



## 1 Shear wave splitting variations in Greenland

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Seismic anisotropy was investigated by measuring shear wave splitting at 19 temporary and permanent broadband stations in Greenland. We examined mostly SKS and SKKS phases, but also a few PKS and depth phases of SKS for deep events. The events used are larger than 5.5 in magnitude and at epicentral distance beyond  $88^\circ$  in order to avoid contamination by S and ScS. Splitting parameters (fast polarization,  $\phi$ , and time delay,  $\delta t$ ) were determined for these phases. In total, 369 usable phases from 173 events were found at the 19 stations. The number of individual phases used at the various stations ranges from 4 to 56. Uncertainties ( $1\sigma$ ) range between  $1.4^\circ$ - $9.8^\circ$  and 0.03–0.24 s for  $\phi$  and  $\delta t$ , respectively.

The fast polarizations at eight sites in southern Greenland are quite uniformly oriented roughly N-NE. One additional site in southernmost Greenland shows no evidence of splitting. Four sites in central Greenland show varying orientations of fast polarization. Three sites in central northern Greenland show a similar geometry to southern Greenland. Three sites in northern Greenland show weak splitting and east-westerly orientation.

Time delays (0.7 s on average) range from 0.35 to 1.5 s and can generally not be explained by crustal anisotropy alone since they are larger than 0.1 – 0.3 s. The lithospheric thickness in east Greenland is about 100 km. Time delays of up to 1.5 s indicate an average anisotropy of 5 to 6 % in the lithosphere.

The uniformity of splitting orientations in southern Greenland encompasses a number of structural units, the Ketilidian formation, the Archean core of the continent, and the Nagssugtoqidian and Ammassalik mobile belts on the west and east coast, respectively. Two sites in the Rinkian mobile belt and inland from the Rinkian in central northern Greenland show a similar orientation. This suggests continuity of structural fabric beneath much of Greenland and possibly a common source of the anisotropy. The different geometry in northern Greenland suggests that the source process is not currently active. The irregular geometry of splitting in central Greenland may be related to the impact of the Iceland plume at 55 million years ago.

***Key words:*** *shear wave splitting, anisotropy, Greenland.*