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Swedish National Seismic Network (SNSN)

A short report on recorded earthquakes during the second quarter of the year 2007

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July 2007

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

Data in SKB's database can be changed for different reasons. Minor changes in SKB's database will not necessarily result in a revised report. Data revisions may also be presented as supplements, available at www.skb.se.

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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 short report gives some information about the recorded seismicity during April through June 2007.

The Swedish National Seismic Network consists of 59 stations in operation and additional 2 under construction. During April through June, 1,036 events were located whereof 72 are estimated as real earthquakes, 877 are estimated as explosions and 83 events are still considered as uncertain but these are mainly located outside the network.

The three largest earthquakes recorded by the network during the period were all located in Norway. The largest earthquake located in Sweden was the $M_L = 2.7$ earthquake that occurred on February 28th, 12 km south of Skara. Additionally 16 earthquakes had magnitudes equal to or above $M_L = 2.0$.

The largest two earthquakes with $M_L = 2.1$ occurred on April 3, located 67 km north of Örnsköldsvik and on May 22, located 34 km NW of Robertsfors.

Sammanfattning

Enligt avtal mellan Svensk Kärnbränslehantering AB (SKB) och Uppsala Universitet, Institutionen för Geovetenskaper, fortsätter Uppsala Universitet att driva och bygga ut seismiska mätstationer i det svenska seismiska nätet (SNSN). Denna rapport ger information om registrerade händelser under tidsperioden april till juni 2007.

Det seismiska nätet består av 59 stationer som nu är i drift. Ytterligare två stationer är under uppbyggnad. Under perioden april till juni, 2007 var det 1 036 registrerade händelser varav 72 bedömdes som äkta jordskalv, 877 bedömdes vara förorsakade av explosioner eller sprängningar samt 83 var osäkra händelser, men dessa var i huvudsak lokaliserade utanför det seismiska nätet.

Det två största jordskalven under perioden nådde en magnitud på 2.1. Det förra inträffade den 3 april och lokaliserades 67 km norr om Örnsköldsvik och det senare inträffade den 22 maj, 34 km NW om Robertsfors.

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1 Introduction

This document reports the seismic events recorded by the Swedish National Seismic Network (SNSN) for the second quarter of the year 2007. The work was carried out in accordance with activity plan AP PU 400-06-004. In Table 1-1 controlling document for performing this activity is listed. The activity plan is an SKB internal controlling document.

At present 59 stations are in operation, Figure 1-1. Additional two stations are under construction in Skåne.

