BJO)	2
Blåsjø (BLS)	0
Dombås (DOMB)	0
Espegrend (EGD)	0
Florø (FOO)	20
Flostrand (FLOS)	0
Hopen (HOPEN)	4
Høyanger (HYA)	0
Jan Mayen BB (JMI)	0
Jan Mayen SP (JMI)	0
Jan Mayen (JNE)	0
Jan Mayen (JNW)	0
Karmøy (KMY)	0
Kautokeino (KTK)	0
Kings Bay (KBS)	2,1
Kongsberg (KONO)	1,1
Konsvik (KONS)	0
Lofoten (LOF)	3
Mo i Rana (MOR8)	0
Molde (MOL)	0
Namsos (NSS)	0
Odda (OOD1)	8
Oslo (OSL)	5
Rundemanen (RUND)	15
Snartemo (SNART)	0
Stavanger (STAV)	0
Steigen (STEI)	0
Stokkvågen (STOK)	0
Sulen (SUE)	8
Tromsø (TRO)	0
Average	2,1

3. Field stations and technical service

The technical changes for each seismic station are listed below. It is noted if these changes are not related to a visit from the technical staff at the University of Bergen. 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)

No visit or technical changes.

Blåsjø (BLS)

07.05.08. Visit. New digitizer (ED2400), GPS, Dell Pc, Seislog for Linux, was installed. By a mistake damping resistance was not installed.

21.05.08. Damping resistance, 5.6 Kohm, was installed by the local operator.

Dombås (DOMB)

No visit or technical changes.

Florø (FOO)

01.01 – 06.02.08. A malfunctioning digitizer caused low S/N level. Attempts were made to fix the problem remotely. Station down for 37 days.
07.02.08. Visit. A new ED2400 digitizer, a new Dell PC with Seislog for Windows was installed. The PC replaced the Lap Top.
The 3 SS-1 Rangers sensors were replaced with a new BB sensor, Trillium 120P.
The aluminium box was wet inside, cleaned it up.

Flostrand (FLOS)

No visit or technical changes.

Hopen (HOPEN)

6 – 14.01.08. Station down for 8 days due to a malfunction PC.
14.01.08. A new PC was installed by the local operator.

Høyanger (HYA)

No visit or technical changes.

Jan Mayen (JMI)

No visit or technical changes.

Karmøy (KMY)

No visit or technical changes.

Kautokeino (KTK)

No visit or technical changes.

Kings Bay (KBS)

No visit or technical changes.

Kongsberg (KONO)

No visit or technical changes.

Konsvik (KONS)

No visit or technical changes.

Lofoten (LOF)

18. – 21.01.08. Restarted PC by use of the Telecommander. Station down for 3 days. Reason unknown..
22. – 25.03.08. Station down for 3 days. Reason unknown.

Mo i Rana (MOR8)

No visit or technical changes.

Molde (MOL)

No visit or technical changes.

Namsos (NSS)

No visit or technical changes.

Odda (ODD1)

07.05.08. Visit. A new Dell PC with Seislog for Linux was installed.
22.05.08. When the PC was set up, the sample rate had a mismatch to the digitizer. Changed the sample rate from 50 Hz to 100 Hz. Data lost 7-22/5-08. Station down for 15 days.

Oslo (OSL)

1 – 11.01.08. Station down for 10 days. Reason unknown.

Rundemanen (RUND)

15.01.08. Station down since 01.01.08 due to error on digital line. During February and March digital line unstable.
18.06.08. Visit. The line converted from digital to analog. Installed 1 PTS-3 box (Sprengnether). Gain 84 dB, filter 5-10Hz. 5V full scale.

Snartemo (SNART)

No visit or technical changes.

Stavanger (STAV)

11.-12.06.08. Visit. Installed new Dell PC with Seislog for Linux, new digitizer (Nanometrics RD3). The data are now transferred on a ADSL line.
17. – 30.06.08. A new digitizer (RD3) was replaced by the local operator. Station down for 14 days due to a malfunctioned digitizer.

Steigen (STEI)

No visit or technical changes.

Stokkvågen (STOK)

No visit or technical changes.

