

Aftershock Distribution and the Fault Plane of the 2008 Caucasus Earthquake Relocated by MJHD method

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In order to identify the fault plane of the 2008 Caucasus region, Russia, earthquake (M_w 5.8), we relocated the mainshock and its aftershocks until 2008/10/24 using the modified joint hypocenter determination (MJHD) method by Hurukawa and Imoto (1992) and Hurukawa (1995). We used P arrival times reported by the European-Mediterranean Seismological Centre (EMSC).

Mainshock: CAUCASUS REGION, RUSSIA

Origin Time (EMSC): 2008/10/11 09:06:09.8 UTC
Hypocenter (EMSC): 43.3°N, 46.24°E, 10 km
Magnitude (Global CMT): M_w 5.8

Results

Using 41 stations finally shown in Figure 1, we relocated 16 earthquakes as shown in Figure 2C. Since we plotted the same events in Figures 2B and 2C, we can directly compare hypocenter locations by EMSC and MJHD. The size of the epicentral area becomes almost half. Concerning the fault plane of the mainshock, we could identify it from the following two points: Firstly, epicentral distribution maps in Figures 2C and 2D clearly show that shallower and deeper earthquakes occurred at NE and SW of the epicentral area, respectively. Secondly, it is clear from cross sections in Figures 2C and 2D that hypocenters are located not along the northward dipping nodal plane (shown in cross section C-D) but along the southward dipping nodal plane (shown in cross section A-B).

Conclusion: Fault plane: Nodal plane striking EW and dipping southward.

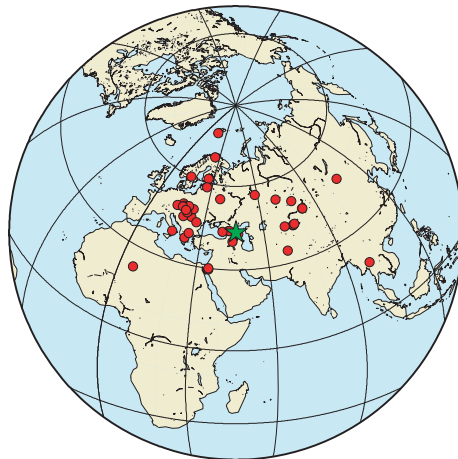


Figure 1. Stations used in relocation. The asterisk indicates the epicenter of the mainshock.

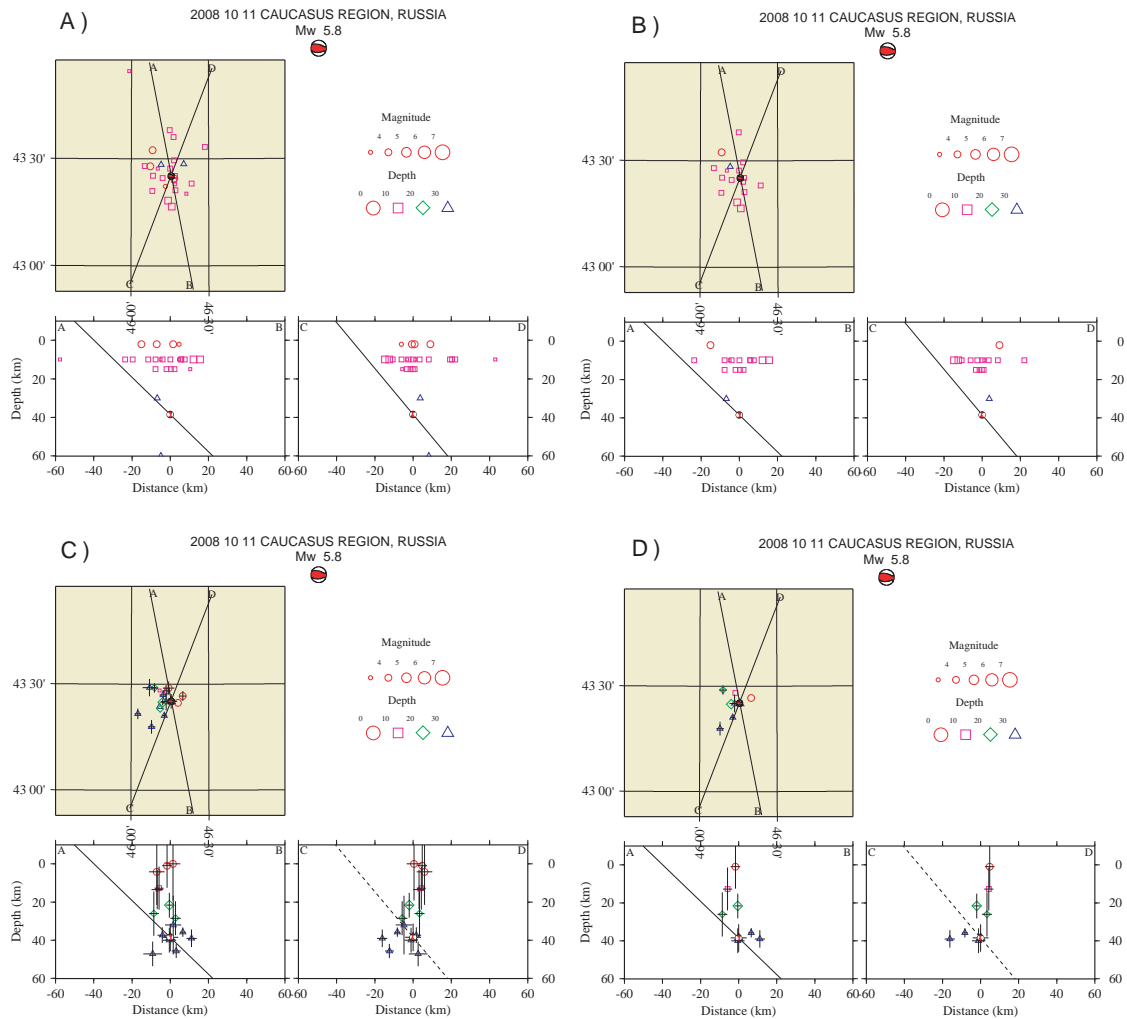


Figure 2. An aftershock relocation of the 2008 Caucasus earthquake (M_w 5.8) with the global CMT solution. The epicentral distribution and two vertical cross sections along A-B and C-D lines, which are perpendicular to the strikes of the two nodal planes of the global CMT, are illustrated. The different symbols represent the different focal depths of the earthquakes. The sizes of the symbols differ according to the magnitudes of the earthquakes. The two straight lines in the cross sections indicate the two nodal planes of the mainshock. (A) The EMSC hypocenters. All 25 earthquakes selected during 11 to 24 Oct. 2008 are shown. (B) The EMSC hypocenters of the events corresponding to the events in Figure 2C are plotted. (C) The MJHD relocated mainshock and the aftershocks are plotted. The thick solid and thin broken lines, which pass through the hypocenter of the mainshock, indicate nodal planes corresponding to and not corresponding to the fault plane, respectively. Crosses indicate standard errors of hypocenters. Note that absolute values of focal depths are not reliable. (D) The MJHD relocated mainshock and the aftershocks that occurred within 2 days, including the day the mainshock occurred, are plotted.

References

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- Hurukawa, N. and M. Imoto, Subducting oceanic crusts of the Philippine Sea and Pacific plates and weak-zone-normal compression in the Kanto district, Japan, *Geophys. J. Int.*, 109, 639-652, 1992.