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Comment

***Interactive comment on “<sup>234</sup>Th measured particle export from surface waters in north-western Mediterranean: comparison of spring and autumn periods” by S. Schmidt et al.***

**Anonymous Referee #2**

Received and published: 1 March 2009

I reviewed the manuscript submitted by Schmidt et al entitled "<sup>234</sup>Th measured particle export from surface waters in north-western Mediterranean: comparison of spring and autumn period". The paper describes the findings on POC export based in <sup>234</sup>Th/<sup>238</sup>U disequilibria at the Dyfamed site in the NW Mediterranean, comparing data obtained during two seasons (spring 1995, already published, and autumn 2004). Several water column profiles were obtained during each season, which would allow using a non-steady state approach. Also, sampling for this type of work at times when production is not expected to be large is of interest, given that most works in the literature focus on bloom period studies, as stated in the manuscript. However, I found the manuscript lacks of a rigorous treatment of the raw data and assessment of the methods used to

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obtain export estimates (i.e. depths of integration, uncertainties, models, neglecting advection, etc.), which compromise the discussion and interpretation. Given that, I would not recommend the publication of the manuscript.

- The authors should better describe the times of sampling, with more details, both in text and in Table/Figure. It is difficult to follow as it is now (see, for instance, that little information on traps is provided). Indeed, this is also the case in some instances in the Results and Discussion section. Details on methods in some instances (how the 10% aliquot of the traps was obtained) could also be provided.

- It is very difficult that uncertainties reported are so small given the chemical recoveries, decay of activity until counting and gamma counting efficiencies. The authors should clearly address this aspect and, if correct, demonstrated the small uncertainties. Indeed, low chemical efficiencies for  $^{234}\text{Th}$  are problematic. This have obvious implications in terms of estimating export fluxes of POC from the upper water column that should be considered: uncertainties on export fluxes should be discussed, especially considering that the authors use a non-steady state model.

- Uncertainty in  $^{238}\text{U}$  mean activity should also be considered when calculating  $^{234}\text{Th}$  deficits and propagated when using these. Indeed, comparison to recent works by others on  $^{238}\text{U}$  in seawater and its relation ship with salinity should be done (i.e Pates et al). Is the presence of different water masses affecting  $^{238}\text{U}$  concentrations?.

- Considering advection as weak and thus negligible at the Dyfamed site is a strong assumption. Recent works during the MedFlux program has shown the opposite in the upper water column. The authors may want to consider this, especially given the vertical profiles they obtained during the sampling cruises, as discussed in the text (page 149), which would point to the actual presence of advection potentially playing a significant role in Th distributions and derived estimates.

- Data sustaining the discussion should also be provided, including S, T, Chla and density profiles. Indeed, very few data from 1995 is presented, and the discussion of

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the major findings, even if published somewhere else, is difficult to follow. Also, some results discussed in page 150 are not provided in Tables/Figures, making difficult to follow the discussion (i.e. data on POC/Th ratios in particles).

- Table 1 is confusing, or at least I could not identify the fluxes discussed in the text. However, it evidences aspects such as that fluxes are very low or close to zero but derived from estimates that integrate Th profiles were excess of Th compensates deficits given the integration depths, although uncertainties are not considered. This is done even without considering low salinity water masses intrusion (advection?). Also, estimates at 60 and 200 m are compared, which doesn't seem to be entirely obvious.

- The interpretation in the 1st paragraph of page 151 is controversial: if averaged over 200/300 m, the data is not reflecting the export from the photic zone, where export would be produced.

- Calculations of the particle export is based on data with low, or very low, vertical resolution, especially for some stations. The authors should be considering this, in addition to the importance of the associated uncertainties.

- Comparison of the Th and trap derived POC fluxes should be done carefully and in the same Table (page 152). The explanation of the discrepancies should be clear, explaining how large are the differences and if a factor of about 2 is or not acceptable, given the available data (uncertainties, resolution and very low fluxes). Indeed, if the low salinities were so clearly observed, it is not very clear the arguments in the second paragraph of page 152.

- Please explain what is meant in the last sentence of section 3.3

- The arguments on renewal of nutrients (page 153) should be discussed, it is not clearly shown; also, it is not clear how the observations are linked to the export fluxes sustained by N<sub>2</sub> fixation

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Other:

1) Does the paper address relevant scientific questions within the scope of BG? Yes  
2) Does the paper present novel concepts, ideas, tools, or data? No, aside from data obtained in 2005  
3) Are substantial conclusions reached? No  
4) Are the scientific methods and assumptions valid and clearly outlined? No  
5) Are the results sufficient to support the interpretations and conclusions? No  
6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? No  
7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes  
8) Does the title clearly reflect the contents of the paper? Yes  
9) Does the abstract provide a concise and complete summary? Yes  
10) Is the overall presentation well structured and clear? No  
11) Is the language fluent and precise? Yes  
12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? No  
13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes (see comments above)  
14) Are the number and quality of references appropriate? Yes  
15) Is the amount and quality of supplementary material appropriate? Would not be necessary if data is presented in the manuscript itself. An option could be to include the already published data as supplementary material to facilitate the reading of the paper.

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**BGD**

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