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Biogeosciences Discussions

Interactive comment on "Settling particle fluxes across the continental margin of the Gulf of Lion: the role of dense shelf water cascading" *by* C. Pasqual et al.

Anonymous Referee #1

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General comments The manuscript addresses settling particle fluxes across the continental margin of the Gulf of Lion from October 2005 to October 2006 and reports high seasonal variability in mass fluxes and important qualitative changes in settling material. Organic matter and main compounds were measured by mooring traps. They found about a 30-fold increase of mass fluxes at Cap de Creus Canyon (similar results were also found in other regions, Lacaze-Duthiers Canyon, Southern Open Slope at different water depths), compared to non-DSWC conditions, after the dense shelf water cascading (DSWC) event. These observations are valuable because such events induced by DSWC are difficult to catch and which should be considered for publication at Biogeosciences. However, I have some concerns with current form of the paper,

especially on how to distinguish the flux values of organic matter, opal, CaCO3 and siliciclasts contributed by pelagic biological production from influence of dense shelf water cascading event. The authors should address this issue deeply because analogous DSWC phenomenon affecting transportation of organic matter to deep western Mediterranean basin has been published in other journals (these studies were conducted in same area despite the time period are different, Palanques et al., 2009; Sanchez-Vidal et al., 2009). They may use existing algorithms to estimate export flux from biological production in the open ocean region and compare their observed field data during DSWC event and see how significant the influence of DSWC event on POC flux in the open ocean is. As a consequence, they may provide a more comprehensive description of DSWC's contribution on organic matter flux extending to open ocean. If the authors are willing to estimate the difference between pelagic POC flux and observed field data, they may increase the value of this manuscript many folds. Moreover, the method applied in the trap deployment should be presented and evaluated in more detailed information, such as trapping efficiency and addition of preservative in trap bottles.

Specific comments are listed below.

Experimental design and data recovery The authors should give an evaluation on the trapping efficiency for the readers to understand the uncertainty of their study. They did not estimate the trapping efficiency, but a paper (Yu et al., 2001) on the trapping efficiency of deep sediment trap should be included in the material and methods. Yu et al. 2001. Trapping efficiency of bottom-tethered sediment traps estimated from the intercepted fluxes of 230Th and 231Pa. Deep-Sea Res. I, 48, 865-889.

Sinking particles were collected by 12 collecting cups. Did the authors add any preservatives into the cup solutions prior to the deployment. Recent research has shown that solubilization of "settling particles" is a serious problem for under-estimating organic matter and other elements (N, P, silica, etc. samples were from 600-4000m) (Antia, 2005). If this is the case (without addition of any preservatives), the flux values will

be significantly under-estimated because the traps have been deployed for more than several months.

Antia, A.N. 2005. Particle-associated dissolved element fluxes, revising the stoichiometry of mixed layer export. Biogeosci. 2, 189-204. Results p. 7904, line 15, “was high form” should read “ was high from” line 24, “up to 80m s-1” should read “ up to 80 cm s-1”

Look at the data showing at Table 1, some of organic matter minimum values (OM, opal) are zero. As I mentioned early, the mooring sediment traps had been deployed for over five to six months each time. I am wondering that the “solubilization” phenomenon of organic matter might be very significant, particularly for cups collected at shallow traps (300 m) during early periods (i.e. Oct. to spring). Because particles mainly contain OM, opal, CaCO3 and siliciclastic, one may wonder how one of the components is equal to zero. If the authors keep the solution of cups, they may measure dissolved organic carbon and compare to their original DOC concentration in the cups prior to deployment. The authors need to address this issue.

Discussion p.7911, The authors just described the impact of DSWC in the open slope and these similar reports have been published by Bethoux et al., 2002, Lopez-Jurado et al., 2005, Font et al., 2007 and Palanques et al. 2009. They should quantitatively estimate the POC flux caused by primary production in the open slope and compare the calculated data to their observed field data. That will give the readers a new insight for the influence of DSWC on organic matter flux in the open ocean.

Conclusions I am not sure if this the first time to record particle fluxes during a DSWC event. The authors should check it carefully because the authors have mentioned several papers talking about DSWC events in similar region (Palanques et al., 2009; Sanchez-Vidal et al., 2009).

Reference P7919, line 10, “dense shelf-water” should read “dense shelf-water”

Table 1, list all of the TM and main components data (every 15-day), not only the Max, Min, and Mean values. This is important information and needs to be explained. Also, why there are so many “o” values in Table 1.

Fig. 2, the y axis “(x103 m-3 s-1)” should read ““(x103 m3 s-1)”

Fig. 3, “Current speed (m s-1)” should read “Current speed (cm s-1)”

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