

Seismic and Hydroacoustic Earthquake Catalogues

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NOAA's Pacific Marine Environment Laboratory (PMEL) produces a catalogue of Pacific Ocean earthquakes based on hydroacoustic monitoring from April 1996. The International Seismological Centre (ISC) worked without referring to the PMEL catalogue for earthquakes through April 2000, so the ISC and PMEL catalogues are independent until then. The PMEL catalogue includes many more intraplate and mid-ocean ridge earthquakes; more than 20 times as many earthquakes as the ISC catalogue in some areas. In some areas ISC earthquakes are nearly a strict subset of PMEL earthquakes, but elsewhere many ISC earthquakes are not in the PMEL catalogue. Along the Chile Rise (33-45°S, 75°-115°E), for example, the PMEL catalogue misses out most ISC earthquakes, including some that are quite large, such as an $mb(\text{ISC})=4.6$, $MW(\text{Harvard})=5.1$ crustal earthquake on 5 Oct 1996. Near the Cocos Ridge (2°-7°N, 81°-88°E) the ISC catalogue includes more earthquakes than the PMEL catalogue. For more than half of the earthquakes in this region in each catalogue, there is no corresponding earthquake in the other. Among earthquakes that are in both catalogues, location differences may be much greater than the formal location uncertainties and, for such well-recorded earthquakes, are unlikely to arise from model errors. For example, an $mb(\text{ISC})=5.1$ crustal hypocentre computed from hundreds of arrival times (and very close to the Harvard CMT, $MW=5.8$) is 250 km and 140 seconds from the nearest PMEL epicentre. It is likely that hydroacoustic-based catalogues can be more complete and accurate for very shallow earthquakes associated with underwater volcanic eruptions. But seismic-based catalogues may be more complete and accurate for deeper tectonic earthquakes such as strike-slip displacement on transform faults. Earthquakes in the middle and lower crust may not generate sufficient hydroacoustic energy or may generate hydroacoustic waves at bathymetric highs far from the epicentre.