

Merging Seismic Bulletins to Improve Event Locations in Asia with Catalog-Scale Empirical Travel Time Correction Surfaces

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The availability of seismic bulletin sources presents a problem when preparing data sets for studies. With so many choices, which catalog should be used? We have developed a method of merging data from all available seismic bulletins into a single database of non-redundant phases for each event. With this new database, additional ground truth (GT) events are readily identified due to the merging of all possible arrivals for each event.

Many seismic location studies utilize catalog arrival information to produce travel time correction surfaces, but for a particular subset of stations and phases. In order to take full advantage of the improved locations correction surfaces can produce for any area, it is necessary to create these surfaces for any and all current or historical stations within the region. We have been able to merge arrival information for over 150,000 events in the Asia region (Lon: 40-125, Lat: 10-85) from 1964 to present. Using this merged arrival set, we used the Bóndar et al. (2004) ground truth criteria to find over 8500 existing and relocated events that pass GT25 or better (epicentral errors less than 25 km). We have created Pg, Pn, P, Sg/Lg, Sn, and S travel time correction surfaces in the Asia region for the 1382 stations that detected a GT event. Using the resulting correction surfaces, we have relocated all Asia events on a catalog scale. This included testing the effect of the corrected secondary phases on the relocations versus using first-P phases alone. The resulting locations are more consistent in their locations and errors, are more accurate and display increased clustering around tectonic features in Asia. In addition, the resulting locations provide a catalog-scale base of improved locations for other types of regional studies.