NECESSArray Project - Earth dynamics viewed from the Chinese continent

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【Outline of survey】

The NECESSArray (NorthEast China Extended SeiSmic Array) is a multi-national collaborative seismic experiment to deploy 280 broadband seismometers across Northeast China to study slab behavior in the mantle transition zone, the cause of intraplate continental magmatism and tectonics, and the evolution of ancient Archean lithosphere that has undergone substantial modification. The experiment will be done in collaboration with scientists from the China Earthquake Administration and several universities in the United States. In total, the Chinese will provide data from 140 broadband seismometers, and the Japan-US team from 140. The maximum spacing of instruments in the array will be about 80 km with an aperture of roughly 1000 km by 1200 km with duration of deployment of 2-3 years. Through our collaborations we will apply all available seismic imaging techniques to the data we collect to develop a seismic image of the mantle beneath Northeast China from the crust to depths on the order of 1000 km. The seismic image of the crust and mantle will include a three-dimensional P and S velocity model with scale lengths of roughly 50 km, a reflectivity profile, and a map of anisotropy.

【Expected results】

The seismic results will be used to answer a number of questions including: (1) Does the subducted Pacific plate lie flat on the 660 km boundary? (2) If the plate is flat, how far does it extend to the west beneath Northeast China within the transition zone? (3) Does the plate at some point sink into the lower mantle and if so how does it do this? (4) How is water transported into the deep mantle beneath Northeast China? (5)Is there any indication of a barrier to slab flow within the top of the lower mantle? (6) What is the relationship of mantle flow above the subducted slab to the active tectonics of Northeast China? (6) How has the Archean mantle lithosphere been modified and deformed due to the subduction and collision history it has experienced? (7) Has Archean mantle lithosphere truly been delaminated or has it only been modified and displaced horizontally?

【References by the principal investigator】

- Kawakatsu, H., and S. Watada, Seismic evidence for deep water transportation in the mantle, ***Science***, 8 June, 2007.
- Niu, F., and H. Kawakatsu, Complex structure of the mantle discontinuities at the tip of the subducting slab beneath the northeast China: a preliminary investigation of broadband receiver functions, *J. Phys. Earth*, **44**, 701-711, 1996.

【Term of project】 FY2007－2011	【Budget allocation】 53,400,000 yen (2007 direct cost)

【Homepage address】 http://gachon.eri.u-tokyo.ac.jp/~hitosi/NECESSArray/