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Atmospheric Chemistry and Physics Discussions

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

Anonymous Referee #1

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General Comments:

The manuscript presents variability of the downward shortwave radiation (DSR) at the sea surface associated with interannual phenomenon of ENSO. It shows that as an ENSO event occurs, the DSR varies in the equatorial central Pacific and the equatorial western Pacific as well as in the off-equatorial western Pacific. To my knowledge, the manuscript is the first to show the DSR anomalies associated with ENSO. However, the result is not surprising to me since the ENSO eastern and western Pacific anomaly patterns have been documented in the literature. In particular, previous other studies have shown that during an El Nino (La Nina) event, warm (cold) SST and low (high) SLP anomalies in the equatorial eastern Pacific and low (high) OLR anomalies in the equatorial central Pacific are accompanied by cold (warm) SST and high (low) SLP

anomalies in the off-equatorial western Pacific and high (low) OLR anomalies in the off-equatorial far western Pacific. Considering the convection (cloudiness) associated with ENSO, these eastern and western Pacific ENSO patterns definitely will result in the DSR anomalies presented in this paper. In addition, the manuscript mainly focuses on the description of the DSR anomalies associated with ENSO without further discussing the physics of the DSR anomaly pattern. In the revision, I hope that the authors may add more discussions of why and how the DSR anomalies vary with ENSO. This may not be a difficult job if the authors carefully read previous ENSO studies related to these anomaly patterns.

Specific Comments:

1. Lines 9-16 on page 6701. The authors state that surface heat flux plays a key role in ENSO evolution and it is a significant variable in models. I have to point out that in many ENSO models, surface heat flux is not important. For example, the coupled Zebiak-Cane model does not have surface heat flux (it is parameterized as a damping term), but the model still can simulate and predict ENSO.

2. Pages 6710 and 6712. These pages discuss the DSR anomalies in the north tropical region of 7-15°N, 150-170°E. In fact, this region is the Nino6 region defined by Wang et al. (1999, JGR). The DSR variation in this region is associated with variability of SLP, SST and thermocline depth in the Nino6. The co-variation of SLP, SST and thermocline depth (and the wind in the equatorial western Pacific) is also a key for the ENSO mechanism of the western Pacific oscillator (Weisberg and Wang, 1997, GRL). It is possible that the DSR anomalies observed in the off-equatorial western Pacific are important for ENSO operating through the mechanism of the western Pacific oscillator.

3. Page 6712 and Figure 9. Figure 9a shows that the Nino3.4 SST anomalies also lead the DSR anomalies. However, this feature is not mentioned. I suggest that the authors discuss and explore this leading relationship. Figure 9c should be expanded that it reflects the correlation between the Nino3.4 SST anomalies and the DSR anomalies

ACPD
8, S2436–S2438, 2008

Interactive Comment

with both lagging and leading months. That is, Figure 9c should show the correlation between the Nino3.4 SST anomalies and the DSR anomalies as a function of leading and lagging months (from -12 to +12