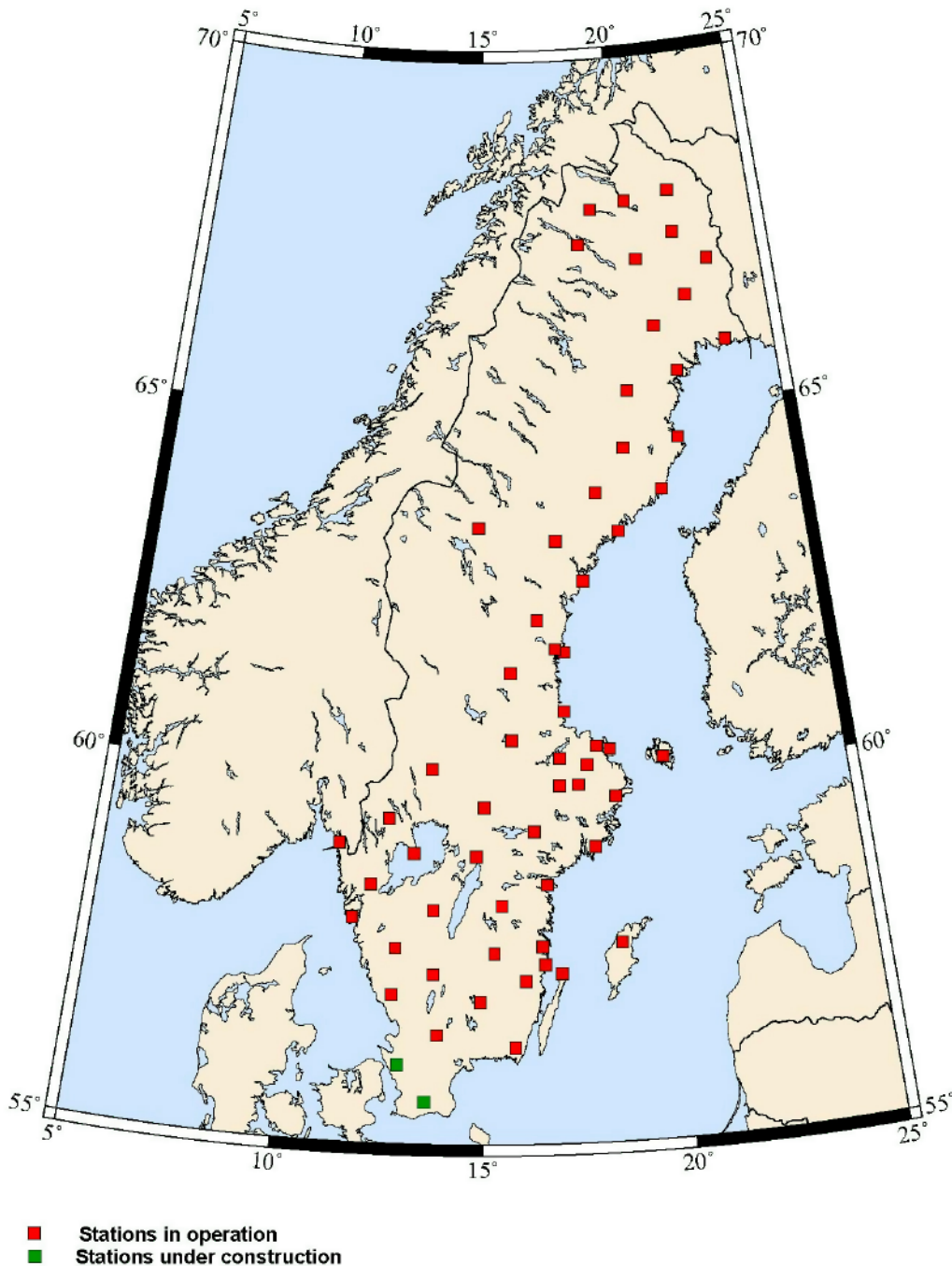


Figure 1-1. The present Swedish National Seismic Network (SNSN).

Table 1-1. Controlling documents for the performance of the activity.

Activity plan	Number	Version
Drift av seismologiskt nät i Sverige	AP PU 400-06-004	1.0

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 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.

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 observations 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.

The sensitivity of the network allows for complete recording of all earthquakes down to a magnitude of lower than 0.5 within the network and down to magnitude 0.0 near the proposed nuclear waste deposit sites.

3 Recorded earthquakes during the second quarter of 2007

Figure 3-1 shows the recorded events in Sweden during April through June. During the period 1,036 events were located whereof 72 are estimated as real earthquakes (which are shown in Figure 3-2). 1,036 are estimated as explosions and 83 are still considered as uncertain but are most probably explosions and are mainly located outside the network. Large amount of induced seismicity around the mines in Kirunavaara, Malmberget and Aitik are observed and 128 events in the very vicinity of the mines have been excluded from the lists.

Event lists for April through June 2007 are given in sections 3.1 through 3.3.

3.1 April

An event list for April is given in Table 3-1 with date, time longitude, latitude, X (RT90 km), Y (RT90 km), depth and local magnitude (M_L). In April 27 events were located whereof one with magnitude $M_L = 2.1$ located 67 km N of Örnsköldsvik. Additional 2 earthquakes had magnitudes above 1.0. The depth range of the events varies between 1 and 37.3 km.

