

Interactive comment on “An ocean modelling and assimilation guide to using GOCE geoid products” by K. Haines et al.

Anonymous Referee #2

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Precise observations of the global gravity field by means of the currently operating satellite gravimetry missions GRACE and GOCE allow for the first time ever the derivation of the dynamic ocean topography (DOT) from space-based measurements alone with sufficient accuracy and spatial resolution to become useful in oceanographic applications. Given that re-processed GRACE gravity fields are still improving and the first GOCE products were only released a few months ago, a guide on how to derive and subsequently assimilate DOT estimates appears to be timely and highly beneficial, and therefore well placed in the journal Ocean Sciences.

The present version of paper is mainly divided into two parts: Sections 2 and 3 discuss strategies to calculate and evaluate DOT estimates which have been, however, only recently reviewed quite in detail (e.g., Hughes and Bingham, Ocean Sciences, 2008;

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Bingham, Haines and Hughes, J. *Atm. Ocean Tech.*, 2008). The authors should be more explicit on what justifies another review on this subject only two years later, or compress sections 2 and 3 merely into a recipe describing a state-of-the-art way to calculate a DOT.

The second part of the manuscript is devoted to describing the impact of assimilating DOT (and hence geoid information) into three different operational ocean modelling systems. This appears to be the central part of the paper. However, findings from sections 5.1 to 5.3 should be discussed more in-depth in view of advantages and potential weaknesses of the different approaches pursued in order to give general advice for future attempts to assimilate DOT estimates in alternative ocean models. Maybe such a discussion could also include the findings of section 5.4 which appears very much out-of-place in its current position.

There are a few minor issues which might be considered during a revision of this paper:

- Frequent references exist throughout the text to projects, programs and consortiums like, e.g., GOCINA, GOCINO and GUTS. Since these programmatic elements are not important to the scientific issues to be communicated by this paper, all funding-related references should be condensed into the acknowledgments.

- In addition to changes in sea surface height, the geoid over the oceans changes in time due to ocean mass redistributions (see e.g., Chambers, *JGR Oceans*, 2007). Although these variations are only of the order of a few mm in geoid height, they might be mentioned for completeness (p.1854 l.15).

- The terms space domain, real space and physical space appear to be used interchangeably. This should be unified throughout the whole text.

- Geoid covariance error information is already provided for selected GRACE gravity fields (e.g., ITG2010 from University of Bonn, Germany). Reference to these models and their error information should be made in section 3.3 in order to demonstrate how

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exactly these fields will be useful. Otherwise, paragraph 3.3 comprises rather proclamations and should be removed from the paper (p. 1861 l.20).

- Brief references should be given on how DOT assimilation is currently pursued in other operational ocean modeling systems organized in GODAE. This includes the various ECCO approaches in the U.S., BLUELINK in Australia, and the Japanese MOVE effort, in order to avoid the impression of focussing entirely on European efforts (section 4).

- There appears to be a typo in the second author's name.

Interactive comment on Ocean Sci. Discuss., 7, 1849, 2010.

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