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JUNEC Focal Mechanism Catalog Using P-wave First Motion Polarities and Its Characteristics

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We determined about 14,000 focal mechanisms which occurred in and around Japan from July 1985 to December 1998 by using P-wave first motion polarities of the Japan University Network Earthquake Catalog (JUNEC) and HASH algorithm (Hardebeck and Shearer, 2002), and compiled a focal mechanism catalog. The Earthquake Information Center, Earthquake Research Institute (ERI), the University of Tokyo has compiled observed data with the cooperation of universities and determined hypocenters amounting to about 190,000 (magnitude 2.0 or above).

The JUNEC P-wave first motion focal mechanism catalog includes abundant small-magnitude earthquakes and it is applicable to various analyses. As an example of such analyses, we investigated the temporal change of probability distributions of the earthquakes against the static changes of the Coulomb Failure Function (dCFF) due to the 1995 Kobe earthquake. The dCFF was calculated on nodal planes of focal mechanisms. The probability distribution after the mainshock clearly shifts to the positive dCFF side relative to that prior to the mainshock. This supports the seismicity rate changes due to the dCFF discussed in the previous studies (e.g. Stein et al., 1992; Toda et al., 1998).

The distribution of focal mechanism solutions is spatially and temporally heterogeneous, and it clearly reflects both the development of observation station network and spatial variation of first motion polarity report rate (i.e. first motion polarity report number / the number of picked onsets). Focal mechanism solutions determined in this study are basically consistent with previously reported ones such as F-net moment tensor solutions by the National Research Institute for Earth Science and Disaster Prevention (NIED) or P-wave first motion focal mechanisms observed by the Kanto-Tokai seismic observation network though some focal mechanisms are significantly different from them.

Acknowledgments

We used the program modified from HASH (Hardebeck and Shearer, 2002) for estimating focal mechanisms and the program by Okada (1992) to calculate the dCFF, as well as pick files observed by the Hokkaido University, Hirosaki University, Tohoku University, Earthquake Research Institute (ERI) University of Tokyo, Nagoya University, Disaster Prevention Research Institute (DPRI) Kyoto University, Kochi University, Kyushu University and Kagoshima University. We also used focal mechanisms determined by NIED and Japan Meteorological Agency (JMA). We thank all of these organizations and individuals. This study is partially supported by the Special Project for Earthquake Disaster Mitigation in the Tokyo Metropolitan Area from the Ministry of Education, Culture, Sports, Science, and Technology of Japan.

Keywords: Japan University Network Earthquake Catalog (JUNEC), Focal mechanism, P-wave first motion