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Comment

# ***Interactive comment on “The transient distributions of nuclear weapon-generated tritium and its decay product $^3\text{He}$ in the Mediterranean Sea, 1952–2011, and their oceanographic potential” by W. Roether et al.***

## **Anonymous Referee #2**

Received and published: 20 June 2013

### General Comments:

The paper presents a very valuable data set on the distribution of the transient tracer Tritium and its decay product  $^3\text{He}$  in the Mediterranean Sea. A new data set, obtained in 2011 is presented and the temporal evolution of the concentration of the two isotopes is discussed for the period 1953–2011.

There is a detailed discussion on the factors making the tritium-helium tracer couple a useful tool to estimate water mass ages and transit times. The approach is original and the conclusions are supported by a sound discussion of an impressive amount

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of data. They are an important contribution to the knowledge on the dynamics of the Mediterranean water masses, in particular the LIW.

The scientific methods are discussed in detail. The procedure for separating tritiogenic helium and estimating tritium-helium ages, although necessary, is too long and heavy in the text. I suggest to put it in an appendix.

The cautions to be applied when dealing with these tracers are clearly considered and explained, so that the conclusions drawn are highly reliable.

Figures: the isolines labels are very small and hardly readable, particularly when dark colors are used (see for ex Fig. 5). Larger figures (ex. Fig 11) are preferable.

#### Specific comments

Page 651 Line 13- Does the author mean that tritium concentration in the Mediterranean is comparatively high because of river input? Please explain better. Also better explain why  $^3\text{He}/^4\text{He}$  ratio of terrigenous He is lower than in most other ocean regions. Or refer to section 4 (or appendix). Line 19 - In both (which ones?), alpha decay. ....

Page 652 Last line - delete similarly – repeated word

Page 654 Line 1-8 – This part is not very clear: could the author explain better ? Line 8: mid depth outflow: To where?

Page 659 Lines 18 - 23 – It would be useful here to refer to water mass ages, instead of changing concentrations due to advection and “making ESS region upstream of that south of Crete”

Page 661 Lines 1–8 –The southern sections of tritium in WMed in 1997 and 2011 look very similar, both showing a tracer minimum at intermediate depth. The WMT might have slightly changed the concentrations in the deep water, depending on changes in the characteristics of the source water, but should not have altered the structure, related to the dense water formation in the Gulf of Lions. Lines 13-14 – Isn't it the

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opposite? Higher conc. in the west (only reduced by some 30% with respect to 2001) because of a net tritium addition here and not in the East ??

Page 671 Line 20-end of page – the discrepancy between tritium-helium ages and the turnover time of the EMDW is already discussed in section 7.3. This part could be shortened.

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Interactive comment on Ocean Sci. Discuss., 10, 649, 2013.

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