



Michael Roth, Björn Lund, Gunnar Eggertsson

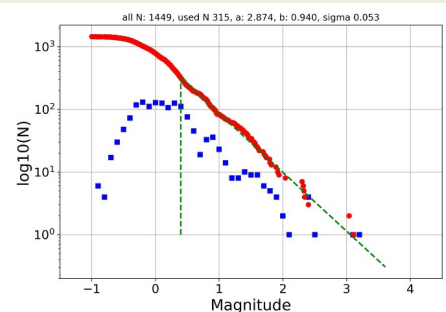
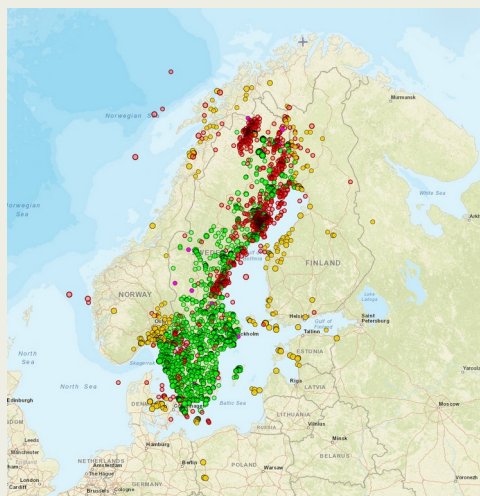
P3.5-280



SNSN operates 67 permanent and 13 temporary broadband stations. Data from 40 stations are shared with neighbouring countries. SNSN subscribes to about 120 stations abroad and processes all data in realtime for local and regional monitoring of seismic events. SNSN's O&M, R&D, automatic and manual processing and media responses is handled by a staff of about 10 persons within a budget of 6.5 person years

In 2024:

- 44 on-site maintenance visits
- ~ 97% data availability
- ~ 6000 events manually analyzed
- ~4500 man-made
- ~1500 earthquakes (red symbols)
- ~1400 earthquakes with $ML < 1$
- 10 earthquakes $2 < ML < 3.2$

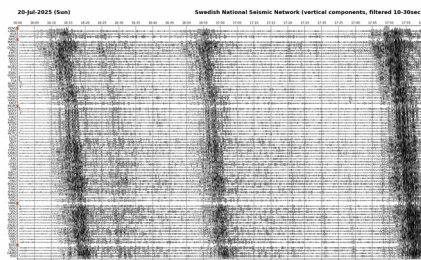
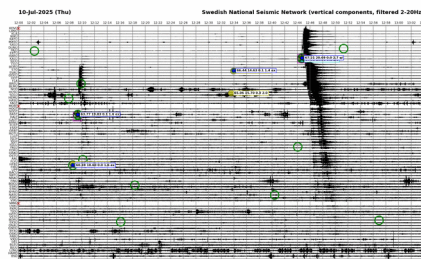


Typical permanent station:

- 2-3 m deep, drained, insulated pit
- sensor on concrete pillar on bedrock
- 300-1200m distance to host building
- 30V DC power, FO communication
- cabinet with UPS, station computer, cell network router, remote control, lightning protection

Instrumentation:

Complete systems from Guralp, Gaiacode and Nanometrics and several Streckeisen seismometers



Testing of new equipment in SNSN's field lab (co-located with permanent SNSN station FIBY, ca 20km southwest of Uppsala). Huddle test to determine coherence and instrument noise, and to check overall system performance.



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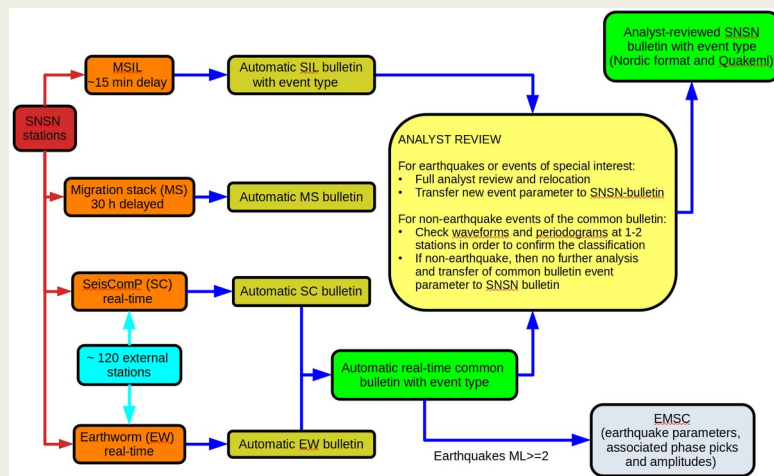


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P3.5-280

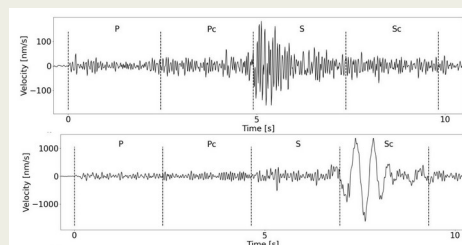
Four independent automatic processing systems:

- MSIL and Migration stack targeting small local events
- Seiscomp (SC) and Earthworm (EW) for local and regional realtime seismic monitoring



