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Influence of high-latitude geomanetic pulsations on recordings of broadband force-balanced seismic sensors

Elena Kozlovskaya and Alexander Kozlovsky
University of Oulu, Sodankylä Geophysical Observatory/Oulu unit, Oulu, Finland (elena.kozlovskaya@oulu.fi, 3588 5531390)

Seismic broad-band sensors with electromagnetic feedback are known to be sensitive to variations of surrounding magnetic field, including variations of geomagnetic field. Usually, the influence of the geomagnetic field on seismic recordings of broadband seismometers is ignored. It might be reasonable for seismic observations at middle and low latitudes. The problem is of high importance, however, for observations in polar regions (above 60 deg magnetic latitude), where magnitudes of natural magnetic disturbances may be two or even three orders larger. In our study we investigate the effect of magnetic disturbances associated with a magnetic substorm on the STS-2 seismic broadband sensors. The substorms are often accompanied by short-period (about 100s) quasi-sinusoidal variations known as Pi2 geomagnetic pulsations. Such pulsations are linked to eigenfrequency oscillations of magnetospheric electric currents. The pulsations have their sources and, respectively, maximal amplitudes in the region of the auroral ovals, which surround the magnetic poles in both hemispheres at geomagnetic latitude (MLAT) between 60 deg and 80 deg. In order to investigate the effect of these magnetic disturbances on the STS-2 seismometers we compared the recordings of permanent seismic stations in northern Finland to the data of the magnetometers of the IMAGE network located in the same area. Our study has shown that the irregular Pi2 pulsations are seen very well in recordings of the STS-2 seismometers. Moreover, the shape of these magnetic disturbances recorded by the seismometer resembles well the waveforms of glacial seismic events reported originally by Ekström (2003), and periods of the Pi2 pulsations are within the range of periods typical for these events. Therefore, these magnetic disturbances can create serious problem for proper interpretation of seismic observations in the vicinity of the auroral oval. The problem may be treated, however, if combined analysis of seismic and magnetic recordings is used.