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

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth Km	M_L Local Magnitude
20070401	20305.7	64.326	20.575	7,144.1	1,730.3	17.9	-0.1
20070402	111459.2	65.344	22.589	7,265.9	1,815.3	1	0.5
20070402	203300.7	64.718	21.242	7,190.3	1,758.8	1.1	-0.2
20070403	32854.8	58.658	13.009	6,507.3	1,337.6	6.9	0.1
20070403	40014.6	62.064	16.953	6,883.9	1,559.9	1.1	0.3
20070403	44520.9	63.884	18.597	7,089.2	1,637	26	2.1
20070404	72624	68.781	20.492	7,639.4	1,689.1	11.1	0.4
20070406	203305.2	66.751	24.566	7,432.9	1,884.8	2.3	1.2
20070408	235725	64.502	20.813	7,164.5	1,740.3	1.2	0.4
20070409	135142.8	59.171	13.451	6,563.4	1,365.2	8.6	0.7
20070410	124407.4	64.561	21.377	7,173.4	1,766.7	25.6	0.3
20070411	162109.1	64.644	21.242	7,182.1	1,759.5	1.8	0.3
20070414	91234.8	63.279	15.299	7,018.8	1,474.4	10.6	0.4
20070415	3605.4	58.879	15.053	6,528.8	1,456.4	6	-0.5
20070415	152657.5	64.595	20.602	7,174.1	1,729.4	25.3	0.1
20070416	194902	62.228	17.282	6,902.5	1,576.6	16.1	-0.2
20070417	32835.3	63.437	19.116	7,040.7	1,665	12.2	0.1
20070417	140410.3	67.799	19.811	7,528.1	1,668.7	1.7	-0.4
20070417	144845.2	59.613	14.776	6,610.7	1,441.7	17.3	0.1
20070419	1637.5	64.185	20.643	7,128.6	1,734.8	27.9	-0.3
20070422	25806.8	65.041	20.877	7,224.8	1,738.5	37.3	0.1
20070422	224414.8	58.796	13.56	6,521.5	1,370.1	3.2	1.8
20070428	10301.4	67.25	18.771	7,464.5	1,627.9	6.5	0.2
20070428	71135.4	61.821	17.114	6,857	1,568.8	15.4	-0.1
20070428	210219.3	63.93	20.493	7,099.8	1,729.6	4.2	-0.1
20070430	21704.3	63.976	20.745	7,105.8	1,741.6	11	0
20070430	110527.6	64.472	20.878	7,161.5	1,743.7	24.4	0.1

3.2 May

An event list for May is given in Table 3-2 with date, time (UTC), latitude, longitude, X (RT90 km), Y (RT90 km), depth and local magnitude (M_L). In May 25 events were located whereof one with magnitude $M_L = 2.1$ located 34 km NW of Robertsfors and 51 km SW of Skellefteå. Additional 3 events had magnitudes equal to or larger than 1.0. The depth range of the events varies between 0.3 and 28.5 km.

