

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

Anonymous Referee #2

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Review of the manuscript “Changes in ventilation of the Mediterranean Sea during the past 25 yr”, A. Schneider, T. Tanhua, W. Roether, and R. Steinfeldt. Ocean Sci. Discuss. 10, 1405-1445, 2013.

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

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Eastern Mediterranean, followed by a delayed response in the Western Mediterranean. The paper is well written and structured, the transient tracer methodology 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).
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.
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

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salinities in 2011 (mentioned on p.1419). This can potentially change the properties of the Mediterranean outflow into the North Atlantic.

Technical notes:

I would suggest changing "25 yr" into "25 years" in the title.

The X-axis on the lower left panels (CFC-12 and Tr/He ages) on Figs. 3, 6, 11, 12 and 13 can be re-scaled as on Fig. 4. This will enable a more accurate interpretation and comparison of the profiles.

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

Consider refinement of the two sentences on P.1422 L.29 and P.1423 end of L.3.

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

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