Ocean Sci. Discuss., 10, C639–C641, 2013
www.ocean-sci-discuss.net/10/C639/2013/

Ocean Science
Discussions

Interactive comment on "Changes in ventilation of the Mediterranean Sea during the past 25 yr" *by* A. Schneider et al.

A. Schneider et al.

ttanhua@geomar.de

Received and published: 28 November 2013

We thank the reviewer for constructive comments.

General comments: This is an interesting paper, which summarizes the results from nine cruises in the Mediterranean Sea over the last 25 years. The standard hydrographic measurements have been combined with a unique set of transient tracer (CFC-12, SF6 and tritium) data. This enables the authors to estimate the age of the water masses, and assess the temporal and spatial variability of the Mediterranean Sea ventilation. The study focuses upon a major event during the early 1990s, when a significant change in the overturning circulation was caused by a shift of the deep water formation site in the Eastern Mediterranean, followed by a delayed response in the Western Mediterranean. The paper is well written and structured, the transient tracer methodol-

ogy is well documented, and the comprehensive description of the results is supported by high quality figures. The potential biases and limitations of the different concepts for age estimates have been also discussed in detail. The paper is well within the scope of Ocean Science and the comments listed below can be easily addressed. Therefore I recommend publication with minor revisions.

Specific comments: 1. The paper would benefit from strengthening the link with atmospheric forcing. The Eastern Mediterranean Transient is described in detail in the introduction, however the cause of this event is unclear. Including some information about the variations of the atmospheric forcing during this period will be useful. For instance, adding a phrase similar to the one on L.8, page 1409 when describing the WMT. In both cases, some information about the magnitude of the air-sea fluxes could perhaps be included. This is also relevant to the changes in the Adriatic Sea for the period of stagnation and the restart of Adriatic deep water formation (see Manca et al., 2002). – The attribution of observed changes in ventilation is not the focus of this study, but rather the detection of changes by a time-series of transient tracer measurements. We do however add a sentence to the introduction stating the reason for the EMT, with a relevant reference.

2. Adding a simplified schematic of the water mass transformation would be very helpful for both, the introduction and the conclusions. This could be a two-panel figure showing the vertical structure of the water masses for the "classical" (Adriatic deep water source) case; and for the transient (Aegean deep water source) case. Extra information can be added showing the water mass properties, their ages, formation rates etc. – Even though we feel that there is a multitude of papers on the Mediterranean Sea oceanography that shows simplified schematics of water mass transformations in the Med, and that another one might not add much information to the subject, we are preparing a figure along those lines suggested by both reviewers.

3. One important issue, which can also be commented on in the conclusions, concerns the wider implications of the results. The study can be viewed as a regional

study, however the major water mass changes in the Mediterranean Sea can potentially have a far-reaching influence in the N Atlantic. The profiles for the Alboran Sea (Fig. 11) show no substantial changes of the age (P.1423, L.4-5), but do show higher salinities in 2011 (mentioned on p.1419). This can potentially change the properties of the Mediterranean outflow into the North Atlantic. – We certainly agree on this note by the reviewer, and added a sentence to the manuscript (section 3, and conclusions) along those lines.

Technical notes: I would suggest changing "25 yr" into "25 years" in the title. – Yes, it used to be years but was changed by OS. . .

The X-axis on the lower left panels (CFC-12 and Tr/He ages) on Figs. 3, 6, 11, 12 and 13 an be re-scaled as on Fig. 4. This will enable a more accurate interpretation and comparison of the profiles. – All figures are now consequently scaled to 45 yrs

P.1416 L.5 change to: ... of Roether et al. (2013b). – Done, thanks

Consider refinement of the two sentences on P.1422 L.29 and P.1423 end of L.3. – Changed to: A special approach to identify temporal changes in ventilation was done by a comparison of apparent CFC-12 ages vs. SF6 ages obtained 14 years later, when the growth rate of the SF6 input from the atmosphere was very similar to that of CFC-12 at the earlier time. Generally, the results of the other parameter comparisons were confirmed and also that the Mediterranean Sea is clearly not in a steady state.

P.1406, L.6, "WM Transit", but "WM Transition" on P.1409, L.12 and P.1419, L.13 - make all consistent. – Done

---

Interactive comment on Ocean Sci. Discuss., 10, 1405, 2013.