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Tsunami source of the 2011 off the Pacific coast of Tohoku, Japan earthquake

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Tsunami waveform inversion for the 11 March 2011 off Pacific coast of Tohoku earthquake (M 9.0) indicates that the source of largest tsunami was located near the axis of the Japan trench, while the deeper interplate fault in Sanriku-oki and Miyagi-oki regions also slipped. Ocean bottom pressure and GPS wave gauges recorded gradual increase of water level (~ 2 m) followed by an impulsive tsunami wave (3 to 5 m). The slip distribution estimated from 33 coastal tide gauges, offshore GPS wave gauges and bottom pressure gauges show that the large slip, more than 30 m, was located along the trench axis. This offshore slip, similar but much larger than the 1896 Sanriku "tsunami earthquake," is responsible to the recorded large impulsive peak. In addition, large (> 10 m) slip on the plate interface at Sanriku-oki and Miyagi-oki around the epicenter, similar to the previously proposed fault model of the 869 Jogan earthquake, is responsible to the initial water rise and presumably large tsunami inundation in Sendai plain. The interplate slip is ~ 4 m in Fukushima-oki, and less than 2 m in Ibaraki-oki region. The total seismic moment is estimated as 3.2×10^{22} Nm ($M_w = 8.9$).

Keywords: 2011 Tohoku earthquake, Tsunami source, Tsunami waveform inversion, Ocean bottom sensor, GPS buoy, Tide gauge