

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

**W. Anderson et al.**

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The reviewer argues that our neglect of the subsurface chlorophyll maximum in this paper constitutes a fatal flaw. We disagree for two reasons.

1. The point of this paper is to evaluate the *total* impact of shortwave absorbers on tropical variability. As it happens, counter to the statement of the reviewer, the Morel (1988) parameterization as it is implemented in most models does in fact include a representation of the subsurface chlorophyll maximum, which kicks in where the surface chlorophyll is low. In such regions as noted by the reviewer, more shortwave radiation would be absorbed in the 30–80m depth range than using our parameterization. This means that there will be *more* shading than in our model, and that removing this shading will produce a *larger* impact than in our model. We will endeavor to make this point clearer in the revision.

The reviewer would have a point if the purpose of the paper was to consider the impact of biases in chlorophyll concentration within the Morel model. However, this is not the main point of the paper. Rather it is to use changes in absorption as a method of probing the coupled system to evaluate the sensitivity of redistribution of heat in the upper ocean.

2. It is by no means clear that the subsurface chlorophyll maximum is nearly as effective at absorbing sunlight as the Morel parameterization would suggest. The reason for this is that much of the absorption of shortwave radiation is actually associated with colored dissolved organic matter, which is photobleached, and thus may be depleted relative to chlorophyll in the downwelling centers of the subtropical gyres. A powerful illustration of this can be seen from the BIOSOPE experiment (Claustre et al., 2008, Figure 6) where high chlorophyll regions in the upwelling, eastern gyres, and Marquesas regions correspond to attenuation length scales of order 10m, but the deep chlorophyll max in the gyre center corresponds to length scales of 20-40m.

We will work to clarify the points suggested by the reviewer. In particular we will A. Add a table describing the model experiments. B. Make some recommendations for climate models- but focussing more on what this says about the vertical redistribution of heat rather than on particular absorption parameterizations.

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