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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 #2

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General comments: This paper investigates possible improvements in predicting the 2006-2007 El Nino event by focusing on the role of the oceanic initial states using an intermediate coupled ENSO prediction system. The study is conducted by comparing hindcasts initialized from three sets of assimilation schemes: 1) assimilating of only the SST anomalies to optimize the initial surface condition, 2) assimilating SL anomalies to update the initial subsurface state, 3) assimilating both the SST and SL anomalies. The roles of initial ocean surface and subsurface states on successfully predicting 2006-2007 El Nino are evaluated and discussed.

The data assimilation system used in this study is a well-developed ensemble Kalman filter (EnKF) that can consistently assimilate the observed interannual sea surface tem-

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perature (SST) anomalies and sea level (SL) anomalies into the intermediate coupled model. Results highlight that all hindcasts can successfully predict the 2006-2007 El Nino event one year in advance indicating a better prediction ability of ENSO in this system than most of the seasonal climate forecasts systems (CGCM based) from operational centers. The topic is relevant and interesting. Considering there is a gap between the ICM and CGCM, the paper may be published with minor revision.

Following are some issues that I feel should be addressed before publication as well as the typographical errors I noticed.

Specific Comments:

- 1) In the paper, all three experiments are initialized by the ocean-only assimilation scheme that assimilates SST and SL observations. However, in your previous publication (Zheng and Zhu, 2010), it is found that a coupled assimilation scheme that assimilates wind observations can decrease the initial condition errors in the surface and subsurface currents that can significantly contribute to SST forecast errors. Why not include the coupled assimilation scheme in this study?
- 2) On page 1546 (line 17), the word “newly developed ” should be deleted.
- 3) Page 1548, Section 2.3: Were altimeter data assimilated into the coupled model once a month like the SST?
- 4) On the page 1550 (line 17-26), Fig.2c, Fig.2d, Fig.2b, Fig.2b are all not matching with what are indicated in the caption of Figure.2 on Page 1558
- 5) On Page 1551 (line 12) “2005” is a typo?
- 6) Page 1552, section 4: add some discussions on CGCM applications. Note that the seasonal prediction systems in most operational centers do assimilate both surface and subsurface obserations.
- 7) On the page 1558, the caption of Figure 2. Mentioned “The dashed red line in (c)”,

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but there is no dashed red line in (c).

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