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Atmospheric Chemistry and Physics Discussions

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

K. G. Pavlakis et al.

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Response to the comments of the Referee-2

Specific Comments

1) We would prefer not to change the order of the sections. It seems more logical to present first section 4 with the DLR space distribution during the ENSO evolution and then using this distribution to define regions like the west Pacific (central Indonesia) or the Niño-3.4 where strong DLR variability is shown during the early, mature or decay ENSO phase. Then we present more detailed results in these regions in section 5 and 6. We present the November-December-January (NDJ) DLR and NSL in section 3 since it is well known that the peak of an ENSO event is late (December-January) in the calendar year (see page 6 line 16).

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2) We agree with the referee that Figures 1(b) and 2(b) may be deleted because the values of DLR and NSL during neutral years are very similar to those of the long-time average. Also in the revised manuscript we replace the El Niño DLR anomaly with respect to the neutral years with the El Niño DLR anomaly with respect to the long-term average in Figure 5, as well as the corresponding La Niña DLR anomaly in Figure 6. We also make the appropriate changes in the text (Sections 4.1 and 4.2). We would like to keep Figure 3. Although all the information there is in Figures 5b and 6b, it is necessary to show Figure 3 for a better inspection of the radiation budget variability among the two extremes of the ENSO cycle. We also keep Figure 4a, which helps to one to inspect directly the DLR differences between the 5 El Niño years by placing them on top of each other. Furthermore, with the aid of Figure 4 we define the August-September-October (ASO) period as the early phase of ENSO, November-December-January (NDJ) as the mature phase and February-March-April (FMA) as the decay phase of ENSO with regard to the DLR variability. We add in Figure 5 the El Niño DLR-A during FMA the decay phase of El Niño and the corresponding map of La Niña DLR-A during FMA in Figure 6 (see also comment 6) and discuss them in Sections 4.1 and 4.2.

3) We delete many symbol definitions in Table 1 as the referee suggests. We present DLR and NSL anomalies with respect to the long-term average and not with respect to the neutral years. Thus the symbols El Niño DLR-ANE and La Niña DLR-ANE have been deleted. The symbols RNE, REN, and RLN have been deleted too because they are not necessary due to the use of the Student's t-test, as the referee suggested, for the comparison of long-term DLR values and the corresponding values during El Niño or La Niña years (see also comment 7).

4) We think that it is better not to expand Section 2 on the radiation model and the data description because there is an extended sensitivity test analysis and a study of database uncertainties in Pavlakis et al. Atmos. Chem. Phys., 4, 127-142, 2004.

5) NSL values are also valid over land areas. We clarify this in the manuscript adding

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on page 7, line 10 (page 12902, line 18 in ACPD paper) the next sentence: 'The surface emissivity for non-oceanic areas was computed by using surface-type cover fractions from the ISCCP-D2 database and the land-surface emissivity set to 0.9'. Over land there is less net thermal cooling compared to the oceans due to the lower skin temperature over land compared with SST.

6) We present now the early (ASO), mature (NDJ) and decay (FMA) phases of ENSO events with respect to DLR.

7) The referee makes here an interesting point so we use the Student's t-test for each grid-box and we present the distribution of P-values at 2.5x2.5 spatial resolution in Figures 5 and 6. Grid-boxes with P-values less than 0.05 denote statistical significance in our results. Sections 4.1 and 4.2 have now changed according to the new analysis of our results.

8) Some discussion was added as the referee suggested, on page 12 line 13 (page 12908 line 8 in ACPD paper).

Minor Comments

1) done

2) done

3) has been changed according to the referee's suggestion

4) has been changed according to the referee's suggestion

5) done on page 14 line 25 (page 12910 line 23 in ACPD paper)

6) All the maps are now slightly larger.

Figures 3b, 5a, 6a are now rescaled. Figures 5b and 6b have been renamed to 5c and 6c, respectively, and rescaled as the referee suggested.

The longitude labels are now at the bottom of each map, as the referee suggested.

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