

グリーンランドと周辺域における氷河地震活動

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Glacial earthquake activities around Greenland and surrounding regions

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A new class of seismic events associated with the Greenland ice sheet was discovered in recent few years. These “glacial earthquakes” generate long-period ($T > 25$ sec) surface waves equivalent in strength to those radiated by standard magnitude-5 earthquakes and are observable worldwide. The glacial earthquakes radiate little high-frequency energy, which explains why they were not detected or located by traditional earthquake-monitoring agencies. These events are 2 magnitude units larger than previously reported seismic phenomena associated with glaciers, a size difference corresponding to a factor of 1,000 in seismic moment. The long-period surface waves generated by glacial earthquakes are incompatible with standard earthquake models for tectonic stress release, but the amplitude and phase of the radiated waves can be explained well by a landslide source model (Kawakatsu, 1989). Over the 14-year period 1993-2006, more than 200 glacial earthquakes were detected worldwide. More than 95% of these have occurred on Greenland, with the remaining events in Alaska and Antarctica. Greenland glacial earthquakes are closely associated geographically with major outlet glaciers of the Greenland Ice Sheet. Ekstrom et al. (2006) reported on the temporal patterns of the occurrence of events, finding (1) a clear seasonal signal and (2) a significant increase in the frequency of glacial earthquakes on Greenland after 2002. These patterns are positively correlated with seasonal hydrologic variations, recent observations of significantly increased flow speeds, calving-front retreat, and thinning at many outlet glaciers. In this presentation, seismicity around the Greenland region, including glacial related signals are presented with discussion associated with recent global warming. Calculated b values by using the data reported to International Seismological Center (ISC) around Greenland region indicate slightly increase from 0.7 to 0.8 during the observation period in 1968-2007. This implies the seismicity including glacial earthquakes around this area become higher in the last four decades.