Answer for referee 1:

Thank you very much for this constructive review.

MAJORS COMMENTS:

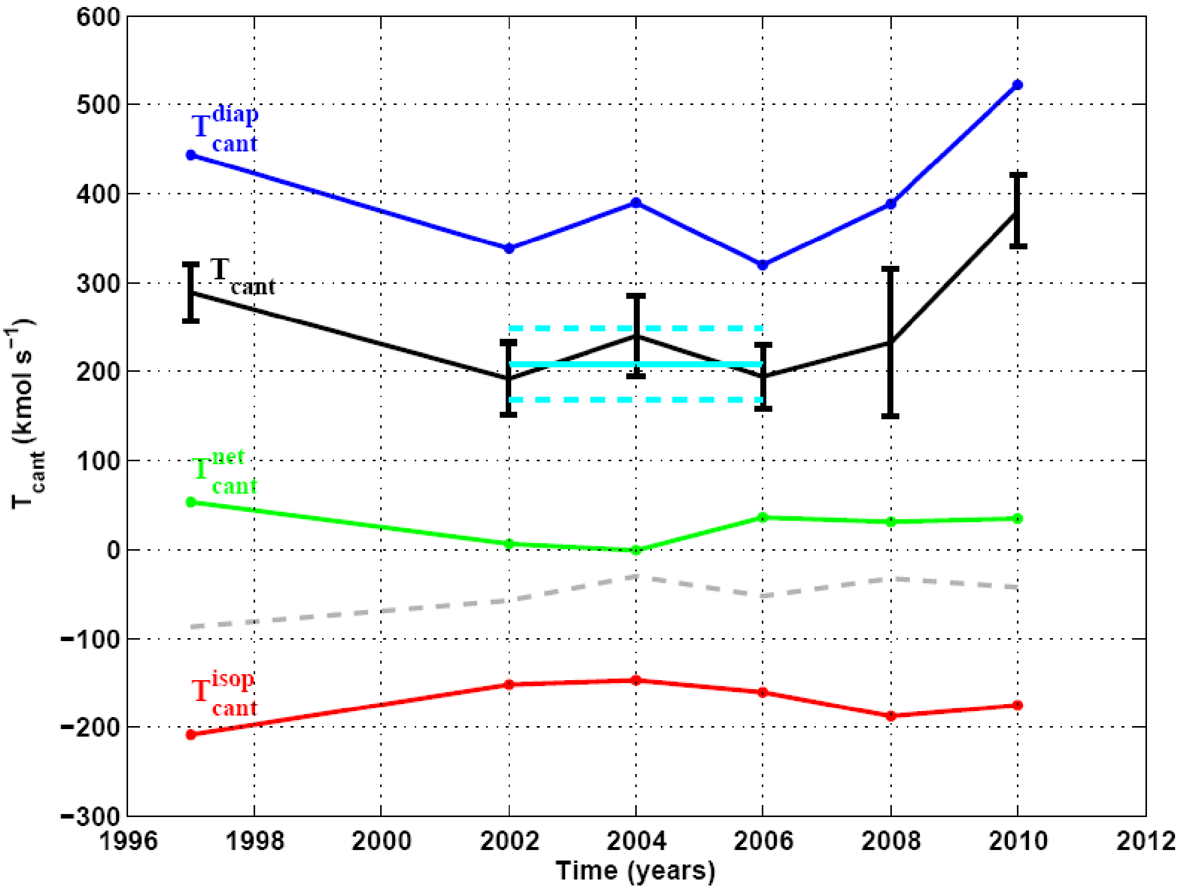
1. In doing calculation similar to that made in this study, Ekman transport is also examined. How do you evaluate the term in the calculation?

The Ekman transport has been computed separately from wind stress data averaged over the months of the cruise (see Mercier et al., 2013) and equally distributed in the first 30 m. After that, it has been added to the absolute geostrophic velocity across the OVIDE section and analyzed together with. This transport causes a southward transport of Cant (see table 1). We have not given details of this component in the first version of the manuscript because its contribution is dispatched between the other 3 components of the circulation. Even thought, we appreciate the commentary of the referee and we have added this information to the new figure 3 and a new paragraph has been introduced in the revised manuscript, at the end of section 4.2. The paragraph is:

"The Ekman transport has been estimated separately from wind stress data averaged over the months of the cruises (see Mercier et al., 2013) and equally distributed in the first 30 m. After that, it has been added to the absolute geostrophic velocity across the section and analyzed together with. It has not been considered as the fourth element of the circulation because it is dispatched between the diapycnal, isopycnal and net transport. Nevertheless, it is worth mentioning that the Ekman transport causes a southward transport of Cant (see dashed grey line in figure 3), which mean value is –50 ± 8 kmol/s and the standard deviation is 21 kmol/s. "

Table 1. Transport of Cant due to the Ekman transport:

cruise	1997	2002	2004	2006	2008	2010
Transport of Cant due to the Ekman Transport (kmol/s)	-87	-57	-31	-52	-33	-43



new Figure 3. T_{cant} (black) and its components (blue, red and green) across the OVIDE section as a function of time. The dashed grey line is the transport of Cant due to the Ekman transport, this component is dispatched between the 3 other components. The cyan lines are the mean value (2002-2006) and error bars of T_{cant} representative of the mid-2000s.

2. Errors of Cant should be relatively large compared to those in the upper layers. But in the inversion calculation, the same weight seems to be taken in a water column. Does the calculation leads to proper results?

Errors on Cant values arise due to both errors in the measurements and approximations in the estimation methods. Our estimation of this error shows that it does not significantly vary with depth. We believe that in your comment you were referring to the error/signal ratio, which varies with depth but is not relevant for our computation (see Perez et al. 2013).

3.In Fig. 3, Tcant shows temporal variations, which seem to me, should be judged to be almost constant between 1997 and 2008, from the error bars. Only the value in 2010 is larger than the rest. The authors take the changes of Tcant as variability, i.e., signal,

but is it really so? This question arises because the inversion calculation presents rather different results by a slight change of calculation conditions.

First, note that we have discovered a small mistake in the plotting of the 1997 error bar that was anomalously small as reported in old Figure 3. We have corrected this error in the revised manuscript and it is now consistent with Pérez et al. (2013). The larger error bar in 2008 is due to lower quality of the ADCP data used to estimate the absolute geostrophic velocity field. The referee is right, the results of T_{cant} showed in the old figure 3 from 2002 to 2008 overlap when error bars are considered. This is why in our work we focus on two main signals. The first, the decrease in T_{cant} between 1997 and mid-2000s according to Pérez et al (2013). In our new figure 3, the mean value of T_{cant} from 2002-2006 is displayed in cyan, now, we can easily appreciate the decrease of T_{cant} between 1997 and mid 2000s. The second signal is the increase between the mid 2000's and the end of the decade. The 1997-mid 2000's decrease was due to the slow-down of the Meridional Overturning Circulation between 1997 and mid-2000s and the T_{cant} increase at the end of the 2000's was due, mainly, to the increase in Cant concentration in the waters. Both signals are significant when considering the mean T_{cant} for the mid 2000's that is now plotted in the new Figure 3.

Therefore, when we talk about statistically significant variability at interannual to decadal time scale we are referring to the initial decrease of T_{cant} followed by the increase at the end of the 2000s decade. It has been explicitly written in the revised manuscript at the beginning of section 4.1:

"The evolution of T_{cant} between 1997 and 2010 (black line in figure 3) presents an interannual variability, with a decrease from 1997 to the mid-2000s (see the mean value 2002-2006 displayed in cyan in Fig. 3) and a recovery hereafter."

And in the discussion section: *"No significant long term changes have been identified during this period, due to the clear decrease between 1997 and mid 2000s (cyan values in figure 3) and the recover hereafter. We have observed that the initial decrease was due to the slow-down of the MOC_σ and that the increase that follows was mainly due to the increase in the Cant concentration in the ocean waters."*

MINOR COMMENTS:

1. Abstract, lines 3-5; for six times, FOUREC 1997 is lacking.

Ok, we have introduced FOUREX in the abstract.

2. Abstract, line 26; not "TCant increase" but "TCant trend"?

We agree, it is T_{cant} trend as the referee proposes.

3. Page 16104, lines 25 to bottom; the observation-based estimations also include large errors in the calculations. Thus for not only models but observation-based estimations also, improvements are necessary. By the way, the observation-based estimations use so-called "inversion" calculation. So I think "ocean inversion" in Table 1 is not appropriate, causing a little bit confusion.

