

New Small Aperture Broadband Arrays in the European Arctic

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Bjørnøya (Bear Island) array (BEAR):

- 6 elements
- Deployment in August 2019

Hornsund (Svalbard) array (HSPA):

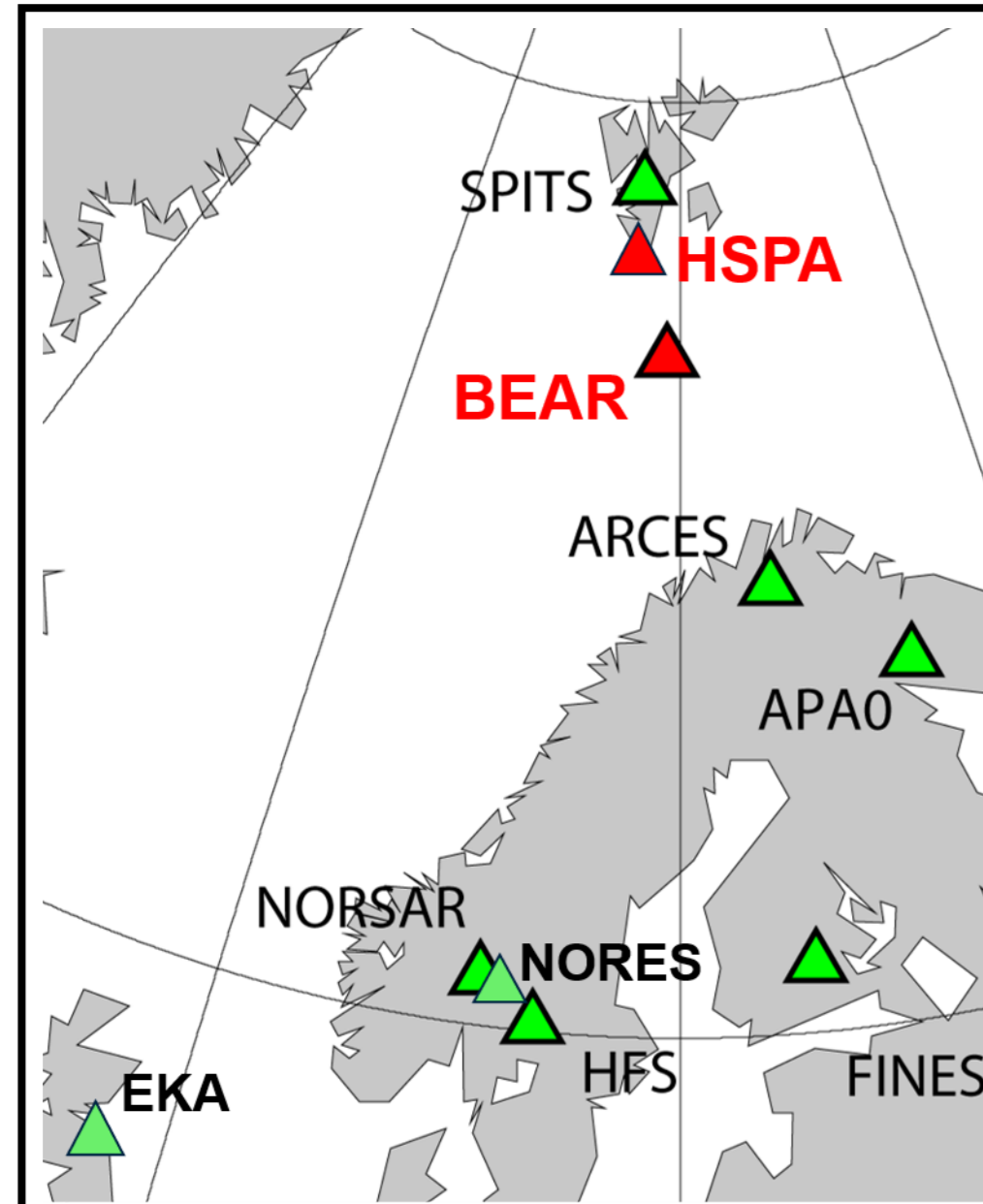
- 6 elements
- Deployment planned for summer 2021

