ERI Visiting Researcher Report

Guangyu FU

Institute of Earthquake Science, China Earthquake Administration

During my stay at ERI, I worked with Dr. Yoshiyuki Tanaka on theoretical post-deformations caused by great earthquakes. Tanaka et al. [2006; 2007] presented new methods for computation of global viscoelastic post-seismic gravity variations and displacements in a realistic earth model. Their methods enabled both of the effects of compressibility and the continuous variation of the radial structure of Earth to be taken into account simultaneously. I grasped successfully Tanaka's dislocation theories for post deformations, as well as the corresponding computing codes. I studied the post-seismic gravity changes caused by the 2004 Sumatra earthquake and the 2011 Tohoku-Oki earthquake using Tanaka's software. We found that the total distributions of theoretical results are comparable with the ones of observations from GRACE. In a word, my four-month study at ERI with Dr. Tanaka might benefit me greatly for my later researches. On the other hand, my computing codes for global co-seismic deformations were installed at EIC, which might be helpful to researchers of ERI for geodetic or tsunami studies.

At the same time, I studied the Bouguer Gravity Anomaly (BGAs) and crustal thickness distribution based on new gravity data at western Sichuan Basin, China. In total, the observed BGAs at the western Sichuan Basin are negative. They change slowly from about -120 mGal (10^{-5} ms^{-2}) at southeast to -220 mGal at northwest of the study area. The contours of BGAs are NNE trending as a whole, with eastward bending at the area east to the Longquan Mountain. Our new BGA data reveal that the Moho beneath the western Sichuan Basin changes smoothly from 38 km at its southeast to 45 km at its northwest. On the other hand, the isostatic crustal thickness calculated using Airy isostatic theory changes between 39 km and 42 km at the same area, with discrepancies of -1.5 km to 3.5 km with the Moho. The Longquan Mountain is a clear boundary of the isostasy of western Sichuan Basin. Concretely, the Moho is basically identical to the isostatic crustal thickness at the east to the Mountain, where the crust is basically of isostatic state. However, at Chendu Plain, the west to the Mountain, the discrepancies between the Moho and the isostatic crustal thickness become bigger and bigger from east to west, where the crust is obviously out of isostasy. Such phenomenon indicates that the great pressure from Longmen Mountain working on the west part of the crust of Sichuan Basin is mainly burdened by the crust beneath the Chengdu Plain. It is little related to the crust east to the Longquan Mountain.