FOCAL MECHANISM STUDY OF SIX EARTHQUAKES IN THE PACIFIC COASTAL MARGIN OF SOUTH AMERICA

by

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The focal mechanism study provides us with a means of understanding the problems of geodynamical processes that cause earthquakes, the stress system present in the earthquake area and its relation to the geotectonic features of the area. In order to study the mechanism of earthquakes, the various types of waves generated by it are utilized. In this research the well known techniques utilizing the initial P motion field and the S wave polarization angle were applied to study six earthquakes. These earthquakes are located on the western coastal margin of South America and occurred during the period 1963-1965. Three of these earthquakes were shallow focus and three were deep focus.

The focal mechanism of deep focus earthquakes was determined, in addition to the techniques mentioned in the foregoing, by a spectral procedure formulated by Teng and Ben Menahem (1965). In this procedure the spectrum of the isolated P wave signal is computed. The observed spectrum is then projected to the focus of the earthquake by removing propagation effects of the mantle, crust and the instrument. These effects are assumed to be linear. When this is done for a number of recording stations a spectral radiation pattern is obtained at the focal sphere.

The focal parameters are obtained by matching the theoretical patterns for various combinations of focal parameters with the observed patterns. The present study shows that the spectral method provides fault plane solutions which are compatible with the P first motion data and S wave polarization data. The six earthquakes analyzed here conformed to the type II force system.

For making regional studies the South American earthquakes studied previously by Stauder and Bollinger (1964, 1965) were included in this work. Taking into consideration the regional geological features of the area, one of the nodal planes was chosen as the fault plane and the direction of motion in the earthquake was determined. It was found that the selected fault planes had a strike parallel to the regional tectonic strike in most of the cases. The fault motion showed a preference for reversed type of faulting in the case of shallow shocks. In the case of deep shocks faulting was mostly of the normal block type.

The plane containing the pressure and the tension axis was found to be nearly vertical in a majority of the earthquakes. The strike of this plane cuts across the tectonic axis of the area at various angles usually lying between 45° to 90°. The pressure

axis usually had very steep plunge in the case of deep shocks. This axis was found to be nearly horizontal for the shallow shocks located to the north of 20° S latitude, and was plunging at considerable angles in the case of shallow shocks located to the south of the above-mentioned parallel.

The above observation shows that the major change in the tectonic trend of regional geologic structures on the two sides of 20° S parallel is associated with a noticeable difference in the alignment of the stress system. The study also indicated the possibility of the extension of the northwest-southeast tectonic trend across the South American continent along Salado-Parana River.