

# **Swedish National Seismic Network (SNSN)**

## **A short report on recorded earthquakes during the second quarter of the year 2003**

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August 2003

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*Keywords:* Seismic network, earthquakes

This report concerns a study which was conducted in part for SKB. The conclusions and viewpoints presented in the report are those of the author(s) and do not necessarily coincide with those of the client.

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## **Abstract**

According to an agreement with Swedish Nuclear Fuel and Waste Management Company (SKB) and Uppsala University, the Department of Earth Sciences has continued to carry out observation and additional construction of new seismic stations within the Swedish National Seismic Network (SNSN). This report gives some information about the recorded seismicity during April through June 2003.

At present 38 stations are in operation and seven additional stations will be put into operation during July or August 2003. During the period April through June 2003, there were 68 located events whereof 2 with magnitude above 2.0 and additional 7 above or of 1.0. The range of the depth to the location to the centre of the generated earthquakes varies between 0.1 and 29.3 km.

The largest earthquake  $ML=2.4$  occurred on May 26th 34 km north of Karlstad. The second largest earthquake during this period occurred June 21th 20 km north of Karlstad.

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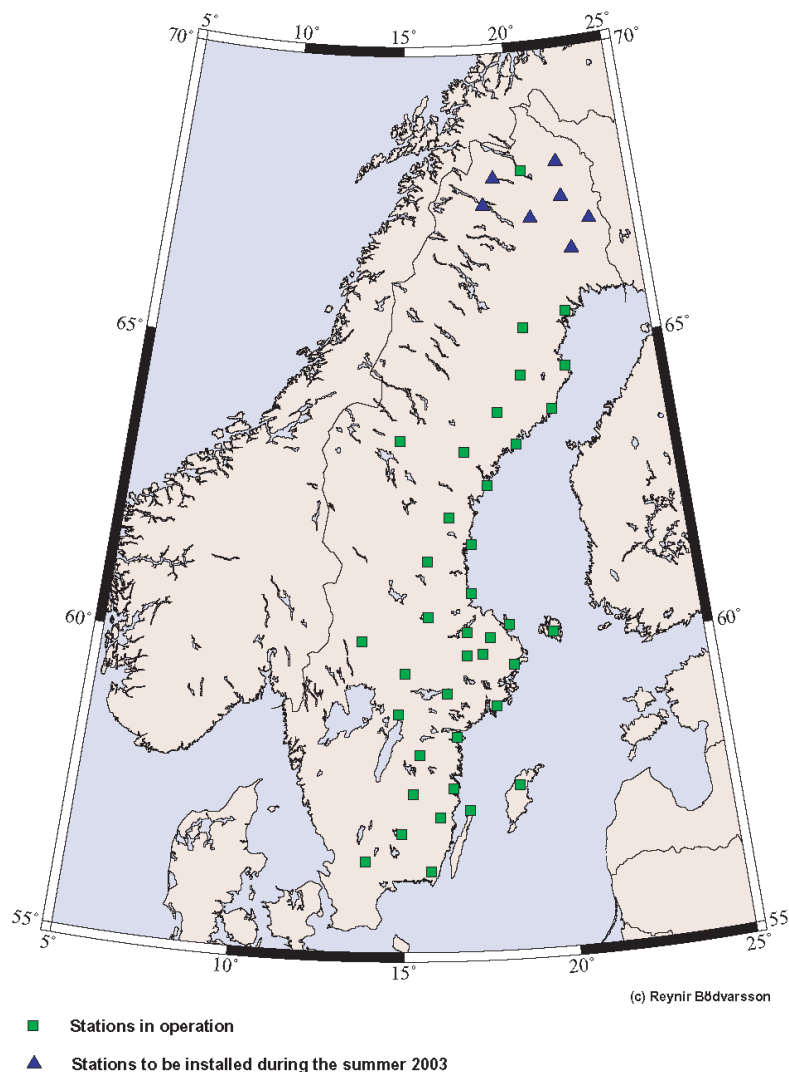
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# 1 Introduction

This is the second quarterly report on seismic events recorded by the Swedish National Seismic Network (SNSN) for the year 2003. At present 38 stations are in operation and seven additional stations will be put into operation during July or August 2003, Figure 1-1.

