

The ISC Could Benefit From S & PKP Arrival Times in Location

D.A.Storchak, Q.F.Chen

The ISC Bulletin contains the largest collection of different phases associated with seismic events all over the world. Currently only P arrival times at a distance up to 105 degrees are used for computing ISC hypocentres. Arrivals other than P serve only to indicate gross mislocation.

A relevant question is whether ISC should follow the example of other international agencies like pIDC and change its location policy to include phases other than P. The most benefit would appear to come from the use of S and PKP arrival times. Used in addition to P, local S arrivals would assist in constraining the origin time, and thereby improve determination of other parameters. Use of PKP arrivals near the caustic is likely to help in the trade-off between origin time and depth as well as improving station azimuthal coverage. Taken together these measures will generally contribute towards optimising location using global 1D travel times.

Another implication of such a policy change would be the possibility of reducing the number of events in the ISC Bulletin with no ISC epicentre. During 1996-1997 the global ISC threshold for completeness is known to be between Mb 4.0 and 5.0. Yet about 10% of events with Mb between 4.0 and 4.5 have no ISC hypocentral estimate. Such events are usually found in the Kermadecs, Tonga, Samoa, Fiji, Vanuatu, Afghanistan etc, where the local network is either non-existent or placed unfavourably and the azimuthal coverage of P arrivals alone is usually too poor to give a reliable location.

An important issue is whether ISC should always use S and PKP when they are available or should they be used optionally? Further options would be to use different weighting functions for these phases, or to choose specific distance ranges in which they would be used. The possibility of making corrections to JB travel times for phases other than P could also be considered.