

Deep structure and tectonics around the Baikal Rift Zone, Russia, from temporary broadband seismic observations

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Temporary broadband seismic observations have been carrying out at the Baikal Rift Zone (BRZ), Russia, from January 2004 in order to study the lithospheric structure and evolution of Siberian Craton - Baikal Rift Zone Mongolia Okhotsk mobile belt. The observations have been conducting by the cooperative program between Institutes of Siberian Branch, Russian Academy of Science (RAS) and the National Institute of Polar Research (NIPR); they will continue until the end of 2005. The observation system consists of a broadband seismometer (CMG-40T), with continuous recording by 24-bit A/D data-logger (LS8000-WD). The station was installed at Makcumuxc (MXM), where located at the center of southern coast of Lake Baikal, with maintained by RAS staff.

The BRZ is considered to have formed lastly in Cenozoic ages by both active and passive origins. Crustal extension associated with the regional phenomena underlying mantle plumes is suggested as the active origin (Zorin et al., 1989; Gao et al., 1994). On the contrary, extension related with the India - Eurasia collision is demonstrated as the passive source. A formation scheme of the BRZ, moreover, is controlled by three factors: i.e., 1) mantle plumes, 2) older (pre-rift) linear lithosphere structures positioned relative to the plumes, and 3) favorable orientation of far-field forces.

Crustal thickness beneath BRZ was obtained as more than 50 km from the deep seismic surveys. This evidence is almost opposite feature in the thin-skinned tectonics to form generally understood rift zones. Why these characteristic features of the thick crust created? This thick crust at BRZ is also supported by the combined interpretation for the crustal section derived from both geophysical and geological information. Several big sutures and large pre-Cenozoic thrusts are supposed to exist associated with the past collision tectonics between Siberian Platform and Mongolia-North China continent (Sharyzhalgay suture, Sayan-Baikal suture, Mongol-Okhotsk suture).

Regarding these tectonic information from previous studies, several scientific targets are proposed by using broadband seismic data at BRZ. By utilizing the teleseismic waveforms, velocity structure in the crust and the uppermost mantle is expected from the analysis of receiver functions and shear wave splitting, etc. a) Determine the crustal thickness and lowermost velocities beneath BRZ. b) Detect the suture zones & large pre-Cenozoic thrusts; When seismic anisotropy is possessed by mylonites in suture and thrusts, low velocity layers would be detected by seismic rays perpendicular to the mylonite foliation. A difference in receiver function structure is expected associated with the back-azimuth variations. c) Comparison with surrounded tectonic province; By making a comparison with the other IRIS station data around Siberia, such as Tayan (TLY), Uranbaatar (ULN), Chita (HIA), and Yakutsk (YAK), broader crustal structure of the Siberian Craton - BRZ Mongolia Okhotsk mobile belt shall be obtained. d) Upper mantle structure; Deeper part of the mantle lithosphere is also expected by analyzing long period receiver functions to define exact scheme of the underlying plume tails beneath BRZ.

Determination of distribution of the seismic wave velocities in depths of the Earth is an essential constituent of geophysics. Deployments of broadband observations within the BRZ enable to obtain more accurate velocity models of the lithosphere beneath the centre and flanks of the zone. The long-term observations are most valuable because a large quantity of the seismic events, which took place in all parts of the planet, let us investigate the velocity structure in the different directions from the stations which is important for such tectonically complex regions as the BRZ.