The report includes fundamental information about the seismic events, including origin time and hypocenter location. Information about the source parameters is not included in the present report but is delivered as a separate ASCII-text. This report is a preliminary report including only the automatic and the brief interactive analysis done on the routine bases at SNSN.

## Swedish National Seismic Network April 2003



**Figur 1-1.** The present Swedish National Seismic Network (SNSN).

## 2 Objective and scope

According to an agreement with Swedish Nuclear Fuel and Waste Management Company (SKB) and Uppsala University, the Department of Earth Sciences continues to carry out observation and additional construction of new seismic stations within the Swedish National Seismic Network (SNSN).

The goal is to complement the existing regional seismic network to establish a local seismic network that also permits registration of small earthquakes in order to obtain relatively long time series and thereby gain a better understanding of the causes of seismic events in the site investigation areas.

Fundamental information about the seismic events, including origin time, hypocenter location and information about the source parameters will be given after every three month period.

Expected results are to obtain information on location, magnitude and source parameters of small earthquakes down to a magnitude of 0.0 near the investigation sites.

### **3 Recorded earthquakes during the second quarter of 2003**

Figure 3-1 shows earthquake activity in Sweden during April through June 2003. During this period there were 564 located events, Figure 3-2. Out of these 440 are explosions, 68 are true earthquakes and 56 are still uncertain but most of these are mainly outside the network.

The largest earthquake  $ML=2.4$  occurred on May 26th 34 km north of Karlstad. The second largest earthquake during this period occurred June 21th 20 km north of Karlstad.

During the spring there have been several observations by the population in the south-east of Sweden, including Öland and Gotland which was thought to be earthquakes. As concluded in the first quarterly report of 2003 it was found to be coming from the above and related to test flyings of the Jas 39 Gripen /Böðvarsson, 2003/.

Event lists for April until June 2003 are given in sections 3.1 through 3.3.

#### **3.1 April**

Event list for April is given in Table 3-1 with date, time, latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (ML). In April 22 events were located whereof 2 with magnitude of or above 1.0. The depth range varies between 2.5 and 28.6 km.

**Table 3-1. Date, time, latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (ML) of recorded earthquakes in April.**

Date	Time	Latitude	Longitude	X (RT90) km	Y (RT90) km	Depth km	ML Local Magnitude
20030403	003740.8	64.576	21.151	7174.1	1755.8	2.5	0.6
20030403	103031.3	64.552	21.214	7171.6	1759.0	24.6	0.5
20030403	115226.0	64.298	20.537	7140.8	1728.7	17.0	0.4
20030403	202517.4	65.138	21.215	7236.9	1753.5	17.7	0.7
20030405	070326.3	63.811	21.470	7090.4	1778.6	20.5	0.9
20030406	042114.2	64.986	20.046	7215.8	1699.9	5.0	0.5
20030408	190751.9	64.494	21.079	7164.7	1753.1	24.8	0.1
20030409	124649.8	64.487	21.126	7164.1	1755.4	26.0	0.4
20030410	083314.3	60.537	17.578	6714.5	1597.1	8.3	0.3
20030410	094821.8	65.214	22.316	7250.1	1804.1	19.2	1.0
20030413	074032.4	63.177	18.953	7011.2	1658.3	13.3	0.1
20030415	204515.6	61.091	19.223	6779.8	1684.1	20.2	0.7
20030416	193000.0	61.729	16.938	6846.5	1559.7	14.7	-0.1
20030421	213151.2	63.378	19.325	7034.6	1675.8	4.8	-0.8
20030422	212426.0	61.978	17.407	6874.8	1583.8	28.6	0.2
20030423	105945.7	64.866	20.425	7203.6	1718.7	3.5	1.4
20030423	135914.6	64.388	20.616	7151.1	1731.8	3.5	-0.1
20030424	045759.4	56.308	15.670	6242.2	1491.4	8.8	0.6
20030425	045404.5	63.925	20.364	7098.7	1723.3	16.1	0.2
20030428	004752.3	64.358	20.679	7148.0	1735.1	16.3	0.2
20030429	203841.2	62.592	17.488	6943.3	1586.3	26.1	0.6
20030430	225117.0	65.001	20.216	7218.0	1707.8	11.9	0.4

### 3.2 May

Event list for May is given in Table 3-2 with date, time, latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (ML). In May 24 events were located whereof 1 with magnitude above 2.0 and additional 3 larger than 1.0. The depth range varies between 4.0 and 27.5 km.



