Response to Referee #2

Carbon (and also other elements) are highly dynamic in marginal seas. In the case of the East China Sea, this is especially the case due to strong marine (Kuroshio) and terrestrial (Yangtze R.) interaction. The shallow depth and broad width makes the region a hot study site for carbon cycles and budgets. It is also due to the high dynamics, results in marginal sea should be treated with more care, whereas in the case of the open ocean, distribution and variations are more or less already-known. The authors presented here a POC flux work in East China Sea, which focused on the sediment trap data. The high light is they try to quantitatively estimate the resuspension effect, though the calculation method is derived from literature. The results suggest that 49–93% of the POC flux in the ECS might be from the contribution of resuspension of bottom sediments rather than from the actual biogenic carbon sinking flux. One can feel that great effort has been applied to these original data set. Moreover, this is not the original version and the authors should have considered the editor's suggestions and comments. After read this ms, however, there are still several key problems that should be overcome before it can be considered for publication in biogeosciences. Following are the comments:

Answer: We have re-checked the TSM data and found few TSM data in outer shelf water (e.g. stations 26 and 10) indeed contain some sea-salts based on the measured sodium concentrations in suspended particles. Because we have run out of most filters, we used a relationship (see figure below) between TSM and transmissometer data (TM(%)) to estimate TSM values in outer shelf water.

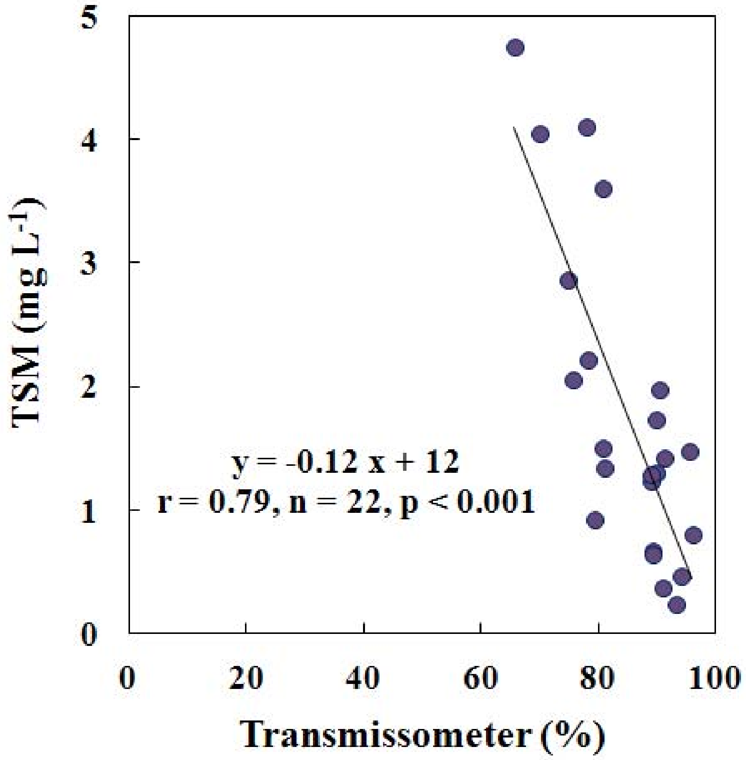
Key problems.

1. The authors presented both PP and vertical flux result in the ms, while they emphasize that the fluvial input is somewhat not obvious in the season and in these region. If this is the case, the vertical POC flux at the bottom of the euphotic layer is a novel result, noting that there is already a published work in the same region (e.g., Iseki et al., 2003). Although Iseki et al's work is mentioned in this ms, the vertical POC flux is not compared and discussed in the whole ms. It is likely that the Iseki et al's result is quite different from the authors' result. It does not make sense that 10 years later, the vertical flux changes such a lot. The authors should carefully explain the reason. Otherwise, this indicates that there is something wrong either in the former work, or in this presented study.

