DETERMINATION OF SURFACE-WAVE SOURCE PARAMETERS FROM SEARCH PROCEDURE AND FROM LINEAR MOMENT TENSOR INVERSION

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Two methods for source study are presented and employed. The first classical method is the null-centroids technique for focal mechanism search that uses the absolute values of theoretical spectral amplitudes to match the observed. The best match would give the solution and three associated spectral-invariant solutions of the focal mechanism. One of these must satisfy P-wave first-motion data. The solution obtained predicts theoretical results with good matches in time and frequency domains. A faster method is to use a linear moment tensor inversion. Improvements over the two-step technique were made in this study using weighting schemes and moment tensor decomposition. Source retrieval is expedited by ignoring phase as phase is generally not well known. Moment tensor components are obtained using least-squares fitting, with the solution at the minima of the error curves. A best estimate technique of the seismic moment is employed. The depth of the source is computed from a robust least-absolute deviation straight line fitting of information obtained at the minimum of the error curve of all data at each depth.

Since surface-wave displacements can be expressed as a linear function of the moment tensor source using the Greens-function responses of the earth, the expansion of the expressions for surface-wave displacements in terms of a general dipolar source is made. In addition, various source expressions represented by symmetric and asymmetric moment tensor matrices are derived.

These new techniques of analysis were applied to three $m_b \approx 5$ earthquakes. The focal mechanism results of the earthquakes of Ohio of 31 January 1986 and New York of 07 October 1983 show that the subhorizontal P-axis trends in the direction near east-west to ENE-WSW. The Wyoming earthquake of 18 October 1984 focal mechanism result indicates the subhorizontal T-axis oriented in the NNE-SSW direction. These directions are consistent with other regional determinations of stress orientation for the source areas.

The results obtained from the two proposed methods agree with the observed data and are consistent with each other. Furthermore, the results are in good agreement with those results of other authors who use other portions of the seismic wavefield and other analysis techniques. Hence, these point out the reliability in the proposed methods of analysis and suggest their use on a routine basis for the ever more demanding seismological analysis of the future.