



MERMAID seismometry in the oceans: resolving the detail of geodynamic processes

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Two years of test runs in the Mediterranean and the Indian Ocean as well as two tomographic experiments in the Ligurian Sea and near the Galapagos Islands, allow us to evaluate the potential for an array of floating seismographs to fill the data gap for seismic tomography posed by the oceans.

P-wave onsets obtained by three MERMAIDs in the Ligurian Sea have been validated by inverting them together with onsets measured in the same area from an OBS experiment as well as with nearby land stations. Judging from the posteriori misfits, an average accuracy of 0.4 seconds was obtained despite the presence of some outliers.

Using this accuracy estimate, current detection rates as a function of distance and magnitude, and observed trajectories of floats in the oceanographic ARGO program, we have modelled the data yield expected from a global array of MERMAIDs operating for five years (a new, second generation, MERMAID has a longevity in excess of five years). With 300 MERMAIDs, we expect to obtain 102,080 onset times, which allows an almost perfect geographical coverage. This rises to 341,607 in a simulation with 1000 MERMAIDs, which is much less than the 1,567,829 delays selected over the same period from the ISC catalogue. However, inverting these together in a checkerboard test shows that we can resolve anomalies of size as small as 300 km almost perfectly in most of the lower mantle, with the exception of the mantle under polar regions, Africa and the South Atlantic. Inverting the ISC data alone leaves the oceanic domain unresolved at this length scale.

The cost of such a MARISCOPE array (about \$30M) compares favourably with the cost of the US-Array deployment.