Answer: The POC flux data of Iseki et al. (2003) have been extensively compared and discussed in the revised version. See the following description about the results of Iseki et al. (2003). Iseki et al. (2003) reported that seasonal POC fluxes (100-3000 mgC $m^{-2}d^{-1}$) in the inner shelf (e.g. station PN 12, marked in Figure 1) of the ECS with highest value occurring in the bottom turbid layer in winter (Feb. to March) and fall (Oct.), and lowest value in spring. Iseki et al. (2003) did not have summer POC flux data in the inner shelf of the ECS. However, Iseki et al. (2003) found that high POC fluxes (~50-~4000 mgC $m^{-2}d^{-1}$), appearing the bottom turbid layer in the middle (e.g. station PN8, marked in Figure 1) shelf of the ECS with the highest POC flux in summer (August). In the outer shelf (e.g. station PN5, Figure 1), the POC flux ranged from ~30 to ~1100 mgC $m^{-2}d^{-1}$ with the highest value in winter and fall (Iseki et al., 2003). In comparison, the uncorrected POC flux in the middle shelf in summer is much lower than that of reported value by Iseki et al. (2003). However, the uncorrected POC flux in the outer shelf in summer is similar to the reported value by Iseki et al. (2003). Moreover, we have used rare earth elements to distinguish suspended particles and sediments based on their levels (see the comment #7). Finally, we also address possible difference between our results and reported values of Iseki et al (2003) in the discussion.

2. there seems to be problems in the original data set. As indicated by fig. 2 and fig.3, I highly doubt about the original data quality. According to fig. 2, POC at station 19 is_450 ug/L, whereas at station 26 the POC is only _50ug/L. But the TSM in these two stations are almost the same, as indicated by fig. 3. If this is the case, POC% at station 19 would be something like 22%. So far as I know, this is not possible and there should be something wrong. The data quality is essential, as flux result is highly depending on POC and TSM concentration.

Answer: We have re-checked the TSM data and found some of TSM data in the outer shelf water (e.g. stations 26 and 10) may contain some sea-salts and other TSM data in the inner and middle shelves should be OK due to high concentrations of TSM. Because most of filters have been used, we used a relationship between TSM and TM(%) (see figure below) to estimate TSM values in outer shelf water. As a result, the data of TSM values in outer shelf water were derived from the inferred TM (%)-based value.



Regarding to OC% (~20 %) in suspended particles at station 19, it should be reasonable due to its high Chl-a (> 5 ug L^{-1}). For example, Iseki et al. (2003) reported that OC content (%) in some sinking particles even higher than 20% in the ECS (see figure below).

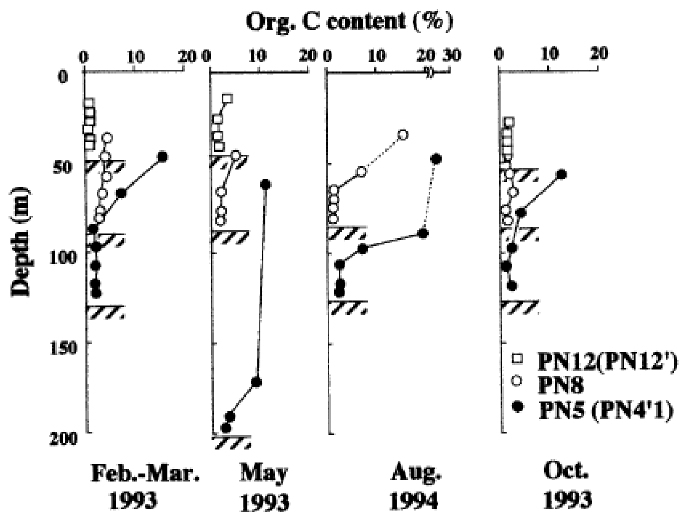


Fig. 3. Seasonality in organic carbon, inorganic carbon and biogenic silicon contents (%) of settling particulate matter on the shelf stations (Stn. PN5 (or 4′-1), 8, and 12 (or 12′)) in the East China Sea.

3. Sediment OC%. The authors seems also measured sediment OC in this ms. According to the resuspension calculation equation, sediment OC% is a key parameters in this study and the calculated resuspension contribution to POC flux is highly depending on the sediment OC content. Firstly, I failed to find the method description in MATERIALS AND METHODS so I have no idea how they obtain and measure the sediment OC%. The key problem here is sediment grain size and sediment OC% variation from station to station. The authors investigate almost the whole East China Sea, so they actually covered a complex surface sediment grain size, ranging from over 64 um (sand) to less than 4 um (clay). OC content (OC%) is highly depending on the sediment grain size and hence the whole study area would have a notable variation in sediment OC%. If I was doing this calculation, I would do the resuspension contribution calculation with the exact sediment OC% data at that station. I would say it is not persuasive, or wrong, to do the calculation with a uniform OC% parameters for all the stations without considering the differences of sediment OC% from station to station.

