INTRODUCTION

We are exploring the use of relative travel-time residuals to better constrain models of the earth for use in event location, and to usefully augment station correction information, using residual estimates from events which were previously thought to have little utility due to poor ground truth (GT) parameters.

We begin exploring the method by relocating all events in the JABCE catalog, using the USGS/IR vertical model, applying no station corrections. This ensures that the relocated events will have consistent phase residuals to a common reference model, using a uniform location method. Approximately 32,550 events with over six million arrivals were used.

For each JABCE station pair we select event-station geometries such that a 20 km change in source location results in less than 0.2 change in travel-time residuals, based on synthetic sensitivity studies, and we restrict our source-receiver distances to 2-20 degrees. A median smoother is run over a one degree grid to remove residual difference outliers. These residual difference maps (example above) became the input for inversion.

The differential results also provide catalog pick quality control, which may help us to identify outliers that contaminate the data set. In cases with few recording stations, this may be critical. Here we show results from inversion of differences for an estimate of picking error. Note at left the lineations at +/- 60, 20 and 10 s, which are clearly typographical errors in the catalog that were made during data entry. Box 7, above right, shows the same dataset sorted by station.

SUMMARY

This study is a work in progress. Initially our focus was only to derive improved utility for the more poorly constrained events in the data set. We have found that the regional slowness perturbation mapping and the catalog QC features of the differential analysis are an added benefit to the work. Our initial relocation results show improvement in location accuracy through the use of our Pn tomographic corrections; however, they also reveal zABCE dataset limitations and weak resolution in Tibet. Additional constraints on our Pn model will be provided by new local and regional catalogs. Our initial look at Siberia suggests plentiful data for Pn, Pg, Sn, and Sg analysis. We are currently relocating the Siberia dataset in order to normalize all hypocentral information to one model, prior to implementing our differential Pn analysis.

This is the same data as in Box 6, but sorted by station to reveal station-specific.