



Unusual tremors in Greenland

Tine B. Larsen, Trine Dahl-Jensen, and Peter H. Voss

Geological Survey of Denmark and Greenland (GEUS), Geophysics Department, Copenhagen, Denmark (tbl@geus.dk)

Greenland is the origin of a wealth of seismic signals. Every year more than a thousand small to moderate magnitude earthquakes are located primarily along the coasts. Most known Greenlandic earthquakes range between ML 1.0 and ML 3.0, and it can be a challenge to locate them due to the large distances and sparse network. The data collected and distributed by the Greenland Ice Sheet Monitoring Network (GLISN) federation and its members is important for the successful identification and location of seismic events in Greenland. The data are routinely processed for tectonic events on a daily basis at GEUS.

A class of emergent non-tectonic signals clearly stands out from the tectonic earthquakes. Many of the signals lack both clear P- and S-onsets, but are coherent over a smaller part of the network. In rare instances the signals are detected over all of Greenland. The S-energy dominates and the duration of the signals can be up to a few minutes. ML measured on the wave train, typically yield values ranging from 1.0 to 3.0, similar to the local tectonic events. For the larger tremors the frequencies peak in the 1-5 Hz range, the smaller tremors are more pronounced at slightly higher frequencies.

The GLISN seismographs are located several hundred kilometers apart and constitute a regional network. Fortunately, the geology and noise conditions in Greenland are very favorable for seismographs, allowing the signals from the slow tremors to be registered 5-600 km away. Lacking a dense seismograph network and clear onsets, the events are hard to locate precisely, but using the trained eye strategy it is possible to build consistent solutions. The origin of the events are in many cases close to major glaciers and ice streams, especially the Jakobshavn Isbrae in west Greenland. The tremors show similar characteristics as glacier-related earthquakes in other parts of the world. Some of the emergent events are located away from large glaciers and the cause is of now unknown. This presentation will give an overview of the current state of analysis of the non-tectonic tremors in Greenland.