Answer: The method of measurement of OC in the surface sediment was added in the Materials and Methods section. We agree with reviewer's suggestion that we do the resuspension-concentration calculation with the exact sediment OC% data at that station rather than with the average value. In addition, we also re-measured OC contents in the surface samples again and found most OC contents were similar to previous data (in early version) except for stations S10, S19 and S26 which could be due to non-homogeneous distribution of sediments at those stations (detailed data are shown below).

Table 2. Organic content (OC) in the surface sediments in the ECS.

Water mass	Station	Cs^1	Cs^2	Cs^3	Cs^4
		(%)	(OC in surface sediment)		
CDW	S18	1.8	0.19%	0.67%	0.54±0.03%
CDW	S19	1.8	0.66%	0.19%	0.42±0.20%
SMW	S28	1.8	0.38%	0.29%	0.25±0.03%
CDW	S29	1.8	0.27%	0.28%	0.22±0.02%
CUW	S5	1.7	0.45%	0.88%	0.49±0.03%
KW	S10	1.3	0.29%	0.42%	0.24±0.06%
KW	S26	1.3	0.28%	0.23%	0.20±0.09%

C_s is the OC concentration of surface sediment (%).

1. model estimated values, 2.Sheu *et al.* (1995), 3. Kao et al. (2003).

4.this study (average±1std, n=4)

Table 3. Statistical data of linear regressions of POC values versus the reciprocal of total suspended matter concentrations in the East China Sea.The unit of C_s and C_0 is %. C_0 (max) and C_0 (min) represent the minimum and maximum derived POC concentrations of phytoplankton.

Water mass	Station	Slope	C_S	C_0	C_0 (max)	C_0 (min)
		$S_0(C_0\text{-}C_S)$	(%)	(S_0=0.5)	(S_0=0.25)	(S_0=0.75)
CDW	S18	13.9	0.54	28.3	56.1	19.1
CDW	S19	13.9	0.42	27.9	55.7	18.7
SMW	S28	13.9	0.25	28.0	55.8	18.8
CDW	S29	13.9	0.22	28.0	55.8	18.7
CUW	S5	8.5	0.49	13.3	26.1	9.0
KW	S10	4.9	0.24	10.0	19.8	6.7
KW	S26	4.9	0.20	9.9	19.7	6.6

S_o is the total weight of surface phytoplankton (mg L^{-1}).
C_o is the POC concentration of phytoplankton (%).
C_s is the OC concentration of surface sediment (%).

4. negative values. Why the result for KW is negative (p4282, line 22). The authors should explain this in much more details quantitatively. Is it because this model is not applicable to this region or to this data?

Answer: We have re-checked the TSM and POC data and found that a few TSM data in the outer shelf indeed contain some sea-salts based on the measured sodium concentrations in suspended particles. In addition, we also found some data copied mistake for some of POC data were copied from original spreadsheet for making relationship between POC and 1/TSM. We have revised all of them and the results are more reasonable (without negative number appearing) now.

5. Pore size. POC, TSM and Chla in this ms is collected by GFF, but suspended particles in sediment traps seems to be collected by quartz filters (p4275, line 2). Is the pore size the same? The pore size introduction is missing. If this was not the same, there would then be a pore size problem in the POC flux calculation.

Answer: The nominal pore size of filters (GF/F filter) for the determination of POC, TSM and Chl-a is 0.7 um, while the nominal pore size of filters for the determination of sinking particles is 1.0 um (QMA filter). The difference in the retention efficiency between these two types of filters should be minimal because others have shown that filters with even larger differences in nominal pore size retain similar fractions of the phytoplankton (Venrick et al., 1987). Moreover, the dominant phytoplankton species in the study area (inner shelf and midshelf) are larger phytoplankton, such as *Skeletonema costatum, Thalassiosira* spp., *Thalassionema nitzschiodies,* and *Trichodesmium* spp. (Chen 1995), which should be retained effectively by both kinds of filters. As mentioned by the reviewer, more water should be usually filtered to minimize the pore size problem. Regarding the POC flux filter (1.0 um QMA filter), sinking particles in the collection tubing of sediment traps are like a concentrated soup with high density particles which are difficult to filter because particles are easily to be clogged. So, small particles (<1 um) would not significantly affect the POC flux calculation in this study.

