Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

ACC32-P03 会場:コンベンションホール 時間:5 月 24 日 13:30-14:30

東南極・東ドロンニングモードランドでの雪氷圏ダイナミクスに関連した特長的な地震波
Characteristic Seismic Waves Associated with Cryosphere Dynamics in Eastern Dronning Maud Land, East Antarctica

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Several kinds of natural source signals are recorded by seismic exploration stations on the continental ice-sheet in Eastern Dronning Maud Land, East Antarctica, during 2002 austral summer. They include not only tectonic earthquakes, but also ice related phenomena possibly involving recent global climate change. The recorded signals are classified into (1) teleseismic events, (2) local ice-quakes and (3) unidentified events (X-phases). The teleseismic waves show the high signal-to-noise ratio in spite of the small magnitude of the event: this indicates that it is highly feasible to study not only the local shallow structure but also the deep structure of the earth by using teleseismic events. Frequency spectra of the all waveforms represent discordances along the observation seismic profile. The abrupt change of topography in the valley along the seismic profile might cause both the anomalous frequency content and travel-times. Finally, an origin of the X-phases is speculated as the intra-plate earthquakes or possibly large ice-quakes (glacial earthquakes) around Antarctica, involving global warming appeared in polar region.

The characteristic seismic waveforms from various natural sources (teleseismic, local ice-quakes and unknown X-phases) are obtained by the SEAL-2002 exploration in Eastern Dronning Maud Land, East Antarctica. Interesting features of the seismic wave propagation around Antarctica are significantly demonstrated. Anomalous behavior of the waves characterized by the focusing/defocusing effects is possibly caused by a valley structure beneath the stations located at the middle of the seismic profile. Several characteristics were identified by detailed spectra analyses. A difference of the response generated from the valley structure might exist for different kinds of incident waves: i.e. P-wave incidence on the valley results in a‘ frequency gap ’ while on the other hand, S-wave incidence produces both the‘ gap ’and the‘ peak ’with a sufficient delay of the arrival-time. Although the origin of X-phases is not accurately identified, the most plausible candidates are an intra-plate earthquake or a large ice-quake (glacial earthquake) in the Antarctic. Maybe the pre-cursor vibration of the break-off process at the Larsen B Ice Shelf could be the most plausible candidate to cause the X-phases.

キーワード: Cryosphere dynamics, seismic waves, Antarctica, ice-sheet, Larsen-B, X-phases
Keywords: Cryosphere dynamics, seismic waves, Antarctica, ice-sheet, Larsen-B, X-phases