

Swedish National Seismic Network (SNSN)

A short report on recorded earthquakes during the first quarter of the year 2005

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April 2005

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Keywords: Seismic network, Earthquakes.

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.

A pdf version of this document can be downloaded from www.skb.se

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 January through March 2005.

The Swedish National Seismic Network consists of 45 stations in operation and additional two under construction. During January through March, 1,788 events were located whereof 137 are estimated as real earthquakes, 1,299 are estimated as explosions and 352 events are still considered as uncertain but these are mainly outside the network.

The largest earthquake with magnitude $M_L = 2.6$ occurred on February 4th 10 km north of Piteå. Additionally six earthquakes reached magnitude $M_L = 2.0$ during the period.

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 januari till mars 2005.

Det seismiska nätet består av 45 stationer som nu är i drift. Ytterligare två stationer är under uppbyggnad, en i Oskarshamn och en i Forsmark. Under perioden januari till mars, 2005 var det 1 788 registrerade händelser varav 137 bedömdes som äkta jordskalv, 1 299 bedömdes vara förorsakade av explosioner eller sprängningar samt 352 var osäkra händelser, men dessa var i huvudsak lokaliserade utanför det seismiska nätet.

Det största jordskalvet med en magnitud på 2,6 inträffade den 4 februari 10 km norr om Piteå. Ytterligare sex skalv nådde magnitud 2,0 under perioden.

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1 Introduction

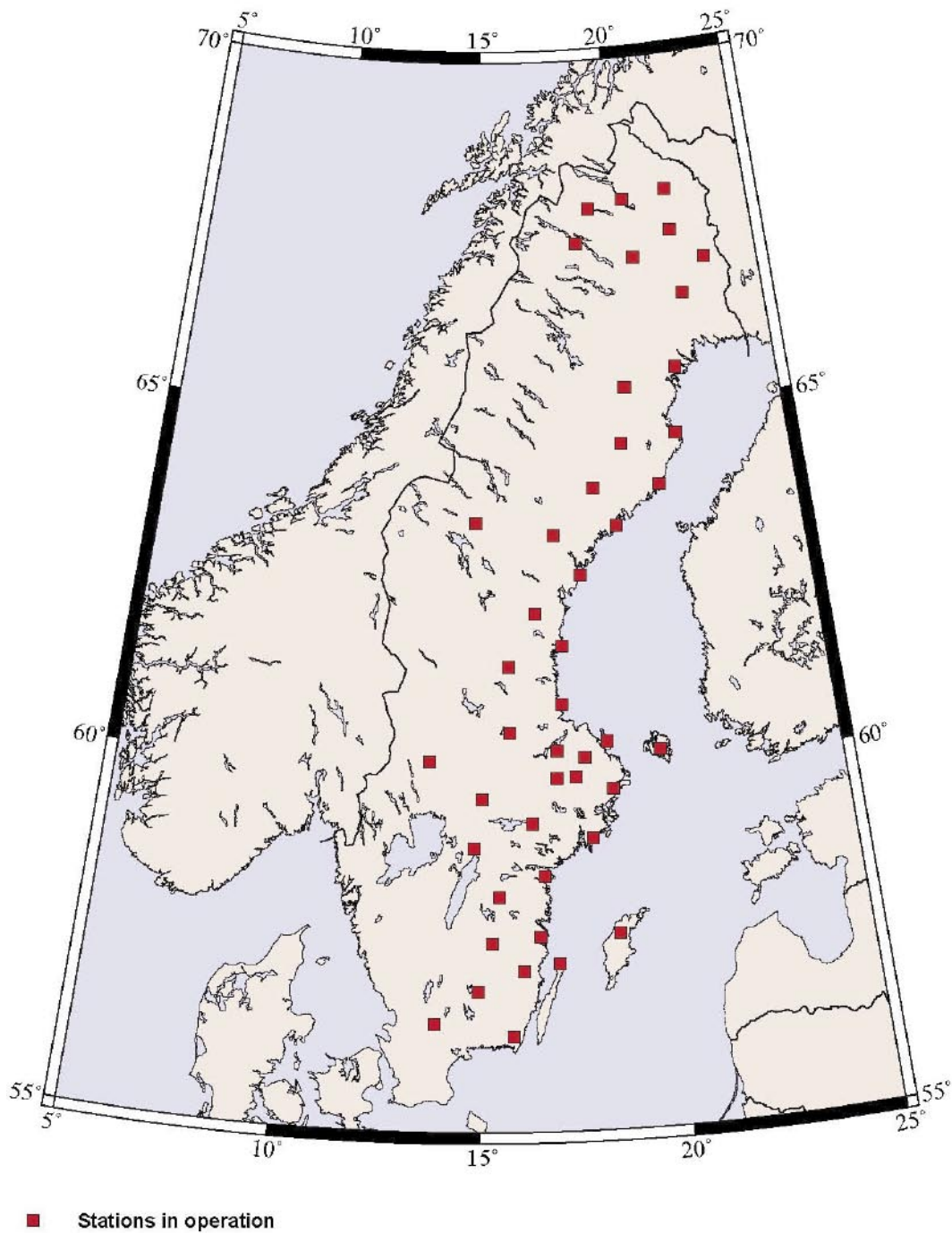
This document reports the seismic events recorded by the Swedish National Seismic Network (SNSN) for the first quarter of the year 2005. The work was carried out in accordance with activity plan AP TD F73-01-013. In Table 1-1 controlling document for performing this activity is listed. The activity plan is an SKB internal controlling document.

