PASSIVE ACOUSTIC TOMOGRAPHY: RESULTS FROM INTIMATEŠ00 AND TOMPACO PROJECTS

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INTIMATE'00 (Internal Tide Measurements with Acoustic Tomography Experiments) and TOMPACO (TOMografia PAssiva COstiera) projects developed and tested on real data a new sea temperature acoustic tomographic methodology relying on the noise emitted from ships of opportunity as sound source.

The experimental campaign took place on October 2000 in the Atlantic Ocean in front of the Portuguese coasts, in an acoustically shallow water area where internal tides regularly occur, leading to a significant variability of the thermal structure.

The passive tomography experiments were carried out with a co-operative vessel (NRP Don Carlos I from the Hydrographic Institute of Portugal), with oceanographic conditions in the experimental area monitored both by fixed moorings (currentmeters, CTD, thermistor chains) and by XBTs. Both pseudorandom noise sequences from a towed projector and the radiated ship noise were used as sound sources for the tomographic inversion; a 16 elements array was used as sound receiver.

In the flat bottom region (range-independent case) and with a constant speed of the vessel (about 9kn), the tomographic inversion process applied to the received sound signals achieved a quite satisfactory reconstruction of the vertical temperature profile in the area.

The quality of the results was increased by an appropriate pre-processing of the cross-spectral matrix of the ship radiated noise and by a smooth selection of the frequency bins for the inversion; the use of genetic algorithm allowed an efficient solution search in the huge volume of the unknown parameters to be inverted.

Results demonstrate that this methodology can be effectively exploited for the remote, long term monitoring of temperature profile variability in wide oceanic areas.