



Interactive comment on “Seasonal cycling of phosphorus in the southern bight of the North Sea” by C. van der Zee and L. Chou

Anonymous Referee #3

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van der Zee and Chou present a data-set of inorganic and organic nutrients with a good temporal and spatial coverage in the Belgian coastal zone (BCZ). The manuscript is well written, well structured and well documented. My comments are only minor in nature.

P683 L2-5 : referencing to the work by Smith et al. (2003) would be relevant.

P683 L21 : define TN and TP

P684 L4-6 : express annual loads in mol and not kt

P684 L18 : define DIN

P684 L22-25 : these two sentences are very similar to the last sentence of the paragraph.

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P685 L6-7 : Lacroix et al. (2004) report that the low salinity plume off the BCZ is exclusively due to the input of freshwater from the Rhine with little or no influence from the Scheldt. The authors could shed some light into this matter: DOC at zero salinity is two times higher in the Scheldt than in the Rhine. The authors could attempt to use their (wintertime) DOC data as a water mass tracer in the BCZ (since this is to my best knowledge the first comprehensive study of spatial and temporal variability of DOC in the BCZ).

P685 L20 : part of the sentence ("immediately put (. . .) aluminium foil and") is unnecessary

P686 L4-5 : provide information on the "Certified reference materials"

P687 L21 - P688 L6 : it would be interesting to show the DOC data in figure 2

P687 L21 - P688 L6 : I do not understand the units of POC in figure 2 (mg/g); mg/l is the preferred unit for POC

P687 L21 - P688 L6 : The discussion on re-suspension of sediments can be argued convincingly using the ratios POC:SPM and POC:Chla. POC:SPM decreases and POC:Chla increases with re-suspension of sediments; if POC is dominated by phytoplankton then POC:SPM increases and POC:Chla decreases. This comment also applies to P691 L5-7

P688 L18 : "Nitrate plus nitrite (hereafter referred to as nitrate)" should be in the first sentence of the paragraph and not the second one.

P690 L22-24 : the lack of spatial trend in DOP could also suggest rapid removal of this compound in the salinity range < 32 (Figure 5). It does not necessarily mean that DOP is produced in the BCZ. Are DON and DOP versus salinity trends similar ?

P690 L25 : "timing" would be more appropriate than "intensity"

P691 L21-24 : the time lag of the onset of the bloom as suggested by nutrient con-

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centrations is most probably related to light-limitation (and spatial trends of SPM); note that this is consistent with oxygen, pCO₂ and chlorophyll spatial and temporal patterns described by Borges and Frankignoulle (2002) in the BCZ.

P692 L1 : update reference

P692 L5-6 : the authors argue different N and P loads due to variations in discharge based on 2 publications in Scottish rivers. It seems unlikely that the conclusions based on observations in Scottish rivers can be applied to highly polluted estuaries such as the Rhine and Scheldt. Variations of N and P loads due to discharge can easily be checked in the case of the Scheldt from the large data-sets in the upper freshwater reaches of this estuary and its tributaries (van der Zee and Chou 2004). Monitoring data in both Scheldt and Rhine are also available from various data-bases.

P693 L9-11 : this statement is fairly obvious since the start of the bloom is set by favourable light conditions.

P693 L16-19 : The discussion on nutrient limitation (based on Si:N and Si:P) only applies to diatoms. In May (some of the lines in Table 2), the phytoplankton biomass and net primary production is dominated by *Phaeocystis* sp. (e.g. Gypens et al. 2004).

Table 1 : units of latitude and longitude are incomplete (same for P684 L9).

Table 1 : It seems unlikely that the authors sampled on 9 December 2004, unless something to do with travelling in time is missing from the material and methods section. Please check all dates since they are inconsistent with those in Figure 5.

Refs: Borges, A.V. and M. Frankignoulle, Distribution and air-water exchange of carbon dioxide in the Scheldt plume off the Belgian coast, *Biogeochemistry*, 59, 41-67, 2002.

Gypens, N., C. Lancelot, and A. V. Borges, Carbon dynamics and CO₂ air-sea exchanges in the eutrophicated coastal waters of the Southern Bight of the North Sea: a modelling study, *Biogeosciences Discussions*, 1, 589 2004.

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Lacroix, G., K. Ruddick, J. Ozer, and C. Lancelot, Modelling the impact of the Scheldt and Rhine/Meuse plumes on the salinity distribution in Belgian waters (southern North Sea), *Journal of Sea Research*, 52, 149-163, 2004.

Smith, S.V. et al., Humans, hydrology, and the distribution of inorganic nutrient loading to the ocean, *BioScience*, 53, 235-245, 2003.

van der Zee, C.; Chou, L. Phosphorus speciation in the Scheldt estuary and the Belgian coastal zone (Poster), EGU04-A-06119, European Geosciences Union, 1st General Assembly, Nice, France, 25 - 30 April 2004.

Interactive comment on *Biogeosciences Discussions*, 1, 681, 2004.

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