At present 45 stations are in operation, Figure 1-1. Additional two stations are under construction in Oskarshamn and Forsmark. Additional 10 to 15 stations are planned to be constructed during the summer 2005.

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.

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

Activity plan	Number	Version
Drift av seismologiskt nät längs Östersjöns kust	AP TD F73-01-013	



■ Stations in operation

Figure 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.

The sensitivity of the network allows for complete recordings 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 first quarter of 2005

Figure 3-1 shows the recorded events in Sweden during January through March. During the period 1,788 events were located whereof 137 are estimated as real earthquakes (which are shown in Figure 3-2). 1,299 are estimated as explosions and 352 events are still considered as uncertain but these are mainly outside the network.

The largest earthquake with magnitude $M_L = 2.6$ occurred on February 4th 10 km north of Piteå. Additionally six earthquakes reached magnitude $M_L = 2.0$ during the period.

Event lists for January through March 2005 are given in Sections 3.1 through 3.3.

3.1 January

Event list for January is given in Table 3-1 with date, time (UTC), latitude, longitude, X (RT90 km), Y (RT90 km), depth and local magnitude (ML). In January 35 events were located whereof one with magnitude 2.3 located 40 km west of Borlänge, two with magnitude 2.0, 49 km south of Skellefteå and 12 km north of Keino in Lappland. Additional 5 earthquakes had magnitude above 1.0. The depth ranges of the events varies between 0.1 and 31.0 km.

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

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth km	M_L local magnitude
20050101	050057.3	67.599	22.256	7,514.6	1,773.9	14.8	0.4
20050101	055853.1	64.492	20.742	7,163.2	1,737.0	20.3	0.2
20050102	122333.5	64.182	20.330	7,127.2	1,719.7	16.9	-0.2
20050102	194530.0	61.941	17.355	6,870.6	1,581.2	18.2	0.0
20050104	200259.9	61.875	17.251	6,863.1	1,575.9	12.4	0.5
20050105	175542.8	64.776	20.777	7,194.9	1,736.1	31.0	0.4
20050106	075112.1	62.022	16.382	6,878.8	1,530.0	13.4	0.3
20050106	083546.3	64.020	20.219	7,108.8	1,715.5	17.9	0.5
20050107	093437.8	64.263	20.458	7,136.6	1,725.2	18.1	-0.1
20050108	011608.9	64.432	21.229	7,158.4	1,760.9	19.7	0.3
20050109	013219.4	64.898	20.944	7,209.1	1,743.0	19.9	0.7
20050109	063431.6	63.994	20.773	7,107.9	1,742.7	15.4	0.7
20050109	192642.8	60.433	14.605	6,702.2	1,433.7	19.7	2.3
20050109	193051.2	60.434	14.581	6,702.4	1,432.4	17.3	1.4
20050111	085751.1	67.105	20.514	7,453.0	1,704.2	2.5	-0.6
20050111	121158.3	64.641	20.708	7,179.6	1,734.0	9.2	0.6

