

Interactive comment on “ENSO surface longwave radiation forcing over the tropical Pacific” by K. G. Pavlakis et al.

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Review of “ENSO surface longwave radiation forcing over the tropical Pacific” by K. G. Pavlakis et al.

This paper discusses the spatial and temporal variation of the surface longwave (LW) radiation budget (downwelling and net) in the tropical and subtropical Pacific Ocean associated with the ENSO events. An excellent correlation was found between the downwelling LW radiation (DLR) anomaly in the central Pacific and the Nino-3.4 SST index and a high anticorrelation over the western Pacific. The surface LW radiation budget associated with ENSO events are shown to be closely related to water vapor and cloud variation during ENSO. The surface radiation budget variability associated with ENSO events has not been well documented due to the lack of quality surface

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radiation measurements. This paper uses a radiative transfer model and the cloud, temperature and water vapor inputs from ISCCP-D2 and NCEP/NCAR reanalysis to estimate the ENSO surface LW forcing. Although the potential uncertainties in the NCEP/NCAR temperature and water vapor and ISCCP clouds may cause large errors in their surface LW budget, this paper is a step forward for our knowledge of surface LW radiation forcing associated with ENSO. Thus, this paper is potentially suitable for publication in Atmospheric Chemistry and Physics (ACP).

However, this paper might be too long and some revisions may be needed.

1) The order of the presentation for sections 3, 4, and 5 is not very logical to me. The November-December-January (NDJ) 3-month mean DLR and NSL were presented in section 3, but the reason of choice of NDJ was given later in section 4. Why not follow the order in the abstract: first define the El Nino 3.4 DLR index similar to the El Nino 3.4 SST index, then show the strong correlation of El Nino 3.4 DLR and SST indexes (section 5 and Figures 7, 8, 9), and then present the long-time mean surface LW radiation at normal, El Nino and La Nina events (section 3, figures 1, 2, 5, 6)?

2) There are too many redundant materials that should be deleted or reduced. For example, Figure 1(b) may be deleted because the DLR at the neutral conditions (1b) is very similar to that at the normal conditions (1a). A sentence to state the similarity between the two might be enough. Figure 3 may be deleted. I do not think the El Nino DLR anomaly with respect to La Nina DLR (Figure 3) can give us much more information than the El Nino DLR anomaly with respect to the neutral years or normal conditions (Figure 5b) except bigger amplitudes. Also the El Nino DLR anomaly with respect to the neutral years may be replaced by the El Nino DLR anomaly with respect to the normal condition (long-time average) (such as Figure 1a). Similarly, the La Nina DLR anomaly with respect to the neutral years may be replaced by the La Nina DLR anomaly with respect to the long-time average (such as Figure 1a). Figure 4a may be deleted and keep only figure 7a.

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3) Many symbols were used in this paper. Some were defined in table 1 and some were not. I find these many symbols confusing. The authors may want to delete and/or add some symbol definitions in table 1. This is related to the comments above.

4) Page 12901, lines 6-13: Some discussions of the errors of the surface LW budget resulting from the potential uncertainties in the NCEP/NCAR temperature and water vapor and ISCCP clouds and their implications may be needed.

5) Page 12902, lines 13-21: What value is used for the surface emissivity over land? Can we trust the results of NSL over land? Why is there a net thermal warming over land compared to a net thermal cooling over oceans?

6) Page 12904: The DLR for earlier stage (ASO) and mature phase (NDJ) of ENSO events were shown in Figures 4 and 5. What is the basic argument to show the DLR for earlier stage? If earlier stage is discussed, then, why not decay phase? How is the ENSO evolution defined?

7) Page 12905, line 18: Why consider $R_{ne} > 2$ as statistical significant? Why not use the Student's t-test?

8) Page 12908, lines 1-8: The increase of the DLR at a higher rate than the surface LW emission is related to the “super greenhouse effect” discussed in Ramanathan and Collins (1991), Inamdar and Ramanathan (1994) and Lubin (1994). Some more discussion may be needed.

Some minor comments:

1) Page 12897, lines 11-15: Here, the authors discuss only the oceanic components of the ENSO, but not the atmospheric components, where the SO refers to. Some discussion of atmospheric deep convection and Walker circulation during the normal, El Nino and La Nina conditions may be needed.

2) Page 12898, lines 2-5: The authors might want to add Tian and Ramanathan (2002) here to support their statement.

3) Page 12901, line 2: “National Center for En..’ should be ‘National Centers for En..’

4) Page 12908, line 26: change “pixel” to “grid”?

5) Page 12910, line 22: It should be pointed out that there might be large uncertainties in ISCCP low cloud amount because of the downward views of satellites.

6) The maps are generally too small for me to read and the authors might want to enlarge them. The color bars in some figures, such as Figures 3b, 5a, 5b, 6a, and 6b, should be rescaled. The authors may also want to plot the longitude labels at the bottom of the maps instead of the middle.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 12895, 2006.

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