

Estimation of the lower limit of the coseismic slip and the strength in the deeper part near the 2011 mainshock

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Numerous studies have estimated the slip distributions of the 2011 off the Pacific coast of Tohoku Earthquake. However, the reliable slip distribution has not been necessarily clarified. We estimated the lower limit of the coseismic slip region in the deeper part of the fault near the mainshock, using the F-net focal mechanism data and stress changes by the various fault models and then discussed the relation the initial stresses and the slip distributions. Two characteristic focal mechanism distributions after the mainshock were found at the deeper part of the fault off the Miyagi ~ Iwate Prefecture, where are located in the vicinity of the mainshock hypocenter. The first case is the distribution composed of P-axis with vertical dip angle above the plate boundary and with dip angle parallel in the direction of the plate subduction below the plate boundary in depth of about 40km. The second is located deeper than the first case, which is located about 40-50km at the plate boundary, and is characterized by thrust type events near the plate boundary. We calculated the stress changes by the coseismic slip model that we made artificially, referring to Chiba et al., (2012) using Okada(1992), and then found that above-mentioned features about the focal mechanism distributions appeared equally in the case of the stress changes. The first and second case in the stress change correspond to the parts that the slip gradient is steep and lower limit of the slip, respectively. However, it may be practically expected that focal mechanism distributions after the mainshock are also affected by postseismic slip and initial stresses. We thus examined the dip angle distributions of the P-axis and .axis, which calculated the stress changes with the slip model including the afterslip and initial stress, above the plate boundary. As a result, it was implied that the shear strength in the region deeper than the lower limit of the coseismic slip distribution was high to some extent($> 5\sim 10\text{MPa}$), whereas the shear strength in the region with large coseismic slip was weak($< 5\text{MPa}$).

Keywords: focal mechanism, fault model, stress change, initial stress