Goal: Improved seismic monitoring of Svalbard region, mid-Atlantic ridges and Barents Sea

Data availability: Norwegian EIDA node: <http://eida.geo.uib.no>

Network code: NO
NORSAR (1971). NORSAR Station Network [Data set], doi:10.21348/d.no.0001

Funded: EPOS-Norway project (Norwegian Research Council)



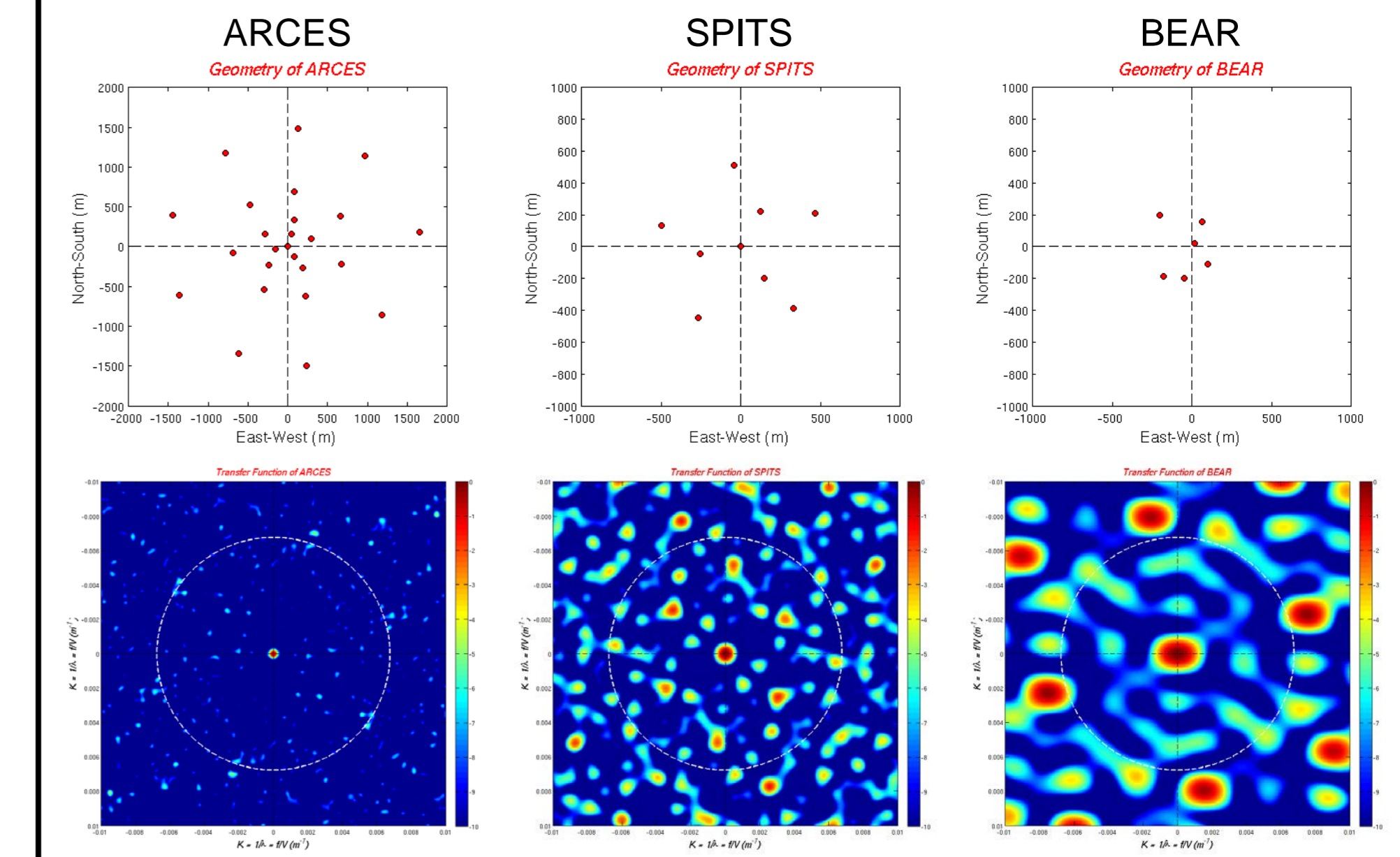
Network of seismic arrays in Northern Europe with the new BEAR array and the planned Hornsund array (HSPA) close to the southern tip of Spitsbergen, the main island of the Svalbard Archipelago.