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth km	M_L local magnitude
20050112	221840.3	64.335	20.702	7,145.6	1,736.4	19.9	2.0
20050113	213618.3	64.540	20.770	7,168.6	1,737.9	16.6	0.1
20050113	222346.1	63.010	18.087	6,990.8	1,615.4	22.6	0.5
20050114	011633.8	67.503	22.395	7,504.6	1,780.9	9.5	-0.6
20050114	164709.0	67.991	22.413	7,558.8	1,775.8	27.3	0.8
20050114	205916.4	64.672	19.067	7,178.0	1,655.5	19.0	-0.0
20050118	005708.6	67.343	18.928	7,475.2	1,634.1	7.2	2.0
20050120	002437.9	63.548	20.818	7,058.5	1,748.9	8.8	0.3
20050120	053253.3	64.423	20.979	7,156.4	1,749.0	21.0	1.5
20050120	054353.5	64.436	20.974	7,157.8	1,748.6	19.2	0.3
20050120	193249.8	64.112	20.555	7,120.2	1,731.2	3.2	1.1
20050121	193120.6	63.088	18.427	7,000.1	1,632.2	8.3	0.3
20050122	165454.5	67.372	18.977	7,478.5	1,636.0	12.2	0.2
20050123	082335.5	66.188	13.679	7,344.6	1,404.1	0.1	1.7
20050123	223007.1	65.761	22.857	7,313.5	1,822.5	4.8	0.4
20050125	172526.3	63.967	20.913	7,105.5	1,749.8	12.9	0.7
20050129	004953.4	59.930	13.399	6,648.0	1,365.3	9.1	0.5
20050130	092129.5	64.584	20.794	7,173.6	1,738.6	18.3	0.7
20050131	080137.8	64.378	20.599	7,150.0	1,731.1	3.5	1.0

3.2 February

Event list for February 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 February 48 events were located whereof one magnitude 2.6 10 km north of Piteå. One earthquake with magnitude 2.0 was located 32 km NW of Merasjärvi i Lappland. Additional 4 events had magnitude above 1.0. The depth ranges of the events varies between 0.0 and 34.7 km.

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

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth km	M_L local magnitude
20050201	041553.8	61.626	16.983	6,835.1	1,562.3	18.4	0.6
20050202	162308.8	64.285	20.461	7,139.1	1,725.2	10.1	0.1
20050202	201619.2	59.510	14.923	6,599.1	1,449.9	18.5	0.4
20050202	214724.5	67.305	18.837	7,470.8	1,630.4	5.4	0.2
20050202	233308.8	68.036	23.485	7,569.0	1,819.8	10.4	0.8
20050203	025625.7	68.063	20.070	7,558.2	1,677.6	25.7	-0.2
20050203	150328.0	64.565	20.560	7,170.6	1,727.6	16.5	0.0
20050203	220422.9	64.422	20.840	7,155.7	1,742.3	15.2	0.1
20050203	233444.3	68.091	20.615	7,563.0	1,700.0	25.8	0.2

