THE USE OF ScS WAVE DATA IN DETERMINING THE MECHANISM AT THE FOCUS OF AN EARTHQUAKE

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For a complete description of the focal mechanism of an earthquake, it is desirable to use data from various types of waves, P waves, S waves and surface waves. Considering the S wave technique, we see that the difficulty is the limitation of available S wave data, since actual seismograms or photostatic copies of the seismograms from various stations must be gathered. To augment data for the S wave technique, this study examined whether ScS wave data can also be used.

The theoretical possibility of reducing ScS wave data to S wave data usable for focal mechanism determinations was first examined. The ScS wave was traced from its origin as an S wave at the earthquake focus to its registration as an ScS wave at a distant station. It was found that to reduce ScS wave data to S wave data only the change of properties brought about by reflection at the core-mantle boundary need be considered. Equations were derived so that the change of properties can be taken into account and the reduction made.

A simplified approach to obtain focal mechanism solutions from S wave data was also proposed. This approach consists of three steps: two graphical methods of the central projection and the stereographic projection, and a statistical analysis using a method of least squares. For the stereographic projection it was

found that the results were less reliable when the orientation of the focal forces of the earthquake was nearly horizontal. The graphical methods are used to give only a rough idea of the solution, while the method of least squares yields a more precise solution. The least squares method also gives an idea of the significance of the solution.

In the actual application of the technique to ScS wave data, difficulties encountered in data processing and calculations were not insurmountable. In the calculations much labor was saved by constructing appropriate graphs.

For four earthquakes, which already had focal mechanism solutions by P wave and/or S wave methods, the solutions were re-obtained by using ScS wave data and by applying the simplified approach. The results were in good agreement with the previous solutions.

ScS wave data can be used in focal mechanism determinations, if the ScS wave data are first reduced to S wave data. This was shown by the consistency of ScS wave data among themselves and by the results of focal mechanism determinations by ScS wave data alone.