Proc. NIPR Symp. Antarct. Geosci., 4, 243, 1990

HETEROGENEITY OF LITHOSPHERE IN THE LÜTZOW-HOLM BAY REGION, EAST ANTARCTICA (ABSTRACT)

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Frequency dependent coda Q_c^{-1} was estimated for the Lützow-Holm Bay region, East Antarctica on the basis of single scattering modeling. Data set is six crustal earthquakes observed with local telemetry network installed around Syowa Station (69°S, 39°E). For the crust Q_c^{-1} is estimated as $0.00495 f^{-0.776}$ (f=4–16 Hz) with short lapse time of 20–40 s, and for the crust and upper mantle, $0.00335 f^{-0.936}$ (f=1–24 Hz) with long lapse time of 150–210 s, respectively. Essential features of our results are; (1) considerably large Q_0^{-1} (1 Hz), (2) extremely smaller values in higher frequency range and (3) consequent strong dependence on frequency.

Coda Q_c^{-1} appears to be a geophysical measure for tectonic activity; positive correlations are reported between Q_c^{-1} and activity; larger attenuation around 1 Hz and stronger dependence on frequency are found in the regions more active in tectonics and seismicity. The East Antarctic continental shield is one of the most aseismic areas in the world. Seismic activity around Syowa Station is also very low.

Coda Q_c^{-1} reflects absorption of medium and scattering loss of energy by heterogeneities such as perturbation of velocity and density, cracks and faults, etc. Taking account of the tectonic condition of the region, absorption caused by internal friction and crack friction must be very small in the wide frequency range of 1–24 Hz. Thereby, considerably large Q_c^{-1} in the lower frequency around 1 Hz should be attributable to the scattering loss due to the heterogeneity with linear dimension longer than corresponding wave length, 3–4 km. The decrease of Q_c^{-1} with lapse time suggests that the existing heterogeneity decreases rapidly with increasing depth in the lithosphere.

(Received February 22, 1990; Revised manuscript received April 10, 1990)