6. the chla data. Chla seems not to be a key parameters in POC flux calculation. But this also affects the reader's confidence about the authors data quality and the way they carry out research, and hence the Journal quality. First problem is the collection. It seems that only 500 ml water is used for chla determination. It may be OK in the high chla region, but how about in the estuary and oligotrophic offshore? Secondly, did they do the filtration under mild vacuum? Was it performed in dim light? There data quality control seems to be missing. Third, I have no idea whether MgCO3 should be used or not here. In this presented study, it seems not being used. Fourth, in the Kuroshio region, majority of chla is contributed by pico-phytoplankton, the size of which is usually less than 0.7 (the authors' GFF). In this case, usually more water should be filtered to minimize the problem. What's worse, as GFF pore size 0.7 um is statistical result (i.e., the average pore size of the whole filtration procedure, probably from large particle size in the beginning to small particle size in the end), so if only 500 ml is filtered, the real status for the filtration on board is then more likely that they only obtained particles with size probably larger than 0.7 um.
Answer: Chlorophyll *a* (Chl *a*) concentration was determined by the method of Strickland and Parsons (1972) with minor modifications by Gong et al. (1993). We have checked the chlorophyll method in our notebook and found that we filtered 1180 ml for chlorophyll at stations 4,5,6,19, 19A,20, 21, 29, 30, and 2030 ml for other stations using 25 mm GF/F filter under low pressure, approximately <100 mm Hg (~1.9 psi). After filtration, the filter was stored immediately at 20 ^{o}C and returned to the laboratory for further processing. In the laboratory, the filters were ground in and extracted with 10 ml of 90% acetone at 4 ^{o}C for 2 h under low light conditions. Then, the mixture was centrifuged for 10 min at 3,000 rpm. The concentration of Chl *a* in the supernatant liquid was measured fluorimetrically with a Turner model 10-AU-005 fluorometer. The precision in the determination of Chl *a* was 6~8% at 0.1 ug L^{-1}. Based on above description, we did not use MgCO3 in our method. The filter

volume (2030 ml) to should be enough to catch small phytoplankton in the outer shelf area.

7. section writing. Although has been suggested by the editor, this version I get still seems to have the problem of "mix the result and discussion". For example, p 4277 line 0-10, and p 4278 line 14-15, these two parts seems to be discussion, not result. I would suggest the authors check this problem again thoroughly.
Answer: The two parts (P4277 and P4278) have been moved to the discussion in the revised manuscript.

Minor problems and suggestions. 1. Physical background names. In figure 1, the authors give several names (abb.): YSW, CUW, KW, CDW, TCWW: : : Besides the commonly accepted TCWW, KW and CDW, what is the reference for YSW and CUW?
For example, why there is Yellow Sea water (YSW) in the East China Sea? As for the CUW, the authors surface temperature distribution patterns seems not supporting that this region is an upwelling region in this study.
Answer: The definition of water types in Figure 1 was based on the T-S characteristics and the classification delineated by Gong et al. (1996). The detailed description of these water types were published in Chou et al. (2009). Surface waters were grouped into seven categories: (1) KW, (2) TCWW, (3) CDW, (4) YSW, (5) CUW, (6) mixing water of
TCWWand YSW (TCWW+YSW), and (7) mixing water of CDW and CUW (CDW+CUW). The temperature and salinity variations in these various water types are listed in Table 2, and the distribution of various water types during the study period are shown in Figure 1 in this paper. KW primarily occurred in the southeast corner, TCWW was present mainly in the midshelf of the ECS, CDW was confined mainly to the northwest corner, YSW occurred in the northeast, CUW was present along the coast of mainland China beyond the influence of CDW, and south of the YSW area the surface waters of the midshelf were TCWW + YSW (stations 15, 16, 27, and 28). The CDW+CUW water type (station 30) occurred at the boundary between CDW and CUW. This distribution of water types is generally consistent with the known summer circulation pattern in the ECS (Figure 1) [Lee and Chao, 2003].

Table 2. Temperature and Salinity Variations in the Various Water Types in This Study

Water Type[a]	Temperature T (°C)	Salinity S[b] (psu)
KW	28.2 < T < 29.8	34.0 < S < 34.5
TCWW	26.6 < T < 29.2	33.2 < S < 34.2
CDW	23.2 < T < 25.4	27.0 < S < 31.0
YSW	23.8 < T < 26.2	32.2 < S < 33.2
CUW	24.4 < T < 25.8	33.5 < S < 34.5
TCWW+YSW	26.9 < T < 27.9	32.4 < S < 33.6

[a]KW, Kuroshio Water; TCWW, Taiwan Current Warm Water; CDW, Changjiang Diluted Water; YSW, Yellow Sea Water; CUW, Coastal Upwelling Water; TCWW + YSW, mixed TCWW and YSW.
[b]Here psu indicates practical salinity units.

