We would like to thank the anonymous referee 2# for the constructive comments on our manuscript Paper. Those comments are all valuable and very helpful for revising and improving our paper. Please find our response to these comments below.

Referee 2#:
H. Zheng et al. present in their manuscript 'A global carbon assimilation system based on a dual optimisation method' an inversion of 8 years of atmospheric CO2 data to estimate terrestrial and oceanic CO2 fluxes. The authors use what they call a 'dual optimisation' method to solve for scaling factors of terrestrial oceanic flux patterns based on prior fluxes obtained from the terrestrial ecosystem model BEPS and CarbonTracker output in the case of the ocean. These scaling factors are differentiated by BEPS plant functional types and latitudinal zones. In addition, the authors also solve for the fluxes directly, that represents the dual optimisation method. The manuscript is not very clear in its methodology description. Therefore it is unclear if the flux is solved for globally or per gridcell on a 1x1 degree resolution.

Response: Thank you for this comment as it indeed helps us to improve the methodology description in our paper. In fact, the flux in the application is solved for grid cells on a 1x1 degree resolution which includes 64800 (180*360) elements at each week. For the application to 1x1 degree flux estimation, the length of the flux we solved in Eq. (11) is actually 388 800 (64800*6) at a 6-week-window, and the estimate of the earliest week in the window is left as the optimized fluxes of its corresponding time (See Sec 2.2 about the time-stepping). We will add the description on the dimension of fluxes and parameters aimed to estimate in Sec 2 (Methodology) and corresponding part in Sec 3.1 (Ecological model) in the revised paper.

Referee 2#:
Besides this unclearity there is a major problem with the set-up of this inversion system. The authors write that they use optimised ocean fluxes from CarbonTracker as their prior ocean fluxes (p14284, ll 26/27). Since the optimised CarbonTracker ocean flux has been derived from essentially the same atmospheric CO2 observations as used in this study for the inversion, the prior ocean flux is then of course not independent form the CO2 concentration used in this study constituting a double usage of the observational data. This has to be fixed before one can analyse and draw any conclusions from the results.

Response: Thank you for this comment. We agree that the usage of optimized ocean fluxes from CarbonTracker in our system could result in a reuse of observational information. We were also conscious of this issue when doing this application, and we can still offer some explanations of this problem. Firstly, we used 312 sites from the GLOBALVIEW2010 data set in our assimilation system while CarbonTracker only used about 100 sites (available from http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/CT2010/documentation_obs.html#ct_doc). So nearly two thirds of observational data is independent from the ocean fluxes we use as an input. Secondly, we made a test on a 2.8×2.8 degree grid cell by using the ocean fluxes computed from OPA-PISCES-T model (a state-of-the-art combined global ocean circulation (OPA) and biogeochemistry model (PISCES–T, Buitenhuis et al., 2006)) and the optimized CarbonTracker ocean flux as inputs respectively with all other things being equal. The opti-

mized ocean fluxes from these two inputs are close, so we use the CarbonTracker ocean flux as our prior ocean flux in this article to reduce the running time of the GCAS-DOM. Moreover, the oceanic fluxes before and after optimization are very similar and the optimized oceanic flux is more close to the results of CT2011_oi compared to the prior flux. It also indicates the rationality of the usage of the CarbonTracker ocean flux.

References:

Buitenhuis, E., Le Quéré, C., Aumont, O., Beaugrand, G., Bunker, A., Hirst, A., Ikeda, T., O'Brien, T., Piontkovski, S., and Straile, D.: Biogeochemical fluxes through mesozooplankton, Global Biogeochem. Cy., 20, GB2003, doi:10.1029/2005GB002511, 2006.