Sulen (SUE)

30/1 – 14.02.08. Station down for 15 days. Reason unknown.

Tromsø (TRO)

No visit or technical changes.

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

18.06.08. Rundemanen (RUND) replaced Bergen (BER) in the WNN network.

4. Data

Figure 1 shows earthquakes and explosions recorded during the first half of 2008 and located within the shown area.

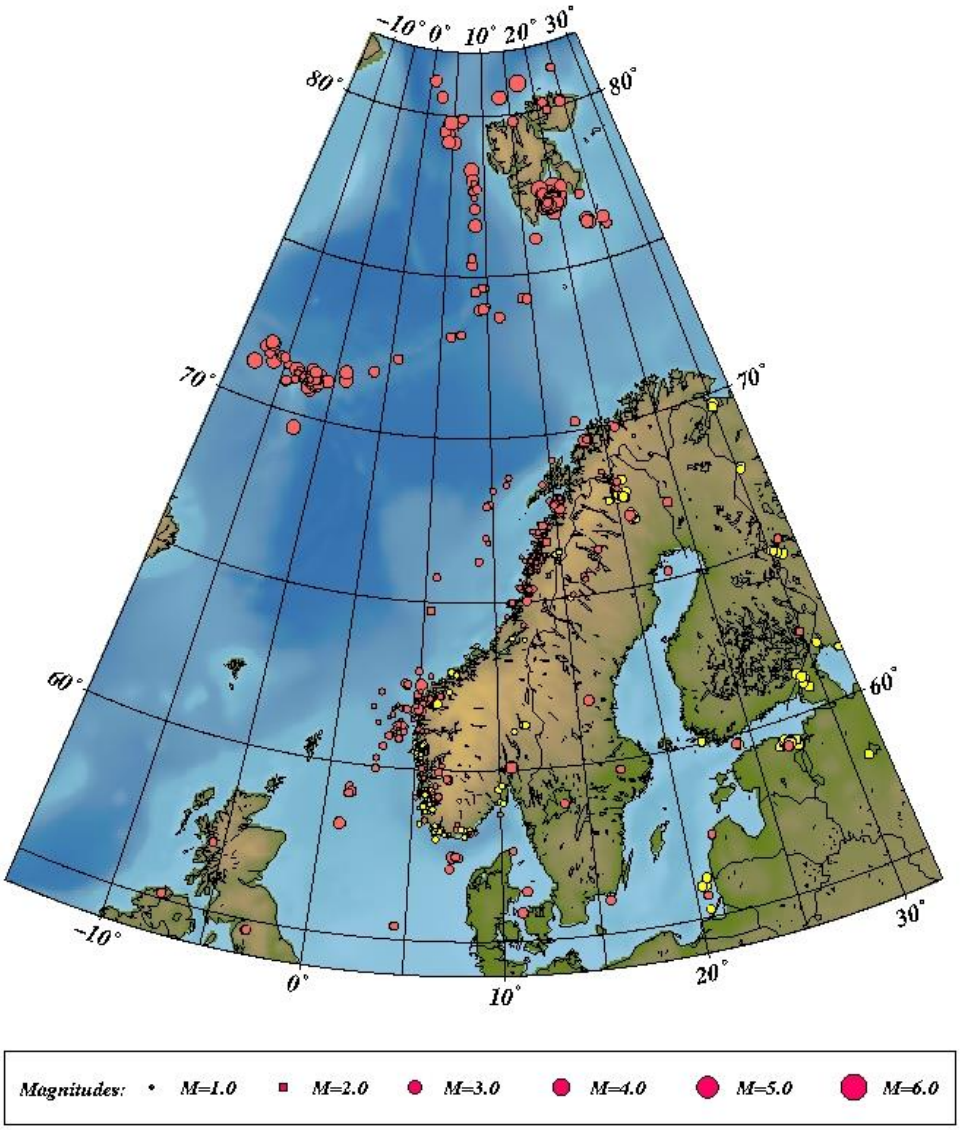

Figure 1. Epicentre distribution of located events recorded during January – June 2008. Earthquakes are plotted in red and presumed and known explosions in yellow.

