Author's Replies

Multiple Authors

AUTHOR'S REPLIES

Closure by G.L. Hempen.

This paper was written to describe a method of earthquake source zonation for the Central United States and to recommend the appropriate parties responsible. Gupta discusses several important aspects of the paper. This reply clarifies some remarks of Gupta.

The analysis of geologic consideration may be systematically evaluated to provide, in Gupta's words, "...sufficient information for bounding earthquakes." The geologic considerations include structural geology, tectonics, geophysics, and historic seismicity. Strong agreement among these factors was found for the type and limit of source zones in USAED-St. Louis (1981). The reduction of pertinent data must require uniqueness between the final zones. Analysis of recurrence rates should be included in the zonation process. Alternate zone models may then be examined on the basis of similarities in geological, geophysical, and earthquake density features, and further earthquake production. The iterative procedure of analyzing possible zone choices strengthens the final results.

Inaccuracies of seismicity catalogs must be reduced prior to evaluating preliminary zones or recurrence data. Methods to eliminate these errors are developed by Chiburis (1979), Nuttli (1974), Stepp (1973), and USAED-St. Louis (1981). The reliability and accuracy of the data base improved by these statistical procedures enhances the confidence of the chosen earthquake source zones.

Other discussions and references cited by Gupta are particularly useful in developing seismic hazards.

REFERENCES

Chiburis, E. F., (1979). "A Comparison of the Seismicity of Three Regions of the Eastern United States," 1979 Midwest Meeting Program, American Geophysical Union, Abstract, Pg. 8, 5-9.

Nuttli, O. W., (1974a). "Magnitude-Recurrence Relation for Central Mississippi Valley Earthquakes," Bulletin of the Seismological Society of America, Vol. 64, No. 4, 1189-1207.

Stepp, J. C., (1973). "Analysis of Completeness of the Earthquake Sample in the Puget Sound Area," National Oceanic and Atmospheric Administration, Technical Report ERL 267-ESL30, Boulder, CO, 16-28.

USAED-St. Louis (1981). Earthquake Potential of St. Louis District, 102 pp., United States Army Engineer District-St. Louis, St. Louis, Mo.

AUTHOR'S REPLY

Closure by Toshio Iwaski, Kazuhiko Kawashima, and Yoshikazu Takagi.

Author's Reply to Discussion by Dinesh C. Gupta

The authors highly appreciate the invaluable discussions on our paper. As noted by the discussor, we believe that analyses of underground seismograms measured during actual strong motions will give a better information to the understanding of the influence of in-situ soil conditions on seismic ground motions. Along with this direction, we already have eight observation stations (one in Tsukuba[1]), four in Tokyo Bay area, one in Nagoya Bay area, and two in Osaka Bay area) where underground motions up to the depth of 100 to 150 meters are being measured. During recent earthquakes including the earthquake of September 25, 1980 (with Magnitude of 6.1) occurred near Tokyo Bay, additional records have been obtained. We will continue to present measured underground records to the earthquake engineering community.

Thank you for your attention to our work.

Author's Reply to Discussion by Umesh Chandra

Thank you very much for the valuable discussion on our paper. The following is the author's reply to the discussion:

1. During the Dec. 4, 1972 Earthquake, only horizontal records are available at three depths at Kannonzaki. Since absolute acceleration values were rather small, these data were not displayed in Fig. 1. The peak accelerations are
   N-S component: 6.5gal(0m), 10.1gal(-80m), 10.4gal(-120m)
   E-W component: 7.3gal(0m), 10.6gal(-80m), 10.7gal(-120m)

2. That is correct for the case of Kannonzaki of Dec. 4, 1972. For the case of Futtsu Cape of August 4, 1974, vertical accelerations which are not shown in Fig. 1, are available as follows;
   20.4gal(0m), 2.9gal(-70m), 3.4gal(-110m)

3. These records are all triggered on ocillograph recording papers with the width of 92mm. Three to five components are traced on one paper. Although peak accelerations can be read directly from the recording papers, analysis of frequency response function can be made only for the records for which time-histories are available in the digital form. Digitization of the analog records have been made only for records with comparatively large amplitudes for all components of various depths. This is the reason why no analysis of frequency response function has been done for some records.

4. So far, we have not conducted the similar analysis for the components except ones shown in Figs. 6 and 7. At the present, however, we are analyzing the remaining records. The results will be available in the future publications.

AUTHOR'S REPLY

Closure by I. Vardoulakis and V. Dougalis.

The polynomial solutions presented in this paper are, of course, not the only possible ones for the governing differential equations (6) and (9). For non-integer eigenvalues α the solution is Batemans $k_\alpha(\xi)$- function. In the present paper the following statement is made: ".... as it will be shown elsewhere, the assumption that the displacement amplitudes be square-integrable in $I_0 \propto$), leads to polynomial solutions (only), corresponding to integer eigenvalues α." If one abandons this assumption, then together with the polynomial solutions the Bateman's solution also exists. However, the corresponding mathematical proof that would lead to the conclusion that only polynomial solutions exist is not given here or is published yet. After this proof is given and the physical assumption behind it is accepted, then one will be able to call the phenomenon a "Layer-effect".

Inspite of that, the polynomial solutions are always useful, since they can be treated more easily and lead to good numerical results.