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TWO-ARRAY METHOD FOR EVENTS LOCATION BY USING LONG-PERIOD SEISMIC WAVES

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In our study we test the capability of two seismic broadband arrays to locate seismic events using long-period seismic signals (periods of 35-150 s). We are in particularly interested in the location of glacial seismic events originating from outlet glaciers in Greenland. These events are depleted in high-frequency content and, in many cases long-period surface waves are the only signals, which could be detected at regional distances from Greenland (20-30 deg). For our test we used the data of the temporary seismic experiments MAGNUS, installed 2006 – 2008 in southern Norway (Weilde et al., 2010) and POLENET/LAPNET installed in northern Fennoscandia during the IPY 2007-2009 (Kozlovskaya et al, 2012). These data were then analysed using array methods. The location technique is based on standard FK-analysis of the signals and then using the estimated backazimuth and slowness for the epicentre determination. Totally, more than 160 long-period seismic events were detected and relocated. The coordinates of epicentres of relocated events were compared to previously published information about glacial events in Greenland and catalogues of seismic events in the northern Atlantic. As a result, we found 50 long-period events originating from Greenland that occurred during June 2007 and May 2008, when both MAGNUS and POLENET/LAPNET arrays were in operation. Most of these events occurred during summer time (June – September, 2007). Within the estimated error bars, the position of epicentres of the relocated events coincides with positions of epicentres in the catalogues.The latitude error estimate for two-array observations is about 1 deg, while the longitude error estimate is 3 deg for events originating along the eastern coast of Greenland and 4-5 degrees for the events originating from the western coast of Greenland, respectively. Testing of the location procedure with synthetic data demonstrated that the location error can be explained by specific position of both arrays with respect to each other. The location can be significantly improved if data of a third similar array are available. The results of the study confirms that standard array methods can be used to develop automatic algorithms for detection and location of seismic events using long-period seismic waves, including glacial seismic events originating from large-scale ice sheets and glaciers.

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