A major earthquake (M_W=6.0) occurred February 21st, 2008 at 02:46 (UTC) south of Spitsbergen. This earthquake was the largest recorded in the history in Norway apart from the plate boundary events. The epicentre was located to 77.16N and 19.89E, at Storfjordsbanken. This earthquake was strongly felt in Longyearbyen were people woke up. This earthquake was followed by several aftershocks of which many were recorded at several stations and could be located. The largest of these aftershocks occurred April 11th with magnitude 4.3. Figure 2 shows 246 earthquakes located within the mapping area and occurring during the first 6

months of 2008. The closest seismic stations are the SVAESS array at Spitsbergen (~140 km) and Hopen (~150 km). The seismic station at Hopen recorded approx. two thousands aftershocks in the following months. These small earthquakes have not been processed.

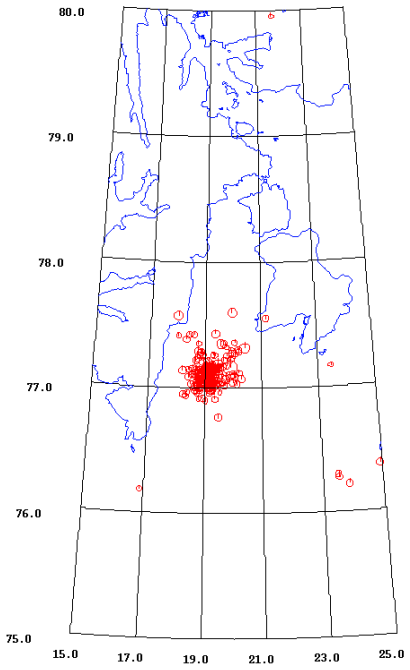

Figure 2. Epicentre distribution (Jan.-Jun.) of located events recorded after the magnitude 6.0 earthquake in February 2008.

5. NNSN-plans 2008/2009

Plans and progress for 2008:

- Plan: Convert the whole network to a real time network, include 11 stations from NORSAR, Finland and the UK and install 2 new stations to form a 44 station real time network. (see Figure 3)
    - Progress: 34 stations are now in real time, the remaining will be included once the communication is available.
- Plan: Store all continuous data from all stations in the NNSN data base.
    - Progress: Done for 34 stations, remaining will be included when communication is ok.
- Plan: Include NORSAR array detections in real time system.
    - Progress: No new software has been made by NORSAR yet to enable this function since all emphasis has been in getting real time digital data. This task will be started in November, 2008.
- Plan: Move all real time processing and data storage to new Linux system.
    - Progress: Done.
- Plan: Upgrade network with 10 new digitizers.
    - Progress: Digitizers were ordered in spring, have not yet arrived.

- Plan: Install one new broad band station in S. Norway and install a station at a Trondheim school.
    - Progress: The chosen site is located in Homborsund, Grimstad and the station will be installed in November. The Trondheim station will also be installed in November. It was not possible to install earlier due to communication problems at the school.

