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Interactive comment on "Evaluating CaCO$_3$-cycle modules in coupled global biogeochemical ocean models" *by* W. Koeve et al.

Anonymous Referee #2

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This study aims to diagnose CaCO3 cycling from modeled or observed alkalinity distributions. It evaluates different methods that have been proposed and used before for this purpose. It concludes that the TA* method is superior and that other methods, such as the potential alkalinity (PALK) method are "disqualified" by the analysis. I think the evidence presented to support this assertion is insufficient and unconvincing. The authors arrive at their conclusion using incorrect assessments. E.g. on page 6123 lines 5-6 they state that "the salinity normalised TA0-anomaly should be constant everywhere." In other words, the author's expectation is that it should be constant. But I think it cannot reasonably be expected that the TA0 anomaly should be constant. Since TAˆ0 is be affected by CaCO3 and organic matter (OM) proudction it's surface distribu-

tion will be not equal to salinity and therefore one cannot expect its interior distrubution to be equal to salinity either.

This statement is followed by assessing the patterns of salinity normalized TA^0 as "spurious" (line 9). The assessment of PALK is similarly flawed (lines 19-21). Again, since surface distributions of PALK^0 will be different from salinity distributions due to production of $CaCO_3$ its interior distributions will also be different. So, it CANNOT be expected that PALK^0 displays a uniform distribution.

In fact I wonder if not the PALK part from dissolution and TA* are very similar. I suggest a simple analysis by calculating the PALK component resulting from dissolution only as PALK_dis = PALK – PALK^0. In Fig. 6 it would be the difference between panels c) and d). Plot this against TA*, e.g. as global average vertical profiles, or basin wide profiles or sections.

This is my mayor comment. Other than that I think the manuscript is well written and presents interesting and new material, which advances the understanding of ocean biogeochemistry by introducing and testing different analysis methods.

Minor comments are embedded directly into the manuscript.

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Interactive comment on Geosci. Model Dev. Discuss., 6, 6117, 2013.