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Seismogenic structures in Wenchuan aftershock region from focal mechanism solutions

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From broadband waveform data recorded by Sichuan regional digital seismic network, focal mechanism solutions and depths of 312 Ms≥4 aftershocks of 2008 Wenchuan earthquake sequence with relatively high signal-to-noise ratio (SNR) waveforms were derived by using CAP waveform inversion method. Based on the focal depths and focal mechanisms of these aftershocks, we analyzed the features of seismogenic structures in the aftershock area. The major results obtained are as follows: The main faults are clearly NW-trending on the southern segment (west of Mianzhu) and central segment (from Mianzhu to Pingwu) of the aftershock area, but no dominant trend on the northern segment (east of Pingwu) was determined. The stress tensors at different depths display that the orientation of S1 axis changes on the central segment and at the northern end of the aftershock zone, indicating that the two portions may have different seismogenic structures at different depths. Except the northern end of the aftershock region, the orientation of S1 axis in the early stage (before June 30, 2008) is close to that in late stage (after June 30, 2008), implying relatively stable seismogenic structures there. Preliminary analysis for the seismogenic structures at the northern end indicates that deeper strike-slip aftershocks occurred on the main faults of the Longmen Shan fault zone at the beginning, and then the NNE-striking branch faults at the northern end were activated and a series of relatively shallow strike-slip earthquakes were generated due to the stress triggering subsequently. The mechanism type of aftershocks near Lixian at the shallower depths is different from that at the deeper depths, indicating the main faults and the NW-striking tear fault are responsible for aftershocks at different depths. And the variation from strike-slip faulting in the early stage to normal faulting in the late stage near Lixian may be the result of the relaxation effect from the mainshock on the branch faults.