Waveform inversion using empirical Green's functions for the rupture process of the 2005 Fukuoka-ken Seiho-oki earthquake

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Ground motion records from two aftershocks, namely, the March 20 20:38 aftershock (MJ=4.5) and the April 1 21:52 aftershock(MJ=4.3) were used as empirical Green's functions to estimate rupture process of the 2005 Fukuoka-ken Seiho-oki earthquake. The conventional least-squares linear waveform inversion (Hartzell and Heaton, 1983) was adopted. A fault plane with a dimension of 24km times 14km was assumed, whose strike and dip angles were set to be 306 and 87 degrees, respectively, reffering to the F-NET CMT solution. The fault was divided into 24 times 14 fault elements. It is assumed that the rupture initiates beneath the JMA epicenter, at a depth of 14km, reffering to the analysis done by DPRI. The rupture front is assumed to propagate radially at a constant velocity of 2.8km/s. Each fault element is allowed to slip 12 times in 3.0 seconds after passage of the rupture front at equal time intervals. The moment release of each slip relative to the moment of the selected aftershock was determined through the inversion. Conventional corrections for the geometrical spreading and time shifts (Irikura, 1983) were applied to the empirical Green's functions to represent arrivals from each fault element. The shear wave velocity in the source region was assumed to be 3.55km/s. Absolute time information for both the mainshock and the aftershock recordings was used.

The result indicats a bilateral rupture from the epicenter. The slip in the asperity in the eastern part of the fault is smaller than that in the asperity in the western part of the fault in our model. The moment release at each fault element at each time window relative to the aftershock moment determined by the inversion is listed in a website (www.pari.go.jp/bsh/jbn-kzo/shindo/japanese/japanese_research/japanese_results_18_2.htm).