(Table 2, from Chou et al., 2009a)

Chou, W.-C., Gong, G.-C., Sheu, D.-D., Hung, C.-C., and Tseng, T.-F.: The surface distributions of carbon chemistry parameters in the East China Sea in summer 2007, J. Geophys. Res., 10 114, C07026, doi:10.1029/2008JC005128, 2009a.

2. Another small problem is the term.

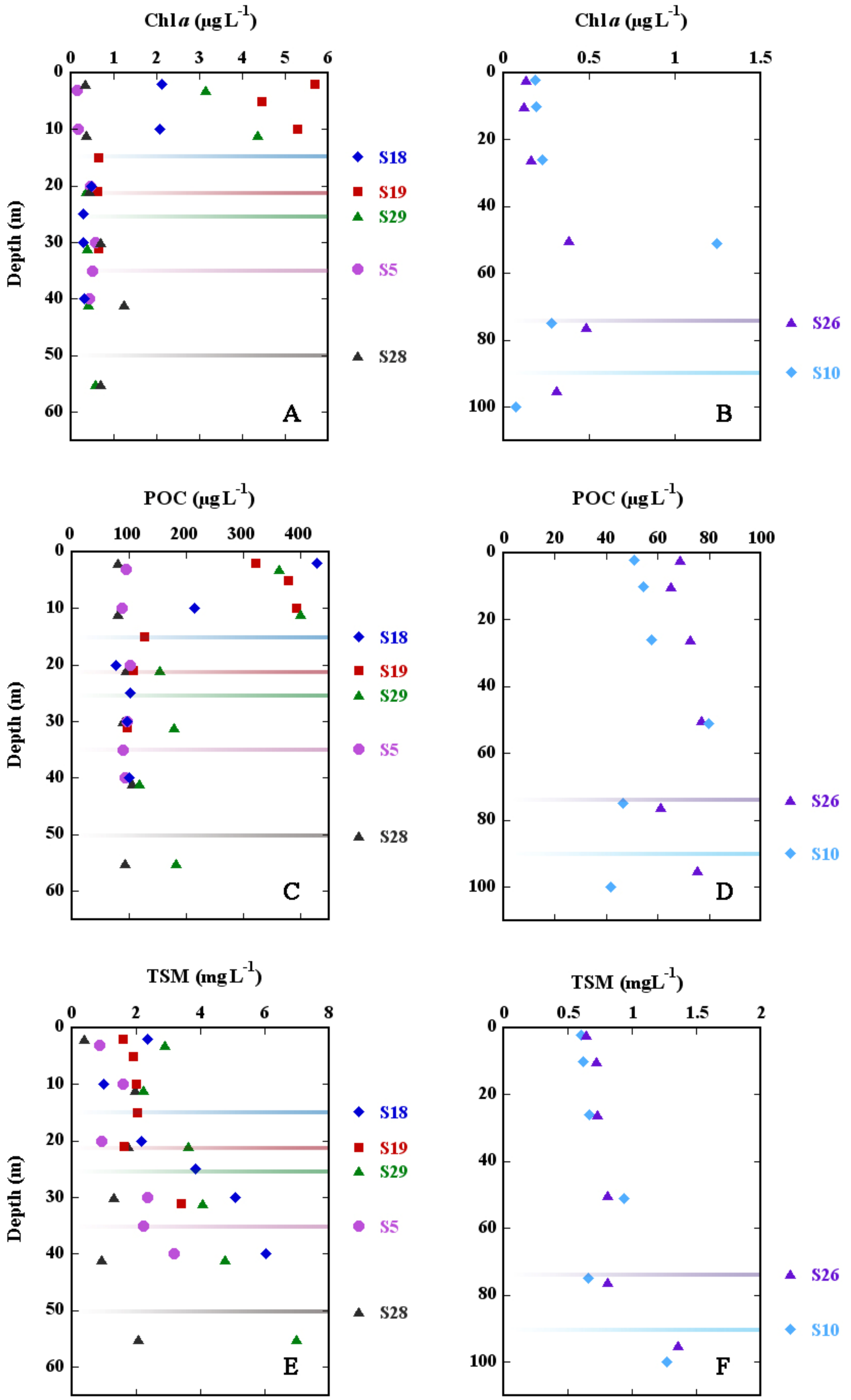
The authors widely use "POC in sediment". I would suggest they use "OC in sediment" or "OC content in sediment" or "OC% in sediment" instead.

