

グローバルCOE地球惑星科学

特別講義



1960年と2010年のチリ地震 —メガスラスト地震の多様性—

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講義内容 :

The 1960 Chilean earthquake ($M_w=9.5$) is believed to be the largest ever recorded, yet its detailed mechanism is not well understood. Since the 2010 Chilean earthquake ($M_w=8.8$) occurred just north of the 1960 event and is studied in detail with hundreds of seismic stations, comparison of these 2 events can give us an important clue to the mechanism of the 1960 event.

The strainmeter record observed at Isabella (ISA), California, for the 1960 Chilean earthquake ($M_w=9.5$) is one of the most important historical records in seismology because it provided the first definitive observations of free oscillations of the earth. Because of the orientation of the strain rod with respect to the back azimuth to Chile, the ISA strainmeter is relatively insensitive to Love (G) waves and higher order (order > 5) toroidal modes, yet long-period G waves and toroidal modes were recorded with large amplitude. This observation cannot be explained with the conventional low-angle thrust mechanism typical of great subduction-zone earthquakes, and requires an oblique mechanism with half strike slip and half thrust. We tested the performance of the ISA strainmeter using other events, and found no instrumental problems. Thus, this observation represents the real characteristics of the 1960 Chilean earthquake, rather than an observational artifact. The strain spectrum at Ñaña (NNA), Peru, observed for the 1960 Chilean earthquake supports the oblique mechanism. Combining the results from earlier studies, we suggest that the strike slip deformation may have occurred at depths with a time scale of about 300s or longer. The slip direction of the 2010 Chilean earthquake ($M_w=8.8$) is rotated by about 10° clockwise from the plate convergence direction suggesting that right-lateral strain comparable to that of an $M_w=8.3$ earthquake remained unreleased and accumulates near the plate boundary. One possible scenario is that the strike slip strain accumulated over several great earthquakes can lead to the occurrence of an especially large earthquake like the 1960 Chilean earthquake. If this is the case, we cannot always expect a similar behavior for all the great earthquakes occurring in the same subduction zone.

主催 : 東北大学 グローバルCOEプログラム
『変動地球惑星学の統合教育研究拠点』
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