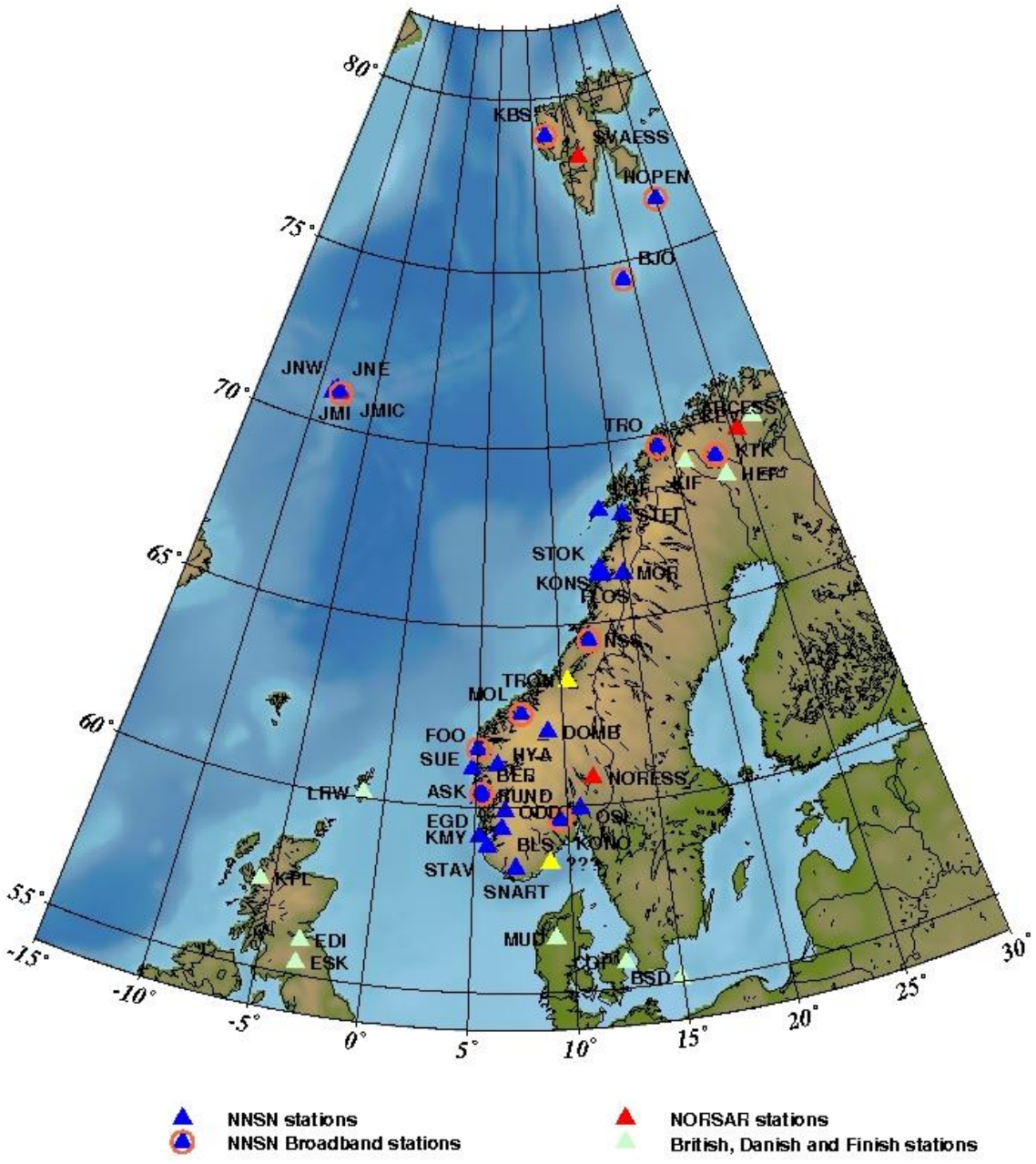

Figure 3. Stations contributing to the NNSN database. Stations marked with yellow triangles are to be installed in 2008.

The last station in NNSN without internetcommunication, Hopen, finally got a satellite link in the fall. This was done in cooperation with the University of Tromsø and the Meteorological Institute. Communication costs will be quite high compare to the other stations (56 kNOK/year).

The main problem in the transition to the new network has been the difficulty in obtaining ADSL lines to the stations. New lines must be ordered centrally at the UIB and this combined with the new company providing communication (Ventelo) has delayed the installation of communication. After a few months of frustration, we were allowed to use other companies and are now also using Telenor and NexeGenTel. Finally there are sites where ADSL is not available and we are currently testing two types of mobile phone connections.

The other problem making progress slow has been the late delivery of the new digitizers which were promised to arrive July 1. Now they are supposed to arrive at November 7th. Unfortunately this is a type of equipment which cannot be easily obtained elsewhere. As replacement, lower quality digitizers have been used in some places.

The moving of the data collection and processing system to a new platform is now complete although minor problems still remain. This task and setting up of the real time communication, has used most of the technical resources so far this year. Figure 4 shows a flow diagram of the NNSN real time data acquisition.

