

Interactive  
Comment

## ***Interactive comment on “Variability in the Subtropical-Tropical Cells and its Effect on Near-Surface Temperature of the Equatorial Pacific: a Model Study” by J. F. Lübbecke et al.***

**J. F. Lübbecke et al.**

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Response to the points raised by the reviews:

Major points:

1) Section 4.2 - Discussion of compensation between interior and wbc transport

We have re-written major parts of the section: the discussion of the compensation mechanism has been rooted now more explicitly on the previous model studies (especially, of Capotondi et al., 2005) which have presented analyses of the adjustment of the tropical gyres to variations in Ekman pumping. Our main point, the relevance of the latitudinal shifting in the poleward extension of the tropical gyre (instead of their

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maximum transports) is brought out more clearly by replacing Figure 13a,b (which appeared too cluttered and difficult to understand) by a set of new figures, i.e., Fig. 11 with a depiction of the mean gyre structures, and Fig. 12 a-d giving a quantitative depiction of changes in maximum transports and latitudinal shifting of the gyres.

## 2) Choice of NST instead of SST

In order to improve the discussion of the relevance of using NST (not instead, but in addition to SST!) as a diagnostic for the impact of dynamical changes, we have completely re-written the pertinent parts of the manuscript, and have replaced the former Figures 3 and 7 by a new figure (Fig. 5 a-d) which also brings in new material. Instead of splitting the discussion into two parts (in sect. 2 and 4.1 in the former manuscript), all material is now presented at the beginning of sect. 4.1.

## Response to other comments

### Reviewer #1:

1) Resolution issue: has been clarified in the text

2) Figure number: has been corrected

### Reviewer #2:

1) Fig. 2 "useless": We agree that there is little information in this figure, since the change between NCEP and CORE stresses is nearly (although not exactly) constant in time; we have thus dropped the figure and instead refer to the more important figure in the Large and Yeager document depicting the spatial dependence of the adjustment factor.

2) Fig. 1, overturning in  $z$ - vs.  $\sigma$ -coordinates: We concur with the reviewer that one has to be careful in interpreting the MOC obtained by Eulerian averaging in  $z$ -coordinates; while of limited use, it is, however, not "wrong" as asserted, but e.g. of some value for assessing the depth range of the equatorward STC flows, or for com-

parison with previous model studies. In response to the suggestion, we have thus added compilations of the MOC in sigma-coordinates, while keeping the z-coordinate representations.

3) Justification of the choice of 80m as the depth for diagnosing near-surface temperature (NST) variability: Concerning the general motivation for discussing NST (in addition to, not instead of) SST variability, see the general response above; as noted, there has been extensive re-writing of the relevant text. The specific choice of 80 m is based on consideration of the depth of the mixed layer over the Nino3-region (very shallow, 20-30m, near the equator, but increasing to about 70-80m away from the equator.

4) 20 Sv/25 Sv, compute more precisely: the discussion of the northern and southern STC transports has been adjusted according to the revision of fig.1; the transport numbers are now discussed on the basis of the sigma-coordinate averaging, with more precise determination of the resolution dependencies.

5) Figure numbers: done

6) Add sigma ranges to figure: have been added to the meridional sections of the zonal equatorial currents

7) Description of WBC structure: The main change here is a new compilation of Fig. 5 (now Fig. 3) to improve the graphical perception of the boundary currents, in particular, the bifurcations of the NEC which is of relevance for, and used in the subsequent discussion of interannual variability.

8) Fig. 10 (now Fig. 8): The text has been revised in order to clarify the interpretation in the context of previous studies, and to note that calculations of transport pathways, e.g. based on trajectory analyses as suggested, have been performed to corroborate the interpretation of the figure (which we believe is useful as a complementary depiction of the variability patterns discussed in previous studies). - We would like to note that the choice of the 50m-threshold represents a good approximation to the actual depth

of vanishing meridional flow (see, e.g., figure 1); while one may argue about why not choosing the actual (varying) depth of zero meridional flow, it is indeed a more relevant choice than the mixed layer depth (which is varying much more in space and time).

Fig. 12: Major parts of section 4.2 have been rewritten in order to improve the discussion of the compensation mechanism; the main point we have tried to bring out more clearly is that the wobbling in gyre extent does not so much represent a new dynamical mechanism, but an alternative, possibly more relevant aspect (than the changes of maximum gyre transport) of the gyre adjustment mechanism discussed in previous work.

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Interactive comment on Ocean Sci. Discuss., 4, 529, 2007.

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