On the one hand we agree with the referee that the observation-based estimations also include large errors in the calculations, therefore, we have changed the two first sentences in page 16104 line 25 to bottom by:

"Comparing the observation-based T_{cant} and T_{cant} estimated by ocean (model) inversions or by biogeochemical models, the observation-based estimations are in general larger than the others (see table 1), but all of them present large errors. It evidences that further improvements are necessary to provide more realistic T_{cant} estimations."

On the other hand we also agree that the observation-based estimations are also ocean inversion, so, in order to do the difference we have changed in the revised manuscript "ocean inversion" by "ocean (model) inversion".

4. Page 16105, line 23; according to impression of reading Pérez et al. (2013), not "on the TCant variability" but "on anthropogenic CO2 storage".

Right, they studied the variability in both the transport of Cant and Cant storage rate. We have added the latter in the manuscript.

5. Page 16107, line 24; in Fig. 2, Cant of AABW shows 5-10 μmol kg-1. Close to 0 μmol kg-1?

We agree. We have changed "*presents a concentration in Cant close to 0 μmol/kg*" by "*presents the lowest concentration in Cant of the whole section*".

6. Page 16109, line 12; "the same way than", "the same way as".

Ok, changed.

7. Page 16110, line 8; "the latter", "Tisop Cant?"

Yes, the latter=Tisop Cant, but because a suggestion of the other referee, it does not appear in the new version of the manuscript.

8. Page 16110, line 9, "same methodology than Alvarez et al. (2003)", "same methodology as in Alvarez et al. (2003)".

Ok, changed.

9. Page 16111, line 26; "section average", "horizontal average".

Yes, in this case it would be the horizontal average. Anyway, the formulation has been lightly changed because referee 2 has proposed another way to estimate the different components of the transport. This new formulation is mathematically the same as before. We have decided to change the formulation because the new one does not change the conclusions of our work and it allows an easier interpretation and comprehension of the results.

10. Page 16113, line 15; "section-average", "horizontal average"?

No, in this case it is referring to the section average value, a number subtracted to each value in order to obtain anomalies.

11. Page 16114, line 1; "a similar intensity than", "similar intensity to".

Right, changed.

12. Page 16114, line 8; "two different elements", "three different elements".

Totally agree. We have identified three different elements of the circulation.

13. Page 16114, line 22; before giving a definition, the MOC index appears here.

14. Page 16115, lines 13-14; what is the difference the upper and lower limbs of MOCsigma and those of MOC?

Concerning comments 13 and 14; We used MOC to refer to the Meridional Overtuning Circulation computed in density (σ_1) coordinates. In order to avoid ambiguities, we now use the acronym MOC_σ to refer to the Meridional Overturning Circulation computed in density coordinate and MOC has been changed to MOC_σ in the revised manuscript. When referring to the Meridional Overturning Circulation computed in pressure coordinates as in section 3, we have written explicitly Meridional Overturning Circulation.

15. Page 16115, line 14; "MOC_ is the intensity of the MOC", how is the intensity decided? The maximum of transport stream function as made by Mercier et al. (2013)?

Yes, MOC_σ is defined as the maximum of the transport streamfunction computed in density coordinates as defined by Mercier et al. (2013). In the revised manuscript, this is better explained in the first paragraph of section 4.3.2.

16. Page 16116, line 2; does MOC included in the estimator have isopycnal contribution?

No, there is not isopycnal contribution in the MOC_σ included in the estimator (by definition). We think that you were confused because of the use of the acronym MOC to refer to the Meriodional Overturning Circulation computed in density coordinate. This question is now clarified by using MOC_σ as an acronym.

17. Page 16116, line 5; "the latter", "Tisop Cant"

No, in this case the latter is referring to $T_{cant_}$diap. In order to be clearer, we have changed this 'the latter' by $T_{cant_}$diap in the new version of the manuscript.

18. Page 16116, line 20; TCant not TCant?

We understand that the referee wants to say $T_{Cant}°$, instead of T_{Cant}. We have changed it in the new version of the manuscript.

19. Page 16117, line 4; "decreased at a rate of "-0.68 ± 0.65", "decreased at a rate of 0.68 ± 0.65"?

OK, sign removed.

20. Page 16117, line 5; for the sign of "-", the same question as in no. 19.

OK, sign removed.

21. Page 16117, line 15; for the sign of "-", the same question as in no. 19.

OK, sign removed