As part of the EPOS-Norway infrastructure project, NORSAR received funding from the Research Council of Norway for a new regional seismic array on Bjørnøya (Bear Island) in the European Arctic.

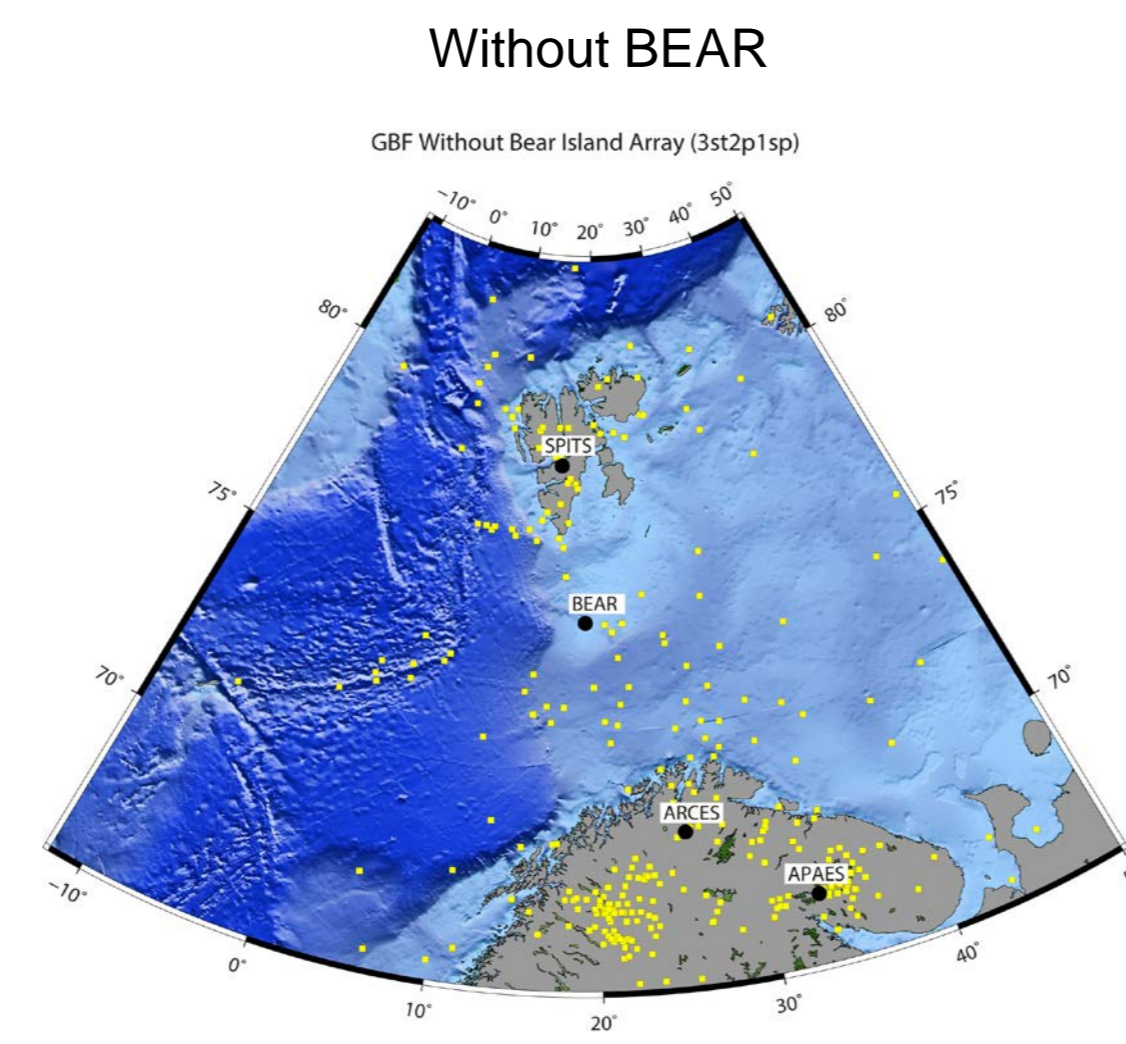
After a long planning phase, a six-element broadband array was installed by NORSAR staff in August 2019 and has been providing data to NORSAR in near real-time since then. Due to several logistical and administrative constraints the 6-element array has an aperture of only 300 m. All sites are equipped with Kinemetrics MBB-2 sensors and Earth Data EDR-209 digitizers that are installed in near-surface vaults. Data are automatically copied to the Norwegian node of the European Integrated Data Archive (EIDA) and are openly available.

