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Interactive comment on “Roles of initial ocean surface and subsurface states on successfully predicting 2006–2007 El Niño” by F. Zheng and J. Zhu

Anonymous Referee #1

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General comments:

Authors report an investigation about the roles of initial ocean surface and subsurface states on predicting 2006–2007 El Niño with an intermediate coupled model. Based on an ensemble Kalman filter (EnKF) assimilation method, the study is conducted by comparing three sets of initialization schemes: 1) assimilating SST anomalies only (called Assim_SST), 2) assimilating sea level anomalies only (called Assim_SL) and 3) assimilating both SST and SL anomalies (called Assim_SST+SL). Since the mixed-layer temperature (T_e) (representing the subsurface ocean state in this simple model) is associated with SL and easily estimated from SL data, the different performance of model forecast initialized from Assim_SL compared to the Assim_SST reflects the role

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of subsurface initialization, or vice versa.

The topic is relevant and interesting. However, authors fail to provide sufficient information to clarify the following questions: 1) to what degree this simple model results are deliverable for a CGCM application? For example, in a CGCM, the subsurface state has some way to impact to the surface temperature, how this simple model to parameterize such relationship (between T_e and SST) so that the conclusions drawn from this simple model results are deliverable for realistic ocean dynamics; 2) to what degree the simple model data constraint is equivalent to the realistic ocean data assimilation in a CGCM? For example, the sea surface height data assimilation in a CGCM case is a quite challenging task while it's pretty straightforward in this simple model. Authors shall discuss the similar and different aspects of subsurface constraints in this simple model case and a CGCM case so that one can comprehend the results to the real world. Authors need to make a linkage between the simple model results and a CGCM application. In addition, the current article has quite a bit technical corrections too. Combined all above, I recommend a major revision for this article.

Specific Comments:

- 1) Section 2.1 – describe more on model equations to address question 1) posted in the general comments. Showing some equations (T_e or/and SST, for example) may be helpful.
- 2) Section 2.2 – give a little details on Assim_SL. Combined with 1), let one understand how you update T_e , which is equivalent to the subsurface data constraint in a CGCM.
- 3) Section 3 – discuss the similar and different aspects of subsurface constraints in this simple model case and a CGCM case and promote the simple model results as insights to CGCM applications.
- 4) Section 4 – add some discussions on CGCM applications.

Technical corrections:

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- 1) Title – At the first glance, it seems that the study is for a comprehensive CGCM case, but it is not. From the title, one deserves to be informed that this is a simple model study. How about something like “A study of initial surface and subsurface conditions for prediction of the 2006-2007 El Nino event with an intermediate coupled model”?
- 2) Abstract – I don’t think the acronyms are necessary. Instead, you may explicitly use “the initial surface (subsurface) conditions” to replace the corresponding acronym.
- 3) Figs. 1-3 – make a consistent forecast direction in all Figs.
- 4) Figs. 2-3 – a) Please make the panels consistent or explain otherwise; b) why the panels of SL and Te in Fig. 2 as well as the panels of SST and Taux in Fig. 3 do not have DEC2005 data? Please make them consistent with others or explain otherwise.

Interactive comment on Ocean Sci. Discuss., 11, 1543, 2014.

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