**Table 3-2. Date, time, latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (ML) of recorded earthquakes in May.**

Date	Time	Latitude	Longitude	X (RT90) km	Y (RT90) km	Depth km	ML Local Magnitude
20030502	082207.2	63.970	21.523	7108.3	1779.6	4.4	0.4
20030502	113800.7	64.396	20.829	7152.8	1741.9	19.1	-0.4
20030503	090550.8	64.118	20.465	7120.6	1726.7	4.2	-0.0
20030503	150051.4	61.788	16.947	6853.1	1560.1	16.1	0.7
20030503	151235.9	59.084	13.832	6553.1	1386.7	11.6	1.6
20030503	161841.8	61.795	16.979	6853.9	1561.8	19.9	0.0
20030504	112332.0	64.220	20.317	7131.3	1718.7	16.5	-0.4
20030506	012455.3	63.952	20.566	7102.5	1733.0	16.5	0.7
20030508	163142.8	64.307	20.870	7143.1	1744.7	19.7	0.0
20030510	122542.8	62.955	18.264	6985.0	1624.6	8.6	0.9
20030512	173714.2	61.743	16.712	6847.9	1547.7	19.0	0.1
20030512	235542.7	61.787	16.945	6853.0	1560.0	16.8	0.8
20030513	061055.3	65.440	20.822	7268.8	1732.4	10.3	-0.1
20030516	070852.8	65.301	22.628	7261.3	1817.6	15.0	0.3
20030518	103651.5	61.913	16.872	6866.9	1555.9	17.6	-0.3
20030520	031209.7	62.698	17.974	6955.9	1610.8	11.5	0.8
20030521	093156.1	61.747	16.274	6848.1	1524.6	8.4	0.8
20030521	193059.0	64.506	21.182	7166.4	1757.9	11.7	1.7
20030522	170720.4	62.830	18.035	6970.7	1613.5	18.2	0.4
20030524	004423.1	61.892	17.870	6865.9	1608.4	5.1	-0.1
20030524	122232.3	64.198	20.520	7129.6	1728.7	19.2	-0.3
20030526	103728.1	59.708	13.654	6622.8	1378.8	4.0	2.4
20030527	044540.1	64.415	21.167	7156.2	1758.0	19.3	0.2
20030531	054011.6	64.280	20.785	7139.7	1740.8	27.5	1.8