Due to environmental restrictions less than the planned 9 array sites could be installed on Bjørnøya and the non-used instruments are now available to extend the broadband station Hornsund (HSPB), Southern Spitsbergen, to another small aperture broadband array, also with 6 sites. The array installation had to be postponed because of the ongoing pandemic and is now planned for the Arctic summer 2021.

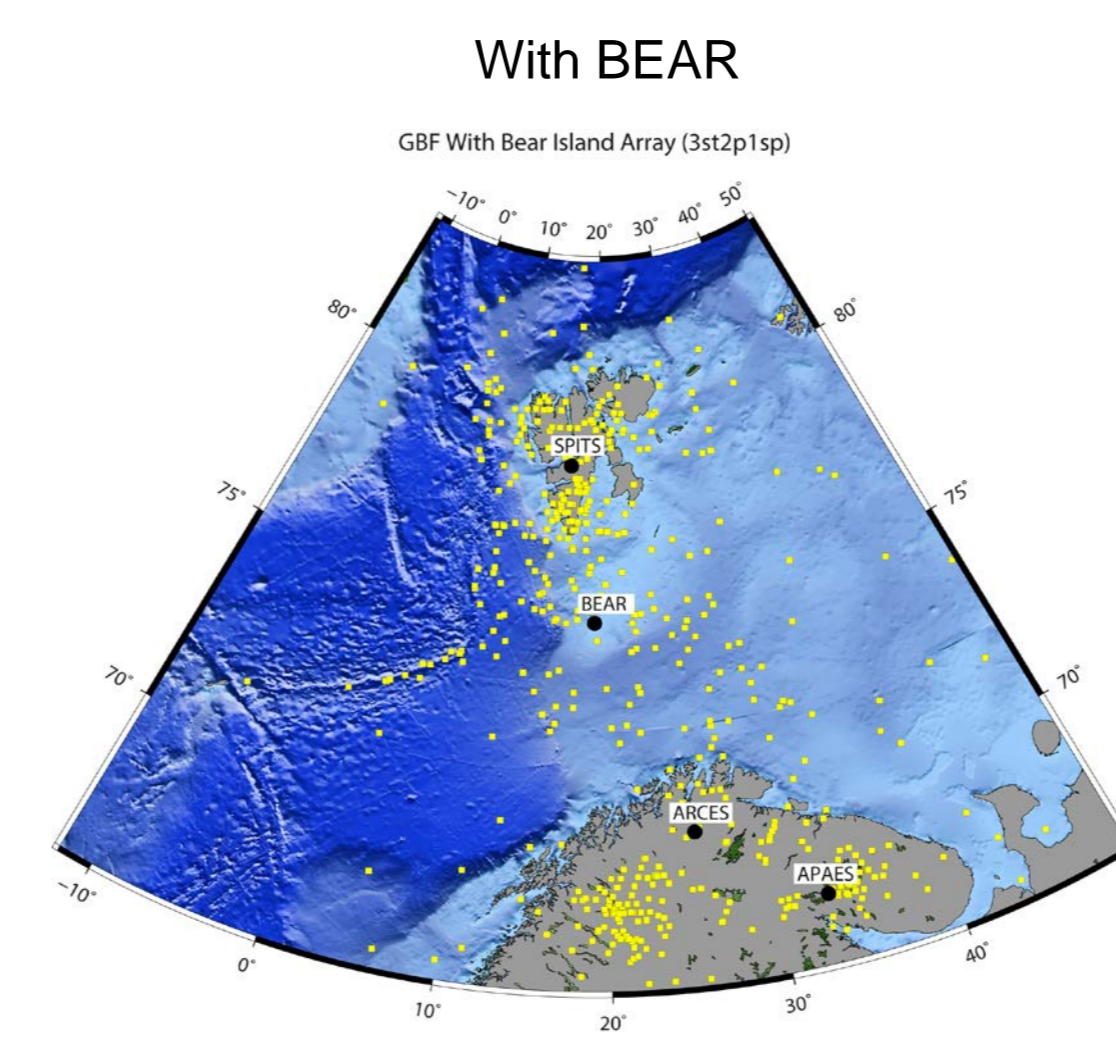
Array geometries and transfer functions



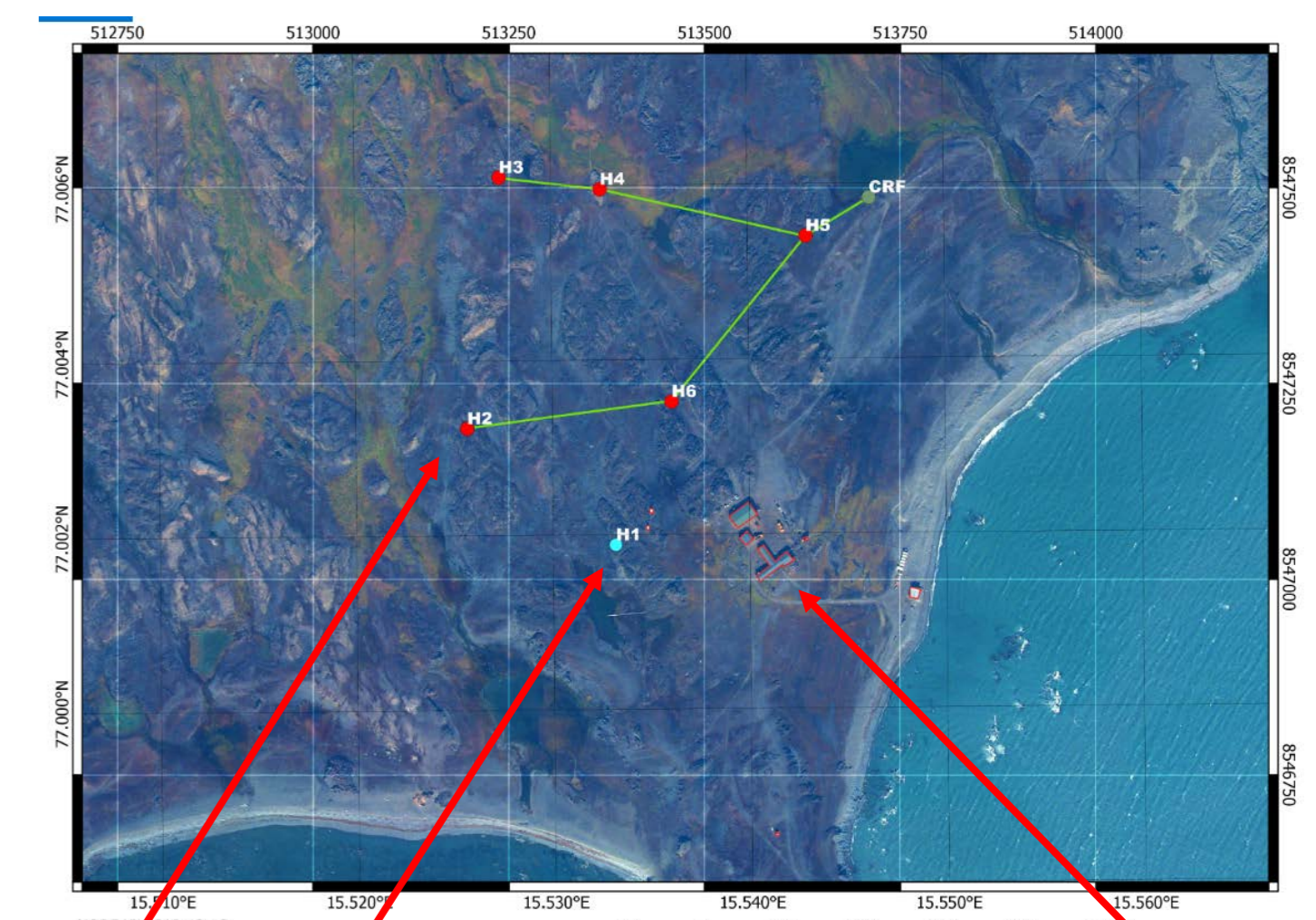
Automatic Event Location based on array observations



