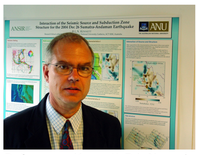
TESTIMONIALS TO ISC

1. The structure of the Earth's Interior

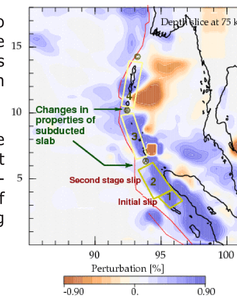
Brian L.N. Kennett, Australian National University



Reference: Kennett B.L.N. and P.R. Cummins, 2005. Relationship of the seismic source and subduction zone structure for the 2004 Dec 26 Sumatra-Andaman Earthquake, Earth Planet. Sci. Lett., 239, 1-8.

The International Seismological Centre has played a major role in efforts to improve definition of the structure of the Earth's interior. Not only has the comprehensive compilation of seismic phase information formed the basis for improved 1-D Earth models, it has also been exploited for high definition seismic tomography for 3-D structure.

Without the systematic work of the ISC to produce high quality earthquake locations and associated seismic phase times we would not have our present high-quality images of subduction zones that are of major benefit for the understanding of seismic hazard as well as Earth dynamics. The small staff of the Centre have worked hard to provide a consistent product whilst working towards updated procedures and improved products.



2. The EHB

E.R.Engdahl, Colorado University, Robert Van der Hilst, MIT, Ray Buland, NEIC/USGS United States

In 1998 Bob Engdahl, Rob van der Hilst and Ray Buland published a paper (Engdahl et al., 1998) describing a new earthquake location methodology now commonly called the EHB algorithm. The EHB algorithm provided a number of improvements over standard catalog location methods in use by the ISC at that time. The most important of these was the use of re-identified teleseismic depth phases pP, pwP, and sP for improved depth determination in the relocation procedure and the application of event selection criteria based on teleseismic station coverage, ensuring that earthquakes within a localized area are relatively well located. At the onset the EHB algorithm was developed to provide a quality-controlled, well-constrained, research database for regional and global tomographic inversions. Later, use of the new EHB catalog became a standard starting point in other areas of seismological research, having been shown to reduce location errors for continental earthquakes to 15 km or less and relative location errors to less than 10 km for any region. Nevertheless, it is important to recognize that, without the comprehensive compilation of global phase data by the ISC since 1964, there would be no EHB bulletin and the ISC has since taken steps to incorporate features of the algorithm in its routine location procedures.

References: E.R. Engdahl, Van der Hilst, R.D., and Buland, R.P., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination: Bulletin of the Seismological Society of America, v. 88, p. 3295-3314.

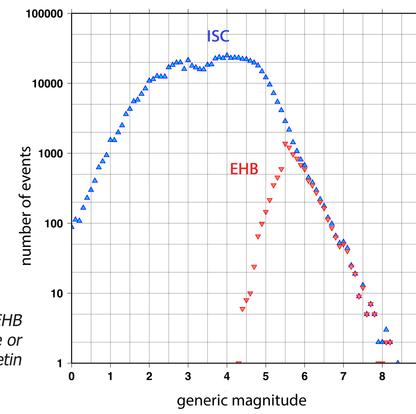


Figure (courtesy of István Bondár): The EHB is a groomed version of selected moderate or large events in the ISC Bulletin

3. Unified earthquake catalogue for Europe and the Mediterranean area

Gottfried Grünthal and Rutger Wahlström, GFZ Potsdam, Germany

At the Section of Engineering Seismology of the German Research Centre for Geosciences in Potsdam, a major task is the creation of a unified earthquake catalogue for Europe and the Mediterranean area. We compile fist-hand data from various domestic agencies all over Europe, including also studies on special earthquakes and earthquake sequences, and calculate Mw magnitudes, where these do not appear in the original data sets, for all entries. We furthermore apply priority algorithms to select one entry if more than one source have reported an event. Since the catalogue is extended to 25°W in longitude and obviously no domestic data are available for the offshore area in the Atlantic Ocean, data from the ISC are here included. From ISC, Mw and MS magnitudes are used, with the conversion from Ms to Mw. The catalogue for Europe north of 44°N latitude is published (Grünthal et al., 2009) with the southern extension soon to follow. In total, about 3% of the events with Mw=6 or larger are based on ISC data. The work is independent from but correlated with the NERIES project examining the magnitudes of large historical earthquakes in Europe (Mw 5.8) based on intensity data points.

In a spin-off study of large earthquakes (Mw 6) in Europe and the surrounding area (Grünthal and Wahlström, 2007), ISC data were used also for other parts than the Atlantic Ocean.

References: G. Grünthal and R. Wahlström, 2007. A unified database of large European earthquakes over the last two millennia. Trans. Am. Geophys. Union (EOS) 88, 69-71. Grünthal, G., R. Wahlström and D. Stromeyer, 2009. The unified catalogue of earthquakes in central, northern, and northwestern Europe (CENEC) - updated and expanded to the last millennium. Journal of Seismology, 13(4): 517-541.

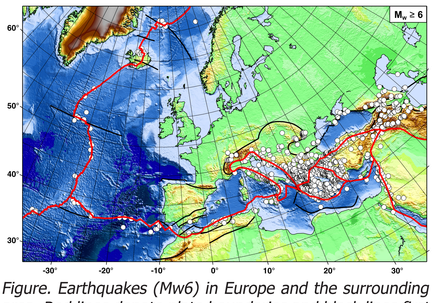


Figure. Earthquakes (Mw6) in Europe and the surrounding area. Red lines denote plate boundaries and black lines first order intraplate tectonic elements.

4. Comparison between automatic and manual arrival time picks

Jimi Lee, Ruhr-University Bochum, Germany

For near-real time location of seismic events, automatic estimations of absolute arrival times and their uncertainties are essential. The quality of automatic picking algorithms may be evaluated by comparing automatic estimations of arrival times with manual readings available from ISC. In our study, we calculate differences between automatic and manual P-wave picks for 500 earthquakes in the regions of longitudes from 0°E to 90°E and latitudes from 20°N to 60°N recorded at stations of the German Regional Seismological Network (GRSN). About 6000 vertical component waveforms for events between 1996 and 2006 are considered. An automatic picker is applied to characteristic function obtained from kurtosis estimation in a moving window. The Figure 1 shows a histogram of the differences between automatic and manual picks. Only automatic picks with an estimated uncertainty of less than 0.2 s are taken into account. The average of the differences is 0.30 s with a standard deviation of 0.44 s. Because of emergent onsets and the filtering applied to the waveforms the automatic picks tend to be slightly too late on average. However, the accuracy of the automatic picks seems to be sufficient for fast location.

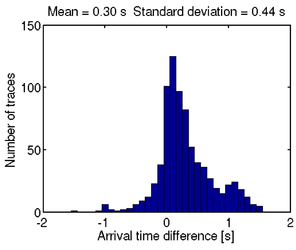


Figure: Histogram of the difference between automatic and ISC manual picks for the selected data set. The maximum picking uncertainty of the considered automatic arrival-time estimates is 0.2 seconds