



Deep seismic profiling across Lake Biwa, Japan: Formation of pull-down basin by subduction-induced mantle flow

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Lake Biwa, the largest lake in Japan, is marked by large negative gravity anomaly and subsidence since the late Pliocene. In this area, many active faults are densely distributed. To reveal the deformation mechanisms of the crust and deep geometry of major active faults, deep seismic reflection profiling was performed along an EW oriented, 100-km-long seismic line across Lake Biwa and major active faults in October, 2006. The seismic source was four vibroseis trucks, air-guns and explosives (100 - 300 kg). Seismic signals were recorded by 10 Hz geophones and hydrophones with maximum 2756 channels. Low-folds seismic reflection profile covers whole seismic line. Near active faults, common mid-point reflection data were acquired by dense shooting of vibroseis. The deep fault geometry of major active reverse faults, such as the Yoro and Katata faults, was imaged down to the base of the seismogenic layer (approx. 15 km in depth). Their dip angle is 30 to 40 degrees. Seismic section processed by low-fold stacking of high-energy shot gathers, portrays the lithospheric image down to 15 sec (TWT). The clear reflector in the lower crust shows downwarp beneath Lake Biwa from 9 sec to 11 sec (TWT). The hypocentral distribution also accords well with this flexure. The upper surface of the Philippine Sea plate (PHS) is identified by strong reflections in the upper mantle beneath the Yoro Mts. east of Lake Biwa at 11-12 sec (TWT). Judging from the seismicity within the slab, the PHS slab shows gentle westward dipping beneath the eastern part of the seismic line and increases its dip angle beneath the east of Lake Biwa along the EW-trending section. The subsided area near Lake Biwa is marked by downwarp of the crust and steep angle subduction of the PHS slab. It is highly probable that the subsidence of Lake Biwa has been produced by subduction induced mantle flow suggested by Kudo and Yamaoka (2003, Tectonophys.).