LP EVENTS AT GLACIER OVERLAIN KATLA VOLCANO, ICELAND

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Abstract

Repeating long-period (Lp) earthquakes (0.5-3 Hz) are commonly observed in volcanic regions worldwide. They are usually explained in terms of a volcanic source effect, commonly in terms of fluid motion and resonating magma pipes, or anomalous propagation through the complex volcanic structure. Recently, Lp events have also been associated with the motion of ice streams. Ekström *et al*. (2006) report seasonally modulated lp seismicity in massive ice streams in Greenland. O'Neel and Pfeffer (2007) report calving events with extraordinary long seismic codas with frequencies focused between 1-3 Hz and conclude that these features are a source effect. Roux *et al.* (2008) report lp events (1-4 Hz) generated by free falling ice blocks in an Alpine glacier (serac fall episodes).

Our joint analysis of climatic and new seismic data shows that small (M ~1-2.5) lp events (0.5-3 Hz) observed at Goðabunga, the western part of the Katla volcano, covered by the glacier Mýrdalsjökull in south Iceland, are likely to be related to ice movements in a steep outlet glacier and not, as previously thought, to volcanic intrusive activity (Jónsdóttir *et al.*, 2009). The over 13,000 lp events recorded since year 2000 are consistent in character and magnitude with seasonal changes of the glacier.

For decades persistent, seasonally modulated, long-period earthquake activity has been registered at Goðabunga. The events are emergent, of unusually long duration and the coda is complex. We investigate Lp events registered at Goðabunga from a new temporary deployment of 10 broad band stations (CMG-3ESP, 60 s), including a mini-array in the near vicinity of the seismic activity giving us better restrictions of the earthquake locations than before. A study of the source time function suggests that the low frequency extended coda can be attributed to the source. The events can be divided into groups of repeating waveforms suggesting a repeating source mechanism at the same location. Consistently all the events are located in a steep outlet glacier were blocks of up to 80 m thick ice fall of a 100 m high escarpment.

Joint interpretation of various climatic data, i.e. electrical conductivity and flow from glacial rivers, precipitation and temperature from nearby weather stations together with a detailed analysis of seismological data reveals a new explanation for the observed seismicity which is consistent with all available data.

References

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