RUPTURE PROCESSES OF SOME COMPLEX EARTHQUAKES IN SOUTHERN MEXICO

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DIGEST

A sequence of earthquakes occurred near the coast of Chiapas, Mexico commencing on April 29, 1970. The long-period P waveforms of the three most important events of this sequence were analyzed using synthetic seismograms. Although some perturbations in the wave forms are shown to be caused by near-source structure, others are produced by complexities in the earthquake source time-functions. The results show that the after-shock of April 30 at 0833 (M_S = 6.4) can be modelled by a simple point source with a seismic moment of 6.6 x 10^{25} dyne-cm. The foreshock of April 29 at 1122 (M_S = 6.3) consisted of two simple events 7 seconds apart having approximately the same seismic moment of 4.1 x 10^{25} dyne-cm. Four events were identified within the 15 second interval prior to the main rupture (M_S = 7.3) for which the seismic moment was 9.9 x 10^{26} dyne-cm. Apparently only two of those events are directly related to the main rupture process. Multiple event analysis indicates that a small faulted area and low rupture velocity seems to be characteristic of these earthquakes.

Strong attenuation of P-wave signals was observed over a certain range of distances and azimuths,

especially at stations in the eastern United States. Three possible explanations of this phenomenon based upon our observations and other studies are discussed.

The P-wave signatures of several other shallow and intermediate earthquakes in this region show that earthquakes occurring near the trench are characterized by complex P waveforms. This complexity is perhaps due to a heterogeneous distribution of stresses along the trench or to a heterogeneous plate composition. The interaction of the American plate with the Cocos and Caribbean plates possibly complicates the rupture mechanism of earthquakes in this area.