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Revision of Earthquake Hypocenter Locations in Global Bulletin Data Sets using Source-Specific Station Terms Technique

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Global earthquake locations are often associated with very large systematic travel time residuals even for clear arrivals, especially for regional and near-regional stations in subduction zones because of their strongly heterogeneous velocity structure. In this case, implementation of travel time corrections can drastically reduce of residuals at regional stations and, in consequence, improve the relative location accuracy. We have extended the shrinking box source-specific station terms (SSST) technique to regional and teleseismic distances and adopted the algorithm for probabilistic, non-linear, global-search location. We evaluated the potential of the method to compute precise relative hypocenter locations on global scales. The method has been applied to two specific test regions using existing *P*- and *pP*-phase picks. The first data set consists of 3103 events along the Chilean margin and the second one comprises 1680 earthquakes in the Tonga-Fiji subduction zone. Pick data was obtained from the GEOFON earthquake bulletin for all available station networks. A set of timing corrections varying as a function of source position was calculated for each seismic station. In this way, we could correct the systematic errors introduced into the locations by the inaccuracies in the assumed velocity structure without explicitly solving for a velocity model. Residual statistics indicate a considerable decrease of the root-mean-square (RMS) residual in the final catalogs. The relocated catalogs exhibit less scattered locations in depth and sharper images of the seismicity associated with the subducting slabs. Comparison with a high resolution local catalog reveals that our relocation process significantly improves the hypocenter locations compared to standard locations.