

Regional Thresholds of the ISC Bulletin

R J Willemann

The detection threshold is, conventionally, the magnitude above which some large fraction (e.g., 95%) of all earthquakes can be located. For a network, detection threshold can be modelled from estimated probability of detection at each station, based on noise level and attenuation. For a bulletin, the detection threshold is more often estimated from observed magnitude / frequency relationships. The observed threshold is the magnitude below which the frequency falls off from a log-linear relationship extrapolated from higher magnitudes. In a bulletin containing some events without magnitude estimates this is, in fact, a magnitude measurement threshold rather than a detection threshold.

We have examined the mb / frequency distribution of the two most recent complete years of ISC Bulletin, 1994 and 1995, for each Flinn-Engdahl seismic region with at least 100 shallow, intermediate depth, or deep focus magnitudes computed by the ISC. From these distributions, we have taken the lowest threshold that any reasonable seismologist might estimate. An important feature of the relationship in each region is the peak of the density distribution. Our estimated lower bound on threshold is never less than the magnitude of this peak, but it is greater in only a few cases.

For 1994, almost all of the lower bound estimates exceed 4.5, and some exceed 5.0. Thresholds are this high even in very well instrumented regions and where local agencies normally report all data for events with magnitude > 3.9 (Japan and California, in particular). High thresholds could result from extension of Flinn-Engdahl regions beyond network bounds, earthquakes reported to the ISC without sufficient supporting observations, or ISC mb estimates different than agency estimates.

Estimated thresholds are lower for 1995 than for 1994, sometimes by 0.5 or more magnitude units. It is possible that the GSE Technical Test 3 caused the change by providing amplitude measurements for more magnitude 4 to 5 earthquakes than in previous years.

[Slides presented at the meeting](#) (postscript format, 368 KB)