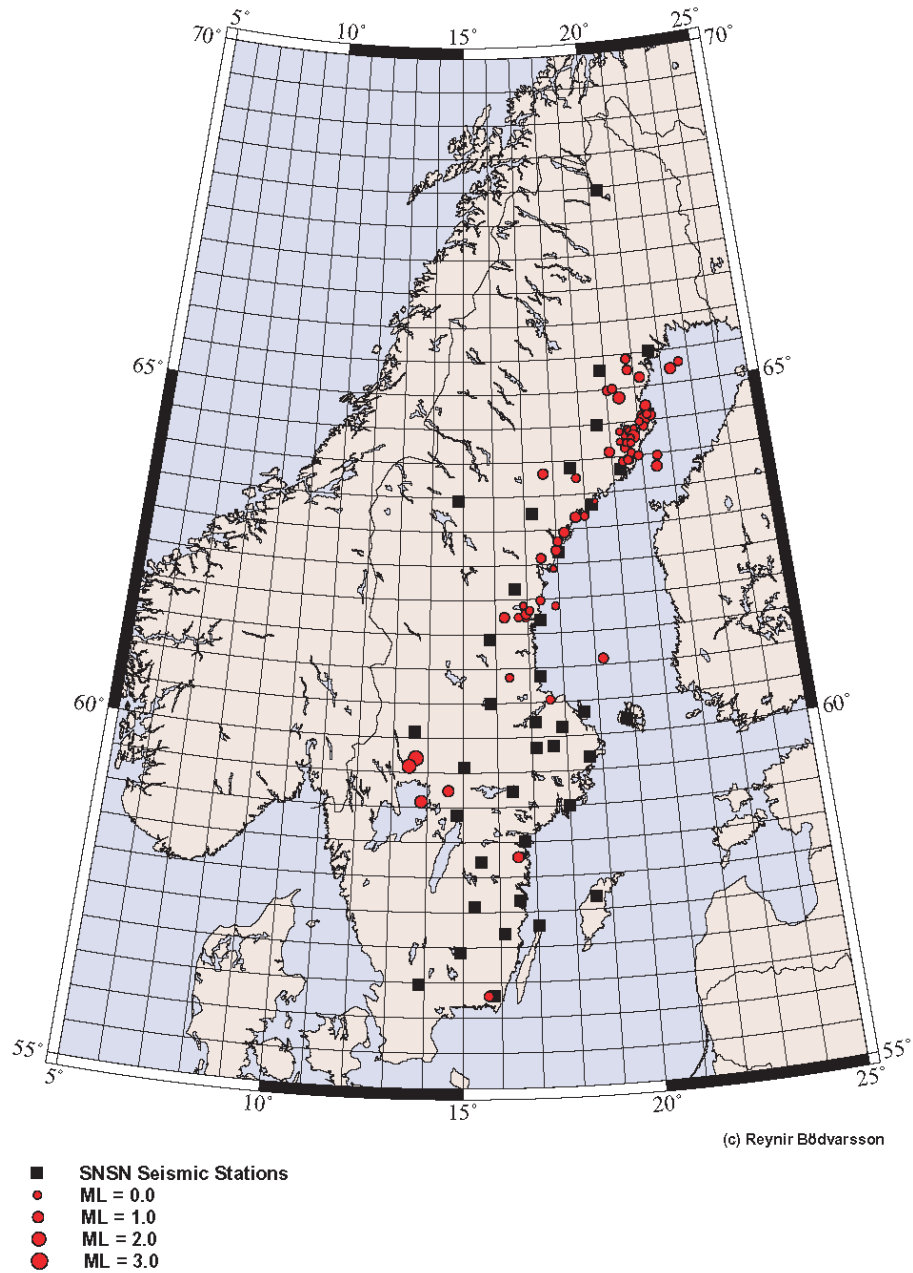
### 3.3 June

Event list for June is given in Table 3-3 with date, time, latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (ML). In June 22 events were located whereof 1 with magnitude above 2.0 and additional 2 with magnitude above or of 1.0. The depth range varies between 0.1 and 29.3 km.

**Table 3-3. Date, time, latitude, longitude, X (RT90), Y (RT90), depth and local magnitude (ML) of recorded earthquakes in June.**

