SEISMICITY
(S Cosponsored by T)

Wilmington Room *Monday 0830h*

Chairmen: ROBERT A. PAGE and CHI-YU KING (U. S. Geological Survey, Menlo Park, California)

S1

Model Seismicity and Source Parameters. The pattern of strain buildup and release along a laboratory model of a seismic fault which consists of spring-connected masses sliding on a frictional surface is examined. Shocks of various sizes are generated with statistical features similar to those on an actual fault. The stress drop associated with a shock increases monotonically with the size of the shock and is usually a small fraction of the average operating stress level. The particle displacement and the rupture length both increase with the size of the shock. However, for shocks of the same size, some may have larger particle displacement and smaller rupture length than the others. The pre-shock strain energy density along the ruptured segment is not significantly dependent on the shock size; the post-shock energy density is smaller for larger shocks. Large shocks are few in number, occur at irregular time intervals, and release most of the strain energy. Rupture and slip velocities tend to be higher for larger shocks. Aftershocks occasionally occur where the slippage is small during the main shock.

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S2

Characteristics of Aftershock Sequences in central California. Understanding of the time-dependent physical processes responsible for aftershocks may ultimately lead to an understanding of the physics of earthquake generation in the earth's crust. Many of the features of the "normal" seismicity of the San Andreas system in central California, including the magnitude-frequency relationship, progressive movement of localized dislocations, and clustering of hypocenters are also common to aftershock sequences. Moderate ($M \geq 4$) central California earthquakes are commonly accompanied by aftershock sequences with the following characteristics: 1) a planar distribution of hypocenters, 2) focal mechanisms similar to the mainshock, 3) a hyperbolic decay of the event rate, 4) an irregular distribution of hypocenters on the fault plane, 5) a persistence of activity within the earliest definable limits of the aftershock zone, and 6) a temporal expansion of the aftershock source area in both the vertical and horizontal directions. These observational characteristics indicate that the time-dependent relaxation of the fault following the mainshock includes continuing movement on the mainshock rupture surface and an extension of the mainshock dislocation into adjacent areas of the fault plane.

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S3

An Automated Digital System for Seismic Event Detection and Recording. We have designed and tested a mini-computer system for processing telemetry from the Caltech/USGS LA Basin seismic array to detect and record seismic events (earthquakes and artificial sources). Data from all telemetry channels are digitized and buffered in mass storage. When an event is detected, all data (starting several seconds before the earliest arrival) are recovered, but only data from channels which significantly exceed their ambient noise level are recorded on magnetic tape for permanent storage. The principal advantages gained are elimination of manual scanning of film or paper records; ease of processing the data tapes to develop and update a data base on regional seismicity; ease of routinely measuring coda length, spectral parameters, etc.; and elimination of timing errors caused by measuring times from several different films. The detection algorithm tests continuously for "candidate events" (at least four "candidate first arrivals" in a short time window). "False alarms" are rejected if less than four candidate arrivals are from any small geographical region or if signal levels do not stay high long enough; other discriminants also are used.

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S4

Seismicity of the Imperial Valley, California, 1973. An array of 16 short-period (1 HZ) vertical seismometers has been operating in the Imperial Valley, California, since April, 1973. The array, which spans the Salton Trough between the Salton Sea and the Mexican border with an average station spacing of about 12 km, is designed to monitor seismic activity associated with geothermal resource development and to define tectonic patterns of the southern San Andreas fault system. All earthquakes of roughly magnitude 1 or greater recorded on the array are routinely timed and located. Epicenters show a linear concentration along the trace of the Imperial fault. This linear trend of epicenters continues northward from the Imperial fault passing beneath Obsidian Buttes and extending in a diffuse pattern beneath the Salton Sea toward the Banning-Mission Creek fault. Two earthquake swarms, which occurred in June, punctuate the linear trend on either side of Brawley. Both individual and composite fault plane solutions for earthquakes on this trend show right lateral motion along planes parallel to the Imperial fault trace. A diffuse pattern of earthquakes extends northeastward from the Imperial fault toward the San Jacinto fault. Results from this array clearly define the general pattern of seismicity in the Imperial Valley suggested by results from the regional Caltech network since about 1965.

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