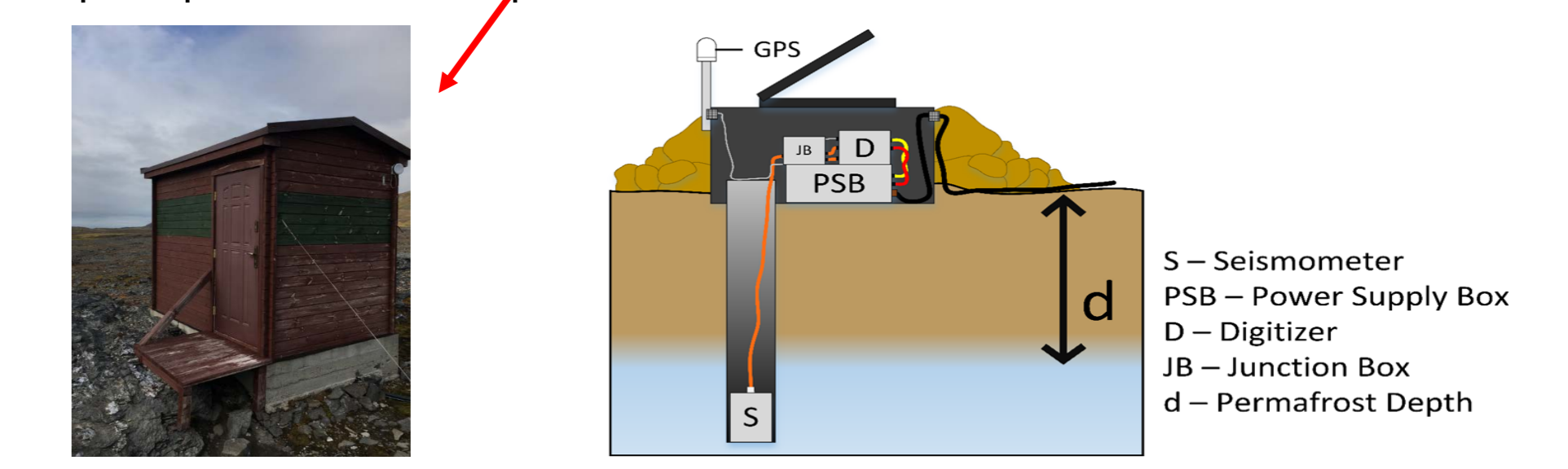
Rerun of NORSAR's automatic location algorithm GBF, which utilizes observations from the seismic arrays in Northern Europe (see map with array locations). The rerun was made once without and once with automatic analysis results from BEAR. Shown on the maps are all events, located with at least 3 arrays, 2 P onsets and 1 S-P travel-time observations. The improvement for events between northern Fennoscandia and Svalbard is obvious.



The planned Hornsund array



The map shows locations of the planned five new Hornsund array sites H2 – H6 (red points) and the location of the already existing broadband station HSPB (H1, green point, picture) close to the Polish Polar Station Hornsund. A principal sketch of the planned borehole installations is shown below.



Pictures from the BEAR installation



The seismometers were installed in a stainless-steel cylinder, oriented and covered with fine sand, the digitizers and modems were installed in a plastic box buried in the ground.

Seismic noise level at BEAR

Noise levels (15 Aug – 15 Oct 2019) at BEAR site BEA4 in comparison to the old station on Bjørnøya (BJO1) and the central elements of the arrays SPITS (SPA0) and ARCES (ARA0).