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

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth Km	M_L Local Magnitude
20070501	85425.8	59.313	11.917	6,583.3	1,278.5	17.4	0.4
20070503	113008.8	61.272	16.029	6,795.1	1,511.8	12.6	0.6
20070505	124813.7	67.443	21.51	7,494.2	1,743.8	17.9	0.1
20070506	190601.2	59.237	13.948	6,569.8	1,393.9	7.7	0.8
20070507	120019.6	63.894	18.562	7,090.2	1,635.2	27.5	0.1
20070507	120257.3	67.831	20.2	7,532.8	1,684.9	1.8	0.4
20070508	3526.4	67.839	20.206	7,533.8	1,685	0.3	0
20070510	11346.9	63.456	19.678	7,044.3	1,692.9	0.7	0.2
20070511	10851.7	64.51	20.706	7,165.1	1,735.1	25.3	0.3
20070512	45159	64.244	20.804	7,135.9	1,742.1	25	-0.1
20070514	215949.7	63.149	15.741	7,004.3	1,496.6	17.2	0.3
20070515	161724.5	63.436	19.664	7,042.1	1,692.4	6.2	0.5
20070516	173003.2	64.6	18.305	7,168.3	1,619.5	9.4	0.8
20070519	14311.4	65.385	19.917	7,259.7	1,690.9	4.7	0.4
20070519	32031.4	67.543	20.824	7,502.8	1,713.7	4.7	0.6
20070519	192335.3	65.653	21.853	7,296.7	1,777.8	28.5	0.7
20070522	53655.3	64.562	21.387	7,173.5	1,767.2	21.5	1.3
20070522	63615	64.401	20.348	7,151.6	1,718.8	10.3	2.1
20070526	2739.3	63.669	18.475	7,064.9	1,632	19.8	0.8
20070526	3739.7	62.362	17.63	6,917.9	1,594.3	5.4	0.6
20070526	34433.8	63.722	21.178	7,079.3	1,765.1	1	0.3
20070526	103612.8	65.01	23.031	7,231.1	1,840	5.3	1.4
20070527	70734.9	58.774	13.56	6,519	1,370	1.1	1.4
20070528	125242.7	65.33	22.448	7,263.7	1,808.9	18.7	0
20070529	31939.7	65.478	21.349	7,275.2	1,756.4	13.8	0.3

3.3 June

An event list for June is given in Table 3-3 with date, time (UTC), latitude, longitude, X (RT90 km), Y (RT90 km), depth and local magnitude (M_L). In June 20 events were located whereof the largest earthquake with magnitude $M_L = 1.7$ was located 2 km north of Gällivare. Additional 8 earthquakes had magnitudes equal to or larger than 1.0. The depth range of the events varies between 0.1 and 26 km.

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

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth Km	M_L Local Magnitude
20070602	132548.8	65.674	22.912	7,304.2	1,826.1	15.9	0.3
20070604	153048.3	67.066	20.929	7,450.1	1,722.5	7.7	1.4
20070604	185250.3	65.184	23.594	7,253.6	1,864	0.5	1.3
20070606	85613.4	64.172	20.548	7,126.8	1,730.3	18.1	-0.1
20070608	25633.9	67.969	21.837	7,554	1,752.1	1	0.2
20070609	231438.1	61.903	17.4	6,866.4	1,583.7	10.1	-0.2
20070610	233231	67.19	20.671	7,463	1,710.2	4.6	1.1
20070611	41959.2	67.971	19.619	7,546.7	1,659.5	14.4	0.7
20070611	232143.6	64.595	21.201	7,176.4	1,758	1.1	0.1
20070613	25425	56.85	12.449	6,307.6	1,295.1	8.4	1
20070615	13952.5	65.426	22.546	7,274.7	1,812.3	11	0.5
20070617	120528.2	67.322	18.772	7,472.5	1,627.5	5.6	1.2
20070618	32757.1	61.873	17.099	6,862.7	1,567.9	1.2	0.4
20070618	161406.9	67.179	20.669	7,461.7	1,710.3	7.7	1.5
20070624	15118.3	63.239	18.896	7,018	1,655.1	18.6	-0.3
20070625	173927.6	58.549	18.445	6,494.8	1,653.5	3	1
20070625	200927.5	64.702	21.35	7,188.9	1,764.1	0.1	0.5
20070627	3213.3	63.851	18.768	7,085.9	1,645.6	26	-0.1
20070629	222212.8	66.471	22.21	7,389.2	1,784.9	11.6	1.2
20070630	5559.4	67.177	20.682	7,461.5	1,710.9	7.5	1.7

