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Simulation of bombe radiocarbon transient in the Mediterranean Sea using a high-resolution regional model.

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The radiocarbon isotope of carbon "^{14}C", which a half-life of 5730 years, is continually formed naturally in the atmosphere by the neutron bombardment of ^{14}N atoms. However, in the 1950s and early1960s, the atmospheric testing of thermonuclear weapons added a large amount of ^{14}C into the atmosphere. The gradual infusion and spread of this "bomb" ^{14}C through the oceans has provided a unique opportunity to gain insight into the specific rates characterizing the carbon cycle and ocean ventilations on such timescales.

This numerical study provides, for the first time in the Mediterranean Sea, a simulation of the anthropogenic ^{14}C invasion covers a 70-years period spanning the entire ^{14}C generated by the bomb test, by using a high resolution regional model NEMO-MED12 (1/12° of horizontal resolution). This distribution and evolution of $\Delta^{14}C$ of model is compared with recent high resolution ^{14}C measurements obtained from surface water corals (Tisnérat-Laborde et al, 2013).

In addition to providing constraints on the air–sea transfer of ^{14}C, our work provides information on the thermohaline circulation and the ventilation of the deep waters to constrain the degree to which the NEMO-MED12 can reproduce correctly the main hydrographic features of the Mediterranean Sea circulation and its variations estimated from corals ^{14}C time series measurements.

This study is part of the work carried out to assess the robustness of the NEMO-MED12 model, which will be used to study the evolution of the climate and its effect on the biogeochemical cycles in the Mediterranean Sea, and to improve our ability to predict the future evolution of the Mediterranean Sea under the increasing anthropogenic pressure.