

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

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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

C753

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:

C754

- 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.