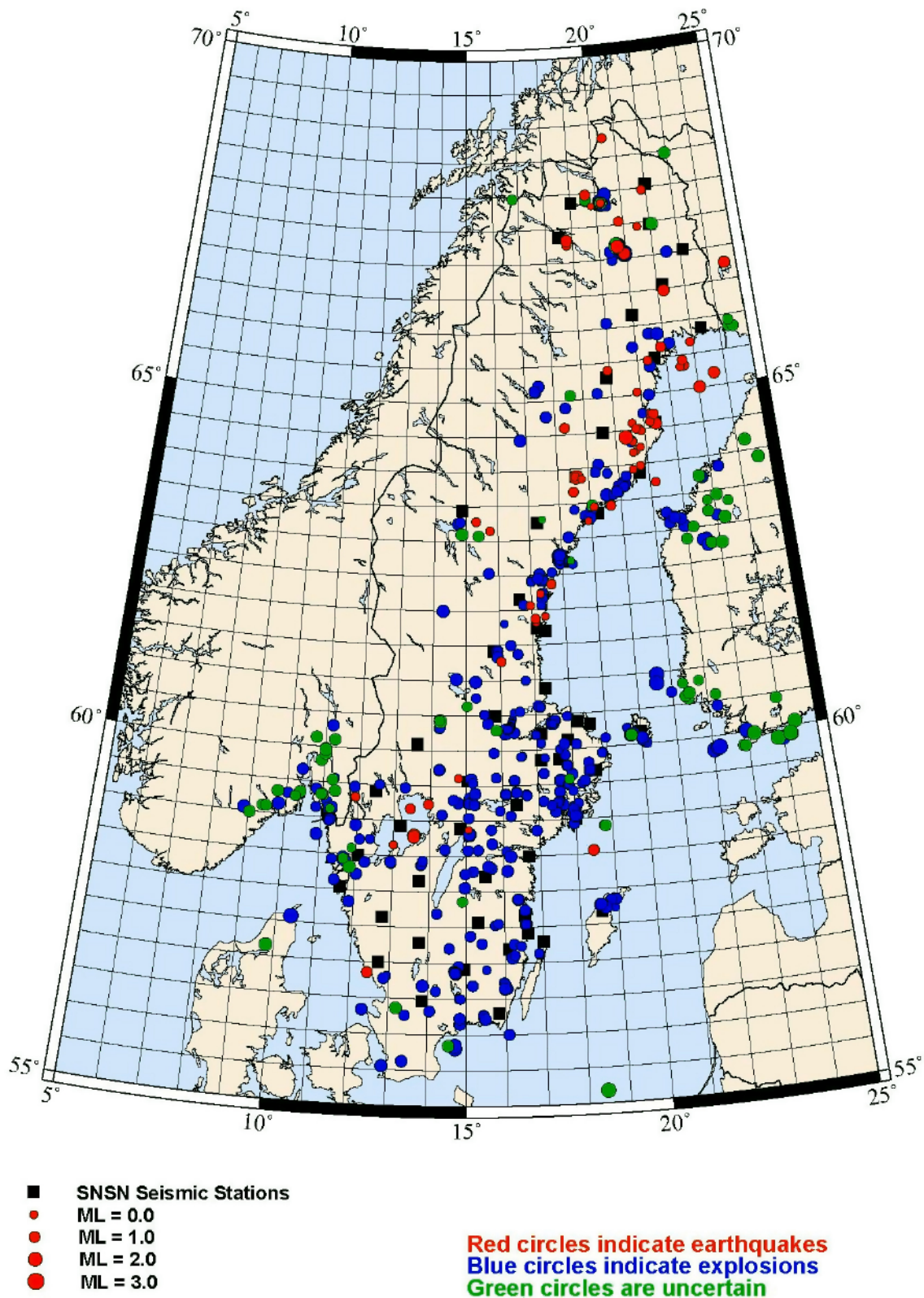


Figure 3-1. Recorded events including explosions in the SNSN network during the period April through June 2007.

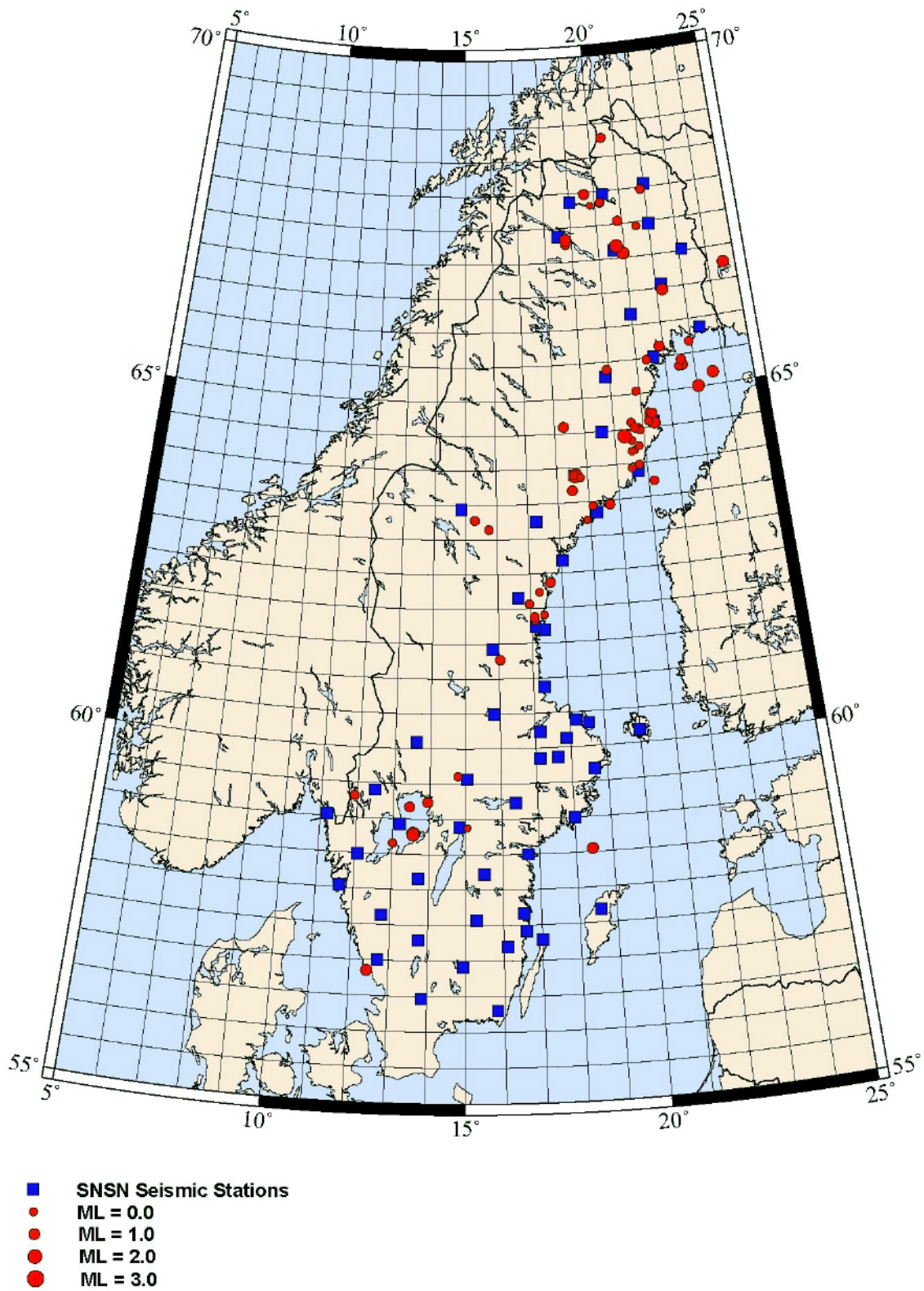


Figure 3-2. Earthquake activity in Sweden during April through June 2007.