Ocean Sci. Discuss., 12, C1066–C1068, 2015
www.ocean-sci-discuss.net/12/C1066/2015/

Ocean Science
Discussions

Interactive comment on "Simulation of the mantle and crustal helium isotope signature in the Mediterranean Sea using a high-resolution regional circulation model" *by* M. Ayache et al.

Anonymous Referee #2

Received and published: 28 October 2015

This manuscript presents a high resolution model of the Helium isotopes in the Mediterranean Sea. The authors are using a state of the art model (NEMO) on an area of scientific interest to help bring new knowledge to the scientific community. They offer new values for the Helium isotopes ratio in the Mediterranean sea which will help modelers of the biogeochemical cycles and the climate better understand the sources of Helium, and constrain the initial conditions for the numerical simulations. Helium studies are useful in the climate simulation community to help describe the ventilation and age of the water masses. While I appreciate the benefit of better constraining these values and command the authors for their work, I think it may be useful to discuss the practical limitations that such work faces when gathering, compiling and synthesizing available

data. The authors use strong words to describe the quality of their findings, which contrasts with the less than optimal datasets they have at their disposal, and the practical limitations and simplifications that a modeler has to make when setting up their study.

I have a few minor comments. 1/ Page 2009: in the delta 3Hesw: what does SW mean? 2/ Page 2009: the value of ratio of 3He/4He seems intuitive 3/Page 2010: discuss a negative ratio. Residence time? Ventilation? He from the bomb: distribution linked to circulation: discuss. 4/Page 2010: Since then helium isotopes... : the authors first refer to a date at which the 3He was discovered then proceed to explain the cycle of the element. "Then" seems to refer to the injection of 3He, not to the time at which it was discovered (3He is being used to trace circulation since it was discovered in 1970 not since it was injected at mid ocean ridges) 5/Page 2011: "represent the ventilation of deep waters". The concept of ventilation of water masses should be explained earlier. I think it would help with statements such as that of p 2010 line 1-3 6/ The authors alternate the use of "helium" and "3He" throughout the manuscript. Be consistent. 7/ Page 2012: "the exchanges with the Atlantic Ocean are performed through a buffer". I am not familiar with the term buffer used in this context. Rephrase? 8/The datasets used in the manuscript cover very different time periods. The temperature and salinity for the Mediterranean sea are prescribed from climatology covering the period 1955-1965. NEMO-MED12 is forced at the surface by ARPERA daily fields of the momentum evaporation and heat fluxes over the period 1958-2013. For the SST a relaxation term is applied to the heat flux. How having 2 different periods for those 2 data source affect the analysis? For the Atlantic buffer the initial state is set from the WOA 2005. How are the possible mismatches in the field values treated? 8/ Page 2014: Each component has a characteristic 3He/4He value: can you please elaborate? Or describe the distribution and values so that it is not left to the reader to do so.. 9/ Page 2015: Paragraph 3.3: it feels repetitive. It seems that the authors explain the sources of helium repeatedly throughout the paper. While I appreciate the thoroughness of the authors in describing the source mechanism and listing references, I am not sure it is necessary to repeat this throughout the manuscript. Referring the reader to Fig1 -

cartoon diagram- may be more useful at this point. 10/ In the eastern Mediterranean: table 2: why not give the value of the 3He release rate? Authors list the ratio, and 4He rate, why not give the 3He rate? 11/ Page 2016: typo: needs a "." before "For the Marsili seamount" 12/ Page 2017. In the 4.1 paragraph. "very similar": well, ... seems to overestimate... 13/ Page 2019: LIW: could you remind the reader what it is? 14' Page 2019: paragraph 4.3: the notion of "correctly representing" is too vague. The paper would benefit from the use of statistics at this point. 15/ Page 2020: typo: Crisisin ? 16/ Page 2023: "It is essential if we are to improve our ability to predict the future evolution of the Mediterranean sea under the increasing anthropogenic pressure it is suffering." While I do understand and agree with this statement, are NEMO simulations coupled to a real atmospheric model? it seems to be that it is a bit difficult to do ocean only simulations for climate modeling purposes. 17/ Figure 2 caption: remind the reader which area the Meteor Cruise looks at, as there are not lat/long reference on the figure. 18/ Figure 4 captio: there is a typo: double "the". There is no explanation about how the straight lines are obtained from the dotted clouds on subfig C/ and D/.

Interactive comment on Ocean Sci. Discuss., 12, 2007, 2015.