Ocean Sci. Discuss., 6, S59–S62, 2009
www.ocean-sci-discuss.net/6/S59/2009/

Ocean Science Discussions

Interactive comment on "Regional impacts of ocean color on tropical Pacific variability" *by* W. Anderson et al.

G. van Oldenborgh (Referee)

oldenborgh@knmi.nl

Received and published: 19 March 2009

This article describes concisely and clearly the result of a well thought-out set of model experiments to investigate the role of ocean colour, and hence different short-wave radiation penetration depths, in different regions on the mean state and ENSO variability. The way the changes in the mean state influence ENSO are elucidated to give a consistent description, although the changes in the mean state are not directly traced back to the penetration depth differences. The result are of value in a wider context, in that they show that the ocean thermocline properties are is not the only factors influencing ENSO properties, for instance the atmospheric mean state is also shown to play a large role.

Even though I have not studied ocean colour before, the text was easy to read and the

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

results well-presented. (I cannot judge the originality.) The figures are not as clear, maybe an attempt could be made to improve these.

I have only one somewhat major comment on a missing mechanism, and a slew of very minor ones.

Geert Jan van Oldenborgh

1 Major comments

1. p.253, Figs. 8,12. Why has the direct influence of zonal wind stress on SST via advection of the SST gradient (the $T_x\tau'_x$ term) been left out of this cartoon and the discussion? There is a lot of evidence that is roughly equally important in ENSO as the indirect influence via the thermocline, from at least Picaut et al. (1996), see also Burgers and van Oldenborgh (2003); Guilyardi (2006) and many other papers. Judging from Fig. 4 there are sizeable differences in T_x between the different mean states, these could translate into different contributions of this term. I guess the answer is mostly contained in Fig. 11 already, but it should be made explicit.

2 Minor comments

1. p.248. Could you give a few more details of the ocean model used? At least the number of layers and average layer depth in the upper tropical ocean should be mentioned, maybe even the densities of the first few layers there.

2. Figs 2a,b,d would maybe be clearer if the contours indicate the climatology and the colours the errors.

OSD

6, S59–S62, 2009

Interactive Comment

3. Caption Fig. 2. Dynes? In a European journal?

4. Fig. 3. Please indicate the continents, especially with the stretched Y-axis the plots become very hard to read. Do Figs 2a,d and 3b,c,d look much worse without this stretching, as in Fig. 4?

5. p.253. Philip and van Oldenborgh (2006) also showed that in the CMIP3 scenario models the thermocline shoals rather than deepens, and changes in many other factors play a role in setting the ENSO amplitude.

6. Table 1. Are the regressions accurate to 4 decimal places?

7. p.256. In Zelle et al. (2004) we found that lag correlations give a better description of the connection between thermocline depth and SST, especially when moving towards the central Pacific. Does this influence your conclusions?

3 Typos

1. p.251. 'in comparable coupled model with a level-coordinate ocean' a.

2. p.251. 'The spatial structure of the wind stress anomalies' add 'zonal'

3. p.254. 'Next we look at how ENSO manifests' itself?

References

Burgers, G. and van Oldenborgh, G. J.: On the Impact of Local Feedbacks in the Central Pacific on the ENSO cycle, J. Climate, 16, 2396–2407, 2003.

Guilyardi, E.: El Niño - mean state - seasonal cycle interactions in a multi-model ensemble, Climate Dyn., 26, 329–348, 2006.

OSD

6, S59–S62, 2009

Philip, S. Y. and van Oldenborgh, G. J.: Shifts in ENSO coupling processes under global warming, Geophys. Res. Lett., 33, L11 704, 2006.

Picaut, J., Ioulalen, M., Menkes, C., Delcroix, T., and McPhaden, M. J.: Mechanism of the Zonal Displacement of the Pacific warm pool: implications for ENSO, Science, 274, 1486–1489, 1996.

Zelle, H., Appeldoorn, G., Burgers, G., and van Oldenborgh, G. J.: On the relationship between sea surface temperature and thermocline depth in the eastern equatorial Pacific, J. Phys. Oceanogr., 34, 643–655, 2004.

Interactive comment on Ocean Sci. Discuss., 6, 243, 2009.