A devastating earthquake occurred offshore Tohoku region of the main island (Honshu) of Japan at 5:46 (UT) on March 11, 2011, causing tremendous damage by its strong shaking and tsunami. The earthquake was scaled as Mw9.0 by the Japan Meteorological Agency, which is the largest ever recorded in and around Japan in its history. Crustal deformation associated with this giant earthquake was recorded by the dense permanent GPS array, GEONET, operated by the Geospatial Information Authority of Japan (GSI). It is the first time in the world’s history that the occurrence and subsequent postseismic deformation process associated with a magnitude 9 earthquake is recorded by such a dense continuous GPS network. The largest displacement, a horizontal offset of 5.4m to the ESE direction and a subsidence of 1.1m, was detected at Ojika station closest to the epicenter, implying an occurrence of low-angle megathrust faulting on the interface of the subducting Pacific plate. We conduct a geodetic inversion analysis to estimate the slip distribution. The largest slip estimated is 29m centered at (143E, 38N) and the source region extends over 400km along the Japan Trench. The slip distribution suggests that historical seismicity in this area during last 400 years does not reflect the whole picture of the seismic cycle on this plate boundary. We also discuss the after slip distribution based on postseismic transients, and crustal deformation associated with the M7.3 fore-shock 2 days before the main shock.