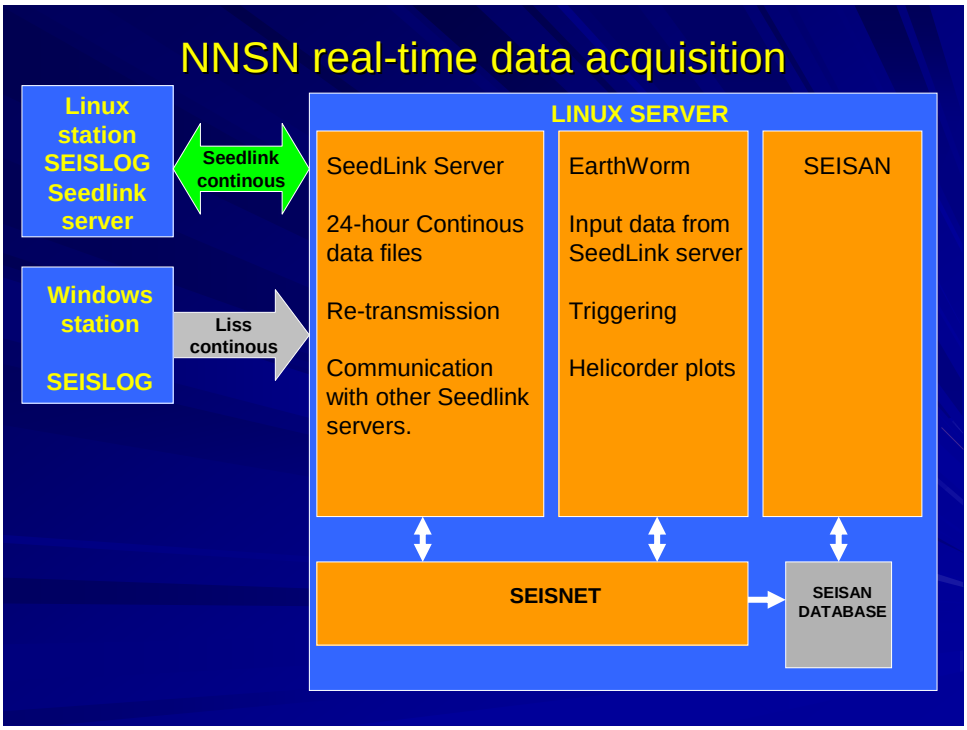

Figure 4. Diagram showing the NNSN real time data flow.

Plans for remaining stations for 2008 – early 2009

♦ UiB

- Odda (ODD) will be upgraded with ADSL, line is ready but modem has not yet been installed.
- Karmøy KMY will get new equipment, mobile phone solution will be tested
- Høyanger (HYA) will get new equipment, mobile phone solution will be tested
- Sulen (SUE) will be upgraded with ADSL, line is ready but modem has not yet been installed.
- Blåsjø (BLS) has got new equipment, mobile phone solution will be tested.
- Bjørnøya will get new equipment, communication is ready but a new PC (Linux) must be installed.
- Dombås (DOMB) will be upgraded with ADSL, line is ready. A 3 component sensor and new equipment will be installed.
- Namsos (NSS) will get new equipment, mobile phone solution will be tested.
- Mo i Rana (MOR) will get new equipment, mobile phone solution will be tested.
- Kautokeino, mobile phone solution will be tested.

There are 3 more ADSL station to be installed and 5 stations will be equipped with a mobile phone solution. GSM mobile phone solutions, today used on 2 stations near Stokvågen (FLOS and KONS), are a bit too slow to provide reliable data since there is no 3G coverage at these sites. This is also the case for the remaining 5 sites and ICE (communication based on old NMT network) solutions are therefore tested. So far it looks good and the first test on a field station will be made in November. If all goes well, it might be possible to get most of the remaining stations online in real time this year.

♦ NORSAR

- Finalize system of delivery of data to NNSN with a SEEDlink server
- Develop the prototype of an event detection system to be integrated with NNSN

♦ NORSAR-NNSN joint analysis work

Since the network only recently has become in full operation (all NORSAR data entered middle of October), little testing has been done with this processing. One person from NORSAR has spent nearly 2 weeks in Bergen leaning the joint processing system and the plan is that NORSAR will participate in the general processing for the rest of the year. Based on this experience, further plans will be made for next year.

♦ Other

Offshore stations.
There is an ongoing effort to connect one sensor from Ekofisk and plans to install a new sensor at Statfjord