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth km	ML local magnitude
20050204	143230.7	65.439	21.436	7,271.1	1,760.8	14.5	2.6
20050204	150649.5	66.236	22.157	7,362.8	1,785.2	14.0	0.5
20050205	051828.1	64.568	21.433	7,174.4	1,769.3	19.7	1.6
20050205	170139.3	65.216	20.288	7,242.1	1,709.4	18.6	0.2
20050205	194551.1	63.794	20.938	7,086.3	1,752.6	9.2	0.8
20050206	013541.6	68.108	20.498	7,564.5	1,695.0	25.3	0.4
20050206	085708.2	64.722	21.182	7,190.4	1,755.9	17.5	0.4
20050207	072717.9	66.459	22.150	7,387.6	1,782.3	12.4	0.5
20050207	230052.9	66.454	22.267	7,387.5	1,787.6	17.6	0.1
20050208	212855.4	64.357	20.579	7,147.6	1,730.3	12.8	0.7
20050208	215019.0	60.780	17.255	6,741.2	1,578.8	18.2	0.3
20050209	012245.0	64.602	21.183	7,177.1	1,757.1	12.6	0.2
20050209	105046.4	57.755	15.529	6,403.3	1,483.4	27.7	0.9
20050209	233700.0	66.839	22.719	7,432.4	1,802.9	16.7	0.2
20050210	052410.2	68.169	22.848	7,580.6	1,791.7	34.7	2.0
20050210	122345.8	63.241	16.848	7,014.9	1,552.3	15.3	1.6
20050211	132847.5	60.094	15.040	6,664.1	1,457.2	0.0	0.7
20050211	180721.4	60.105	16.132	6,665.1	1,518.0	20.6	0.3
20050212	011715.8	62.789	18.857	6,967.8	1,655.5	4.2	0.5
20050212	084609.1	65.411	20.630	7,265.0	1,723.8	19.7	0.3
20050212	102726.2	61.899	17.558	6,866.2	1,592.0	15.6	0.2
20050213	121414.3	68.246	20.157	7,578.9	1,679.8	9.6	1.2
20050213	125434.4	67.750	20.363	7,524.3	1,692.4	23.3	0.1
20050214	023932.7	61.970	16.934	6,873.3	1,559.0	26.5	0.8
20050215	084007.4	64.680	20.940	7,184.8	1,744.8	6.5	-0.1
20050215	173941.1	64.709	21.155	7,188.9	1,754.7	1.9	0.9
20050215	223000.2	67.739	20.403	7,523.2	1,694.2	20.3	-0.2
20050216	002509.9	63.995	20.881	7,108.4	1,748.0	8.5	0.1
20050216	012703.2	68.146	20.192	7,567.8	1,682.0	23.6	0.2
20050216	014144.5	64.715	21.154	7,189.5	1,754.6	3.0	0.8
20050217	200932.5	64.480	21.095	7,163.2	1,754.0	23.4	0.5
20050219	113042.3	61.521	16.482	6,823.0	1,535.8	9.9	0.6
20050224	125447.6	64.326	20.723	7,144.6	1,737.5	19.3	0.1
20050225	183608.5	64.603	20.208	7,173.7	1,710.5	0.4	1.7
20050225	210345.7	64.435	20.765	7,157.0	1,738.6	18.7	-0.1
20050227	173536.5	64.421	20.722	7,155.1	1,736.6	1.9	0.1
20050227	183507.6	67.878	19.399	7,535.9	1,650.9	16.3	0.1
20050228	101344.1	64.340	20.865	7,146.8	1,744.2	19.6	0.1
20050228	222247.2	59.861	16.879	6,638.4	1,560.0	19.2	0.2

3.3 March

Event list for March 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 March 54 events were located whereof one with magnitude 2.4 and one with magnitude 2.0 both located 77 km S-E of Luleå. Additional 7 earthquakes had magnitudes above 1.0. The depth range was between 0.2 and 30.8 km.