Answer: OK, POC in sediment has been changed to OC content in sediment.

3. fig 3: it would be better if the euphotic layer depth is indicated in this figure.

Answer: the euphotic zone depth is indicated in the figure 3 (see figure below).

Fig. 3 Distributions of vertical Chl *a*, POC concentrations and total suspended matter (TSM) concentrations in the inner shelf (S18, S19, S29, S5, and S28) and the outer shelf (S10 and S26) of the East China Sea. The different color lines indicate the depths of the euphotic zone at stations (S18, S19, S29, S5, S28, S26 and S10).



4.the title: I would suggest the authors use only the word “flux”, but not “behavior”.

Smaller title sometimes helps.

Answer: The title has been changed to "Fluxes of Particulate Organic Carbon in the East China Sea in Summer."

5.the equations. The term 1/TSM and 1/S sometimes seems to be the same. It does not make sense to use different terms within one ms. I would say it is be better if we choose one and use it uniformly in the whole ms.

Answer: OK, 1/TSM has been used in the whole ms.

6. table 2: grain size data (e.g., D50) needed.

Answer: Unfortunately, the grain size data are not available in this study. Instead, we have cited the characteristics of surface sediments in the middle and outer shelves in the discussion reported by Lin et al. (2003).

7. if you have overcome the key problem2 above and prove that there is no problem in data quality, then to make the whole work more beautiful, I would suggest you also do the TSM calculation like you did to POC, which makes the ms more significant in science.

Answer: Some questionable TSM data in the outer shelf have been revised using a relationship between TSM and TM(%) in the revised ms. In addition, we used the Eu anomaly (Eu/Eu*) (Eu*: was estimated by linear interpolation between Sm and Tb on the chondrite-normalized curve) to identify possible two end members (suspended particles and sediments) that contribute to sinking particles in this study. For example, the (Eu /Eu*) anomaly on the sediment and suspended particles off the Yangtze River (Changjiang) mouth (near station 19) were 0.48 and 0.67, respectively. The value of Eu/Eu* in the sinking particles at station 19 were 0.62. If a two end-member mixing model is used to estimate the contribution of suspended and sediment on sinking particles, the fractions of suspended particles and sediment will account for 74 % and 26% of sinking particles, respectively. The result suggests that R/T (0.26) is significantly lower than the estimated value (R/T =0.93) by using TSM-OC mixing model. This approach may not truly reflect resuspension value in this study because the Eu anomaly value should be from this study rather than from an estimated value 10 year ago (Yang et al., 2003). Moreover, particularly in shallow areas the dynamics of sediment settling and resuspension can be highly dependent on the seasonal and interannual changes of Changjiang discharge which may affect the Eu anomaly value. Furthermore, we should provide Eu values in both suspended particles and sediments, while the rare earth elements in this study were not available due to the fact that we were using GF/F. Overall, the fractions of REE are a potential approach to evaluate the possible contribution of suspended and resuspended particles in marginal seas where a large river empties into it.

Table 6 Concentrations of light rare earth elements in the sinking particles, sediment and suspended matter (SPM) in the East China Sea.

Station	La	Ce	Pr	Nd	Sm	Eu	Gd
	(μg g^{-1})	(μg g^{-1})	(μg g^{-1})	(μg g^{-1})	(μg g^{-1})	(μg g^{-1})	(μg g^{-1})
S18	40.87	72.44	6.77	35.18	5.37	1.11	5.61
S19	44.29	78.94	7.86	40.40	6.25	1.23	6.18
S28	4.17	4.86	0.24	0.46	ND	ND	ND
S29	17.92	31.27	2.85	14.44	1.63	0.44	1.47
S5	42.80	78.76	7.15	37.01	5.09	1.06	5.21
S10	11.04	21.99	1.84	9.84	1.20	0.31	0.98
S26	23.88	43.20	4.19	21.64	3.27	0.65	3.22
Sediment*	43.00	86.00	ND	44.00	6.00	0.89	ND
SPM*	44.00	85.00	ND	40.00	6.00	1.31	ND

*: the data of sediment and SPM were from the river mouth (near station 19) of Yangtze River in Yang et al. (2002).
ND: no data.

literature cited: Iseki, K., Okamura, K. and Kiyomoto, Y., 2003. Seasonality and composition
of downward particulate fluxes at the continental shelf and Okinawa Trough in the East China Sea. Deep-Sea Research. Part II, 50: 457-473.