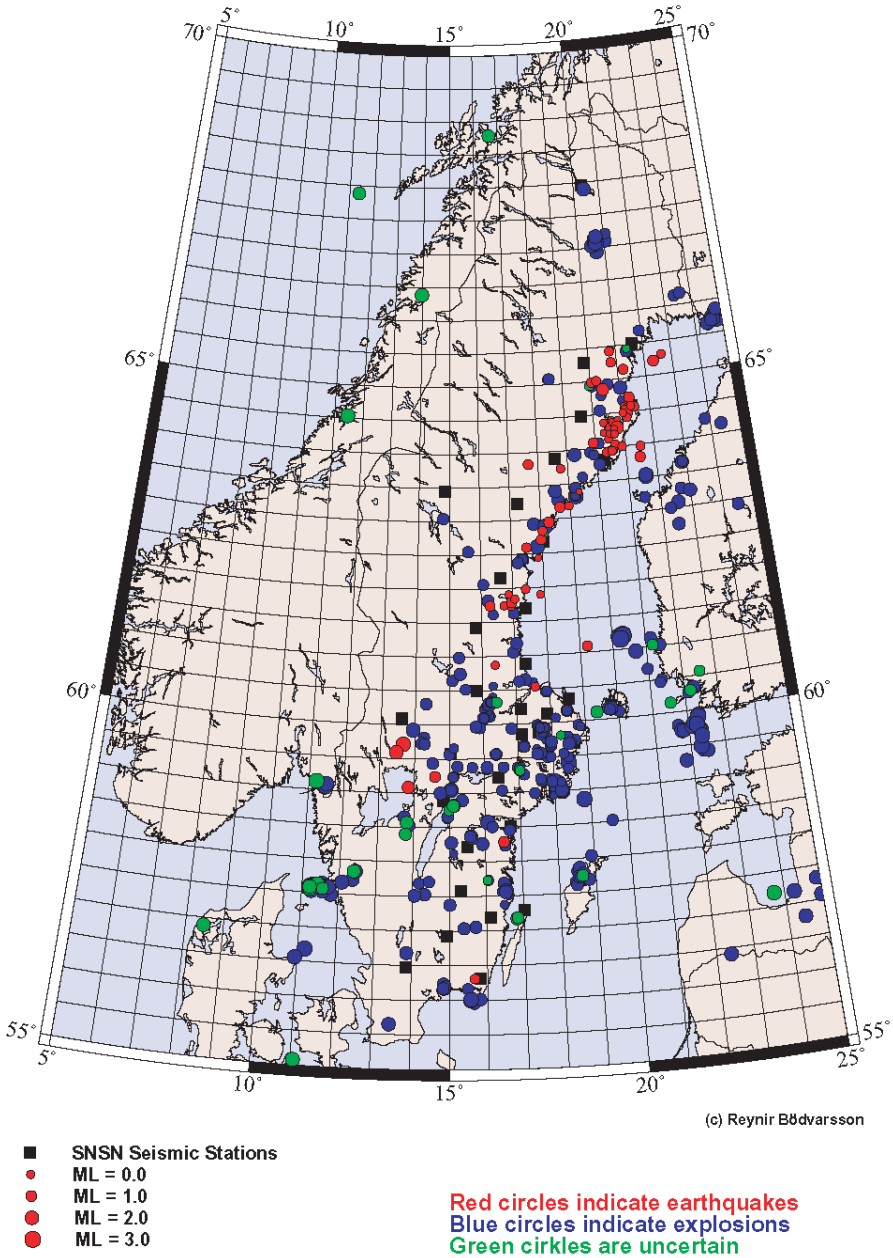
Date	Time	Latitude	Longitude	XRT90 km	YRT90 km	Depth	ML Local Magnitude
20030601	181523.8	64.260	20.690	7137.2	1736.5	18.7	-0.3
20030602	051208.8	65.261	20.795	7248.9	1732.7	20.9	0.6
20030603	054745.2	64.715	21.312	7190.2	1762.1	2.9	0.9
20030604	161900.6	64.188	20.682	7129.2	1736.7	19.2	-0.1
20030605	065908.9	63.169	18.652	7009.6	1643.2	20.8	0.9
20030606	100052.8	64.042	20.672	7112.9	1737.4	10.5	0.1
20030606	141710.9	63.823	17.666	7080.7	1591.5	24.2	0.7
20030606	203733.2	65.424	20.781	7266.9	1730.7	17.8	0.4
20030606	222932.7	64.368	20.343	7148.0	1718.8	19.3	-0.3
20030607	074651.1	60.873	16.393	6750.8	1531.8	19.3	0.1
20030613	184849.9	64.566	21.455	7174.2	1770.4	22.2	0.6
20030615	004702.8	64.488	21.039	7163.8	1751.2	19.1	-0.1
20030616	003220.4	63.736	18.753	7073.1	1645.4	29.3	0.2
20030616	083258.4	63.943	20.542	7101.3	1731.9	16.1	0.2
20030619	043241.0	63.990	20.896	7108.0	1748.8	18.3	0.2
20030620	220345.8	59.240	14.589	6569.4	1430.4	5.6	1.1
20030621	150443.5	59.592	13.466	6610.3	1367.7	17.0	2.1
20030624	004639.1	64.584	21.331	7175.7	1764.3	22.5	0.1
20030626	132420.8	58.285	16.515	6462.5	1541.5	0.1	1.0
20030627	065203.3	64.081	19.931	7114.6	1701.0	22.9	0.8
20030628	162005.7	61.837	17.056	6858.7	1565.7	19.3	0.1
20030628	162100.9	62.435	17.864	6926.3	1606.2	16.8	-0.4

## SNSN recorded earthquakes April through June 2003



*Figur 3-1. Earthquake activity in Sweden during April through June 2003.*

# SNSN recorded events April through June 2003



Figur 3-2. Recorded events including explosions in the SNSN network during the period April through June 2003.

## References

**Böðvarsson R, 2003.** Swedish National Seismic Network (SNSN). A short report on recorded earthquakes during the first quarter of the year 2003. SKB P-03-37.