Biogeosciences Discuss., 5, S1554–S1557, 2008
www.biogeosciences-discuss.net/5/S1554/2008/

Biogeosciences Discussions

BGD

5, S1554–S1557, 2008

Interactive Comment

Interactive comment on "Particle fluxes in the deep Eastern Mediterranean basins: the role of ocean vertical velocities" *by* L. Patara et al.

L. Patara et al.

Received and published: 28 August 2008

There has been a revision on some of the data presented in the Discussion Paper. The changes regard only the first part of the time series, i.e. Mooring 1, and concern:

1. The DURATION of Mooring 1 sediment trap temporal intervals:

- Previous version: 10 days for samples 01 and 02, 11 days for the remaining part of Mooring 1 time series (samples 03-24). Sediment trap recovery: 2 June 2000.

- Updated version: 10.2 days for samples 01-23, 7 days for sample 24. Sediment trap recovery: 13 May 2000.

2. COMPUTATIONAL ERROR on the ocean vertical velocity data for the intervals 03-24 of Mooring 1. The error was done in calculating the vertical average of ocean vertical velocities.

The statistical method used for the computation of correlation coefficients has also changed. In the previous version we used Pearson linear correlation coefficients. In the UPDATED version, we use the non-parametric Spearman rank correlation method. In fact by applying the Jarque-Bera test, we recognized that the particle flux time series do not fit a normal distribution.

In the web site http://www.bo.ingv.it/˜tonani/ (where ˜ = tilde) it is possible to download the updated version of:

- Figs. 5, 6 and 7 (the other figures are unchanged), depicting the time series of ocean vertical velocity and particle flux time series at the Urania and Bannock sites. Note: in the UPDATED version, particle flux time series are plotted in logarithmic scale in order to attain a better visual representation.

- Table 2, containing the Spearman rank correlation coefficients (and associated statistical significance) between ocean current vertical velocities and particle fluxes. Note: in the UPDATED version, statistical significance is computed on the 80%, 90% and 97.5% confidence intervals.

- A revised version of the manuscript text

The main changes in the manuscript text occur in the Results and in the Discussion sections, whereas the Conclusions section remains virtually unchanged.

Results (sub-section 3.4)

Ocean vertical velocities time series:

- URANIA site/ Mooring 1 (Figs. 5 and 6): ocean vertical velocities are higher than 80 cm day-1 in September-November 1999 and lower than -30 cm day-1 in May-June 2000 (as in the previous version). In the UPDATED version ocean vertical velocities are below -30 cm day-1 also in March 2000.

- BANNOCK site/ Mooring 1 (Fig. 7): in the UPDATED version ocean vertical velocities

BGD

5, S1554–S1557, 2008

Interactive Comment

remain close to zero (w $<$ +-30 cm day-1) during most of the time series, except for April and November 2000 (w $>$ 50 cm day-1) and November 1999, August 2000 and March 2001 (w $<$ -30 cm day-1).

Correlation between ocean vertical velocities and particle fluxes (Table 2):

- URANIA site/ Mooring 1: TPF exhibits highest correlations at 2800 m depth (97.5% confidence level) whereas at 500 m depth correlation significance is lower (97.5% in the 1 lag case only). Also TCF exhibits higher correlations at 2800 m depth (97.5% in the 1 lag case) than at 500 m depth, where correlations are not significant at all.

- BANNOCK site: correlation coefficients between CVV and TPF are not significant and are hence omitted from Table 2.

Discussion (sub-section 4.1)

- The fact that correlations are highest at 2800 m depth is probably telling us that the sediment traps moored at 500 m depth may be more affected by upper ocean biases (e.g. swimmers, strong horizontal currents) with respect to the sediment traps moored at 2800 m depth.

- Both TCF and TPF are significantly correlated with ocean vertical velocities. However it might be surprising to notice that TPF, rather than TCF, is actually giving the highest correlations with ocean vertical velocities. We would expect the opposite since, according to our hypothesis, upwelling causes an increase in upper ocean primary productivity, including coccolithophores. There might be two reasons for this behavior. First of all TPF most probably contains, in addition to coccoliths, other sinking matter of biogenic origin: TPF may therefore be, in areas of low lithogenic inputs, a better proxy of upper ocean productivity than TCF itself. Secondly, the measure of TPF may be intrinsically more precise than the measure of TCF: the latter is in fact only an estimate of the true coccolith flux (coccoliths are counted on random radial transects of the sample filter). Moreover, because of the various steps of the sampling and TCF measuring

BGD

5, S1554–S1557, 2008

Interactive Comment

procedures, there is a non-null risk for coccolith plates to undergo partial dissolution.

- The delayed response of particle fluxes to current vertical velocities might suggest a spectrum of particle sinking rates in the ocean interior. Associated with the fast sinking regime of more than 200 m day-1, we envisage slower regimes responsible for the significant correlations - between ocean vertical velocities and particle fluxes - observed in Mooring 1 with a lag of one rotation interval (i.e. with a delay included between 10 and 20 days). Our results suggest that sinking rates in the ocean interior are highly variable and point to the possibility of depth-enhanced particle sinking speeds.

- The lack of significant correlations at the Bannock site suggests that the described mechanisms of upwelling-enhanced deep particle fluxes is not always applicable. It is possible that when ocean vertical velocities are close to zero, other mechanisms become predominant in determining particle fluxes.

Interactive comment on Biogeosciences Discuss., 5, 3123, 2008.