Background noise levels and correlation with ship traffic in the Gulf of Catania

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In the last decades the growing interest in the evaluation of the underwater acoustic noise for studies in the fields of geology, biology and high-energy physics is driving the scientific community to collaborate towards a multidisciplinary approach to the topic. In June 2012 in the framework of the European project EMSO, a multidisciplinary underwater observatory, named NEMO-SN1, was installed 25 km off-shore the port of Catania, at a depth of 2100 m and operated until May 2013 by INFN (Istituto Nazionale di Fisica Nucleare) and INGV (Istituto Nazionale di Geofisica e Vulcanologia). NEMO-SN1 hosted aboard geophysical, oceanographic and acoustic sensors: among these a seismic hydrophone model SMID DT-405D(V). In this work, conducted within the activity of the SMO project, the results on the evaluation of the underwater acoustic pollution in the Gulf of Catania through SMID DT-405D(V) recordings are presented. The seismic hydrophone provided a data set of about 11 months of continuous (24/7) recordings. Underwater sounds have been continuously digitized at a sampling frequency of 2 kHz and the acquired data have been stored in 10min long files for off-line analysis. To describe one-year background noise levels, the mean integrated acoustic noise was measured every second (sampling frequency 2000, NFFT 2048) in the 1/3 octave bands with centre frequency 63 Hz and for each 10 minutes-long file the 5th, the 50th and the 98th percentiles were calculated. Measured noise was correlated with the shipping traffic in the area, thanks to the data provided by an AIS receiver installed at the INFN-Laboratori Nazionali del Sud. An acoustic noise increment was measured in coincidence with the passing of crafts in the area and it was possible to identify the characteristic spectrum of each ship. A simple model for the estimation of the acoustic noise induced by the ships passing through the area was developed. The model was applied by using AIS data acquired during the operation of the NEMO-SN1 and the results of the model were compared with the experimental acoustic data. This approach paves the way for further studies on the acoustic identification of the ships producing high noise levels to find solutions to mitigate the underwater acoustic pollution. Further studies on the whole water column are foreseen, taking advantage of the data provided by the acoustic antennas that are going to be installed between 3500 m and 3000 m water depth, off-shore Portopalo di Capo Passero, in South-East Sicily.