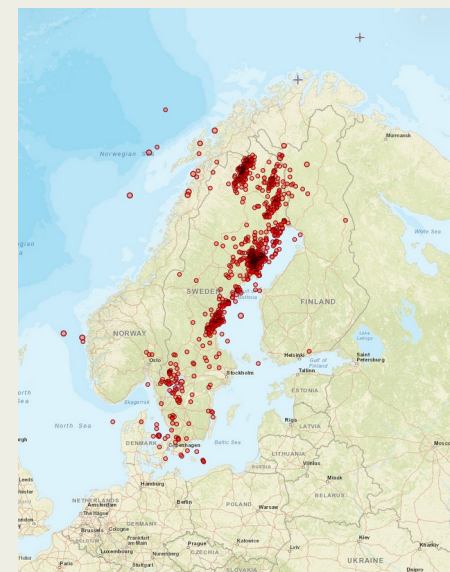
Common bulletin:

- contains events that have been detected and located independently both by EW as well as by SC
- Magnitude threshold approximately $ML > 1$, but lower in areas of higher station density
- Practically spurious-free (20 spurious events out of about 16000 events (0.13%) during the last 2 years)
- automatic event type classification
- automatic event parameters are imported into final SNSN-bulletin
- earthquakes or events of special interest are fully reviewed by the analyst
- other events are only confirmed by the analyst, but remain in the bulletin clearly marked automatic solution

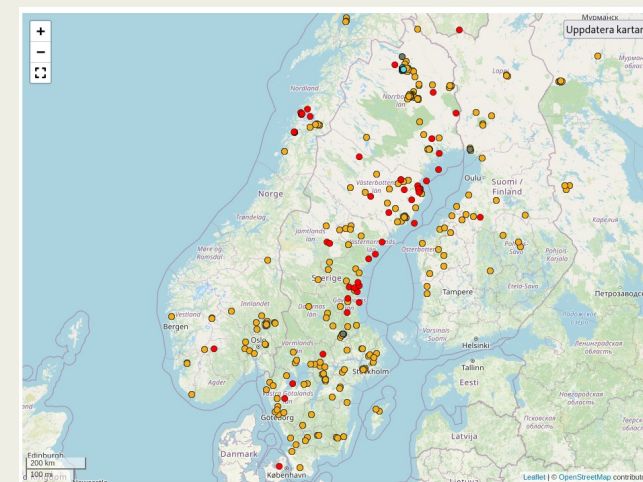


Neural Network Automatic event classification based on RMS amplitudes of instrument-corrected and bandpass-filtered waveform segments
Trained on waveforms of analyst-reviewed events in the time period of 2010-2021

The classification system has been fully implemented in the SNSN automatic processing and it performs at a 98% classification accuracy



Left: 6610 common bulletin events in 2024 (6297 anthropogenic, 313 earthquakes). The common bulletin is made available to the public, and it serves as basis for first responses to the media. The vast majority of anthropogenic events are of no interest to SNSN and are screened out from a full analyst review resulting in a considerable workload reduction. Right: About 1500 analyst-reviewed earthquakes in 2024. Most of these events with $ML < 1$ have been picked up by the MSIL and Migration stack systems.



Troliga jordskalv senaste veckorna					
Tid (UTC)	Latitud	Longitud	Magnitud	Region	
1407 10:48:01	64.95	20.03	0.9	Norsjö, Västerbotten, Sverige	
1307 16:45:01	65.59	17.31	1.7	Sorsele, Västerbotten, Sverige	
1107 17:36:38	59.84	7.83	2.2	Telemark, Norge	
1107 14:00:02	64.92	21.71	1.0	Botten, Västerbotten, Sverige [SIL]	
1007 23:39:13	64.03	19.23	1.0	Björneå, Västerbotten, Sverige [SIL]	
1007 09:42:25	61.95	17.20	0.5	Nordanstig, Gävleborg, Sverige	
0907 02:25:43	64.59	21.22	0.4	Skellefteå, Västerbotten, Sverige	
0807 01:53:53	69.87	24.29	1.7	Finnmark, Norge	
0607 05:35:20	66.71	13.56	1.5	Norska havet	
0507 15:33:34	61.02	16.52	0.8	Ockelbo, Gävleborg, Sverige	

Troliga sprängningar (S), gruvskalv (G) och oklassificerade (O) händelser senaste veckorna					
Tid (UTC)	Latitud	Longitud	Magnitud	Typ	Region
1407 11:31:28	65.55	25.33	1.3	S	Norra Österbotten, Finland
1407 10:36:25	66.75	24.97	1.4	S	Lappland, Finland
1407 10:01:21	63.97	24.30	1.4	S	Norra Österbotten, Finland
1407 07:33:56	67.84	20.21	1.6	G	Kiruna, Norrbotten, Sverige
1307 23:15:32	67.87	20.42	1.7	S	Kiruna, Norrbotten, Sverige
1307 22:02:06	67.16	20.54	0.9	S	Gällivare, Norrbotten, Sverige
1307 22:00:18	67.17	20.63	1.0	S	Gällivare, Norrbotten, Sverige
1307 13:35:04	58.81	15.09	1.2	S	Åkersberg, Örebro, Sverige
1307 07:02:32	60.33	16.24	1.3	O	Hedemora, Dalarna, Sverige
1307 04:26:18	67.83	20.15	1.2	G	Kiruna, Norrbotten, Sverige

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