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

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth km	M_L local magnitude
20050301	080809.5	62.619	18.278	6,947.6	1,626.7	18.2	0.4
20050303	021758.7	58.347	14.462	6,470.1	1,421.2	23.7	0.9
20050303	175409.9	67.516	22.324	7,505.7	1,777.7	17.9	0.3
20050303	193203.7	66.159	21.934	7,353.3	1,776.0	17.6	0.6
20050304	132844.3	67.575	22.441	7,512.8	1,782.0	14.9	-0.2
20050305	065626.1	60.909	17.559	6,755.9	1,595.0	12.9	0.2
20050305	075936.3	67.714	19.474	7,517.8	1,655.1	7.9	0.7
20050305	131657.6	62.596	17.980	6,944.5	1,611.5	7.5	0.3
20050305	171231.1	65.733	23.302	7,312.8	1,843.1	16.5	0.4
20050305	201646.7	64.388	20.681	7,151.3	1,734.9	18.8	-0.1
20050307	024629.8	62.002	17.604	6,877.7	1,594.1	18.3	-0.4
20050307	222344.1	67.684	24.134	7,533.6	1,852.0	18.3	1.4
20050308	035811.9	66.760	22.276	7,421.6	1,784.5	16.3	0.1
20050308	134701.5	65.111	23.316	7,243.9	1,852.0	4.0	1.8
20050308	145522.3	65.097	23.282	7,242.1	1,850.6	2.4	2.0
20050309	014549.4	64.536	20.665	7,167.7	1,732.9	19.2	0.7
20050309	082033.4	67.420	23.241	7,499.5	1,817.9	30.8	0.7
20050309	141957.7	64.959	21.100	7,216.5	1,749.7	19.7	0.1
20050309	191611.8	55.607	14.621	6,164.8	1,425.2	14.0	1.7
20050309	192831.0	58.479	14.768	6,484.5	1,439.3	17.8	0.7
20050310	011426.0	65.100	23.338	7,242.8	1,853.2	7.9	0.5
20050310	103413.0	67.526	22.388	7,507.1	1,780.3	16.0	-0.1
20050311	120152.7	67.707	19.694	7,517.6	1,664.4	18.0	0.0
20050311	120629.2	67.399	18.902	7,481.4	1,632.7	13.2	0.6
20050311	121249.4	67.418	18.975	7,483.6	1,635.7	11.5	0.5
20050312	201738.5	65.267	21.935	7,254.3	1,785.8	26.5	0.3
20050313	235043.4	63.421	19.099	7,038.8	1,664.3	13.3	0.3
20050314	000452.7	63.424	19.106	7,039.1	1,664.6	11.9	0.5
20050315	013502.6	65.103	23.315	7,243.0	1,852.1	4.5	1.0
20050315	033018.8	65.105	23.273	7,243.0	1,850.1	4.5	2.4
20050315	064333.2	65.107	23.293	7,243.4	1,851.0	3.8	0.9
20050316	024605.4	67.365	22.158	7,488.3	1,772.4	18.0	0.3
20050316	140241.1	67.658	19.337	7,511.2	1,649.6	17.8	0.0

Date	Time (UTC)	Latitude	Longitude	X RT90 Km	Y RT90 Km	Depth km	M_L local magnitude
20050319	093043.1	64.762	19.253	7,188.5	1,663.9	22.1	0.2
20050319	180623.6	64.297	20.654	7,141.2	1,734.4	16.9	-0.1
20050319	201930.6	61.797	17.144	6,854.3	1,570.4	16.4	0.5
20050320	012309.1	61.838	17.125	6,858.8	1,569.4	18.5	-0.2
20050320	040229.7	66.500	23.346	7,398.0	1,834.8	9.3	1.5
20050320	180838.4	57.076	15.931	6,327.7	1,507.5	12.5	-0.6
20050321	053309.0	67.592	22.428	7,514.7	1,781.2	17.6	-0.1
20050322	001158.1	66.899	22.901	7,440.0	1,810.1	1.5	0.4
20050323	002532.8	61.731	17.286	6,847.1	1,578.1	22.2	0.4
20050324	174157.4	64.467	20.983	7,161.3	1,748.7	15.9	-0.1
20050324	224030.1	64.351	20.739	7,147.5	1,738.0	15.1	-0.1
20050324	230916.2	64.797	19.227	7,192.3	1,662.4	9.2	-0.0
20050325	015937.1	64.385	20.705	7,151.1	1,736.1	18.3	-0.5
20050326	114206.5	64.503	21.228	7,166.3	1,760.1	9.7	-0.0
20050327	001441.2	65.809	23.256	7,321.0	1,840.0	12.4	0.2
20050327	032636.6	67.514	23.989	7,513.9	1,848.4	6.6	0.3
20050327	120543.3	64.351	20.949	7,148.3	1,748.1	21.4	0.5
20050329	031409.6	67.302	23.997	7,490.5	1,851.9	25.8	1.3
20050330	171135.4	66.953	18.508	7,430.9	1,617.9	0.2	1.2
20050330	234311.8	68.185	19.920	7,571.3	1,670.5	5.9	0.2
20050331	052749.7	67.773	18.317	7,521.9	1,605.9	9.1	-0.6

