Geomagnetic events recorded by global broadband seismometers

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In the past decade, about ten slow slip events have been detected in Japan. Their equivalent magnitudes are 6 to 7 and their source process times are from days to years. However, slow slip events of the source process times from tens of minutes to hours are not known. To find those of source process times from minutes to hours, we bandpassfilter continuos broadband seismic records of IRIS/IDA between 100 s to 3600 s to find synchronous anomalous nonseismic signals.

One of anomalous events of August 13, 2000, is very peculiar in the following sense: (1) predominant period is around 500 s, (2) broadband seismic records show strong similarity, (3) they arrived at IRIS/IDA stations within ten minutes. If we suppose the event occurred within the Earth, only possibility of the source location is inner core. We fail to detect inner core modes, 2S2 (10461065s), 3S3 (692703s), 5S1 (573582s), 3S4 (535544s), 3S5 (439446s), 6S2 (408414s), 4S6 (374379s) and 4S7 (326331s)(eigenperiods are those for Q of 500 and 100, respectively). We also could not detect coherent signals of CMB Stoneley modes.

There are a few pairs of seismic and geomagnetic stations within a distance of 100 km, Alert in Canada, Ashio (Tochigi Pref., Freesia) and Kakioka (Ibaraki Pref., JMA), and Takaoka and Kanaya (both in Kagoshima Pref.) in Japan. Close correlation between broadband seismic and geomagnetic records bandpassed between 100 s and 1000 s suggests that source of the anomalous event is due to the SC of geomagnetic variations. A period range of the wave form correlation is up to 5000 s. In the case of the event of October 29, 2003, long period seismic waveform deconvolved with instrumental response displays close similarity to geomagnetic records bandpassfiltered between 100 s and 5000 s.

Other remarks are as below: (1) S/N of horizontal component seismic records of the geomagnetic event is lower than that of vertical component record, which could be due to relatively high noise level of horizontal component at periods of hundreds of seconds, (2) polarity of the anomalous signal is reverse at about 30 % of the stations which recorded the geomagnetic events, and (3) there are some stations whose seismic noise level is low but did not record the geomagnetic events.

It is unknown how the seismometer records geomagnetic variations.