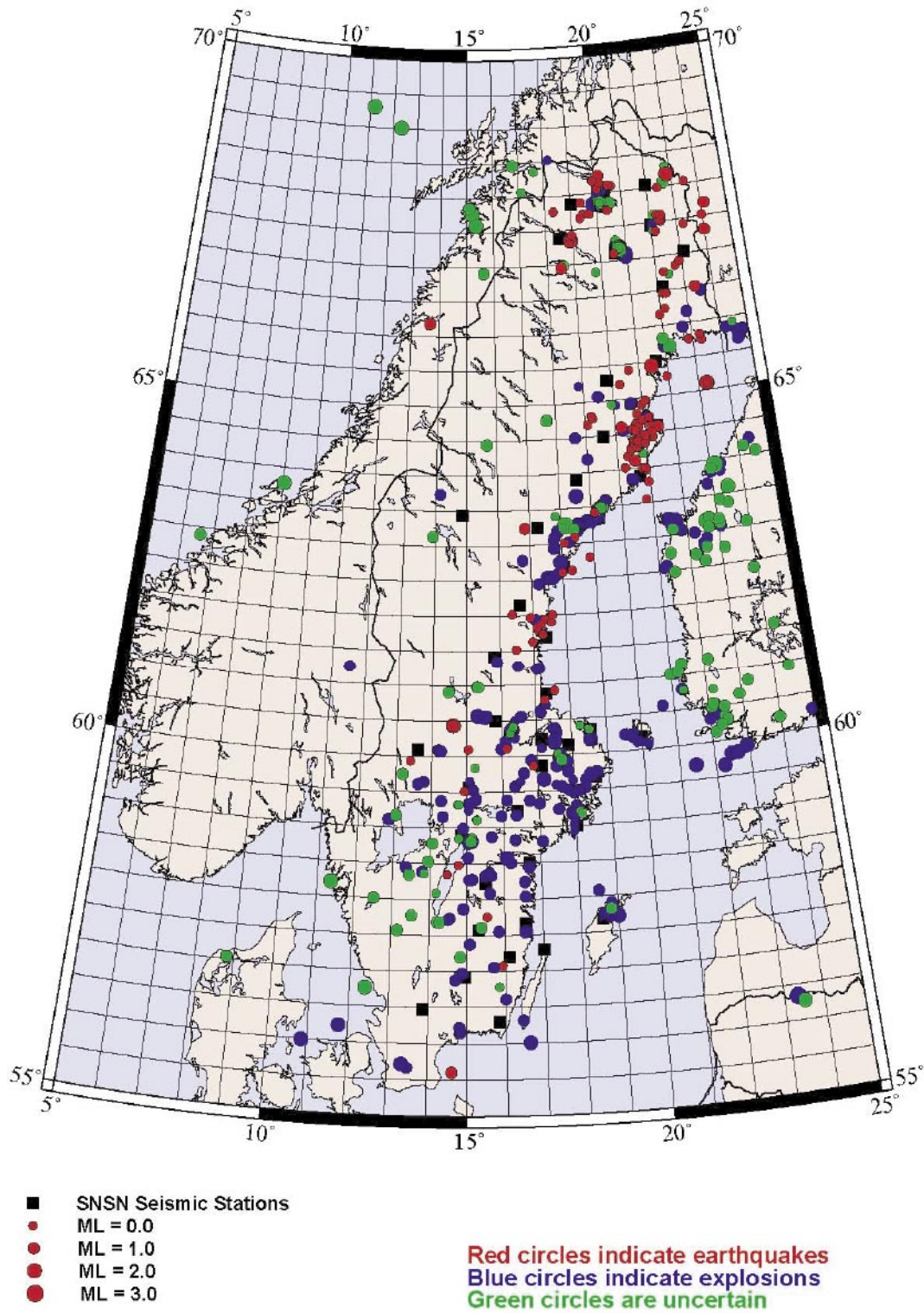


Figure 3-1. Recorded events including explosions in the SNSN network during the period January through March 2005.

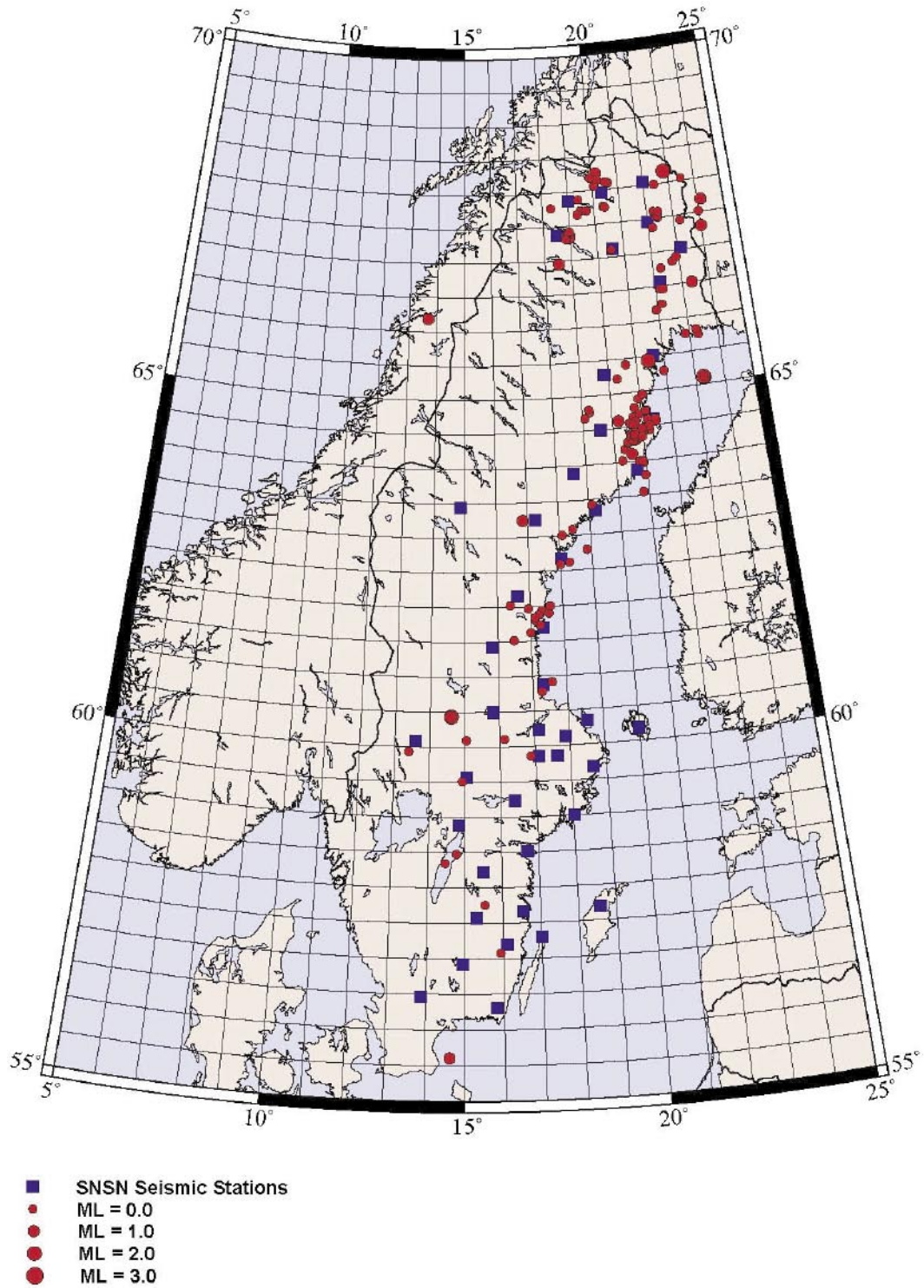


Figure 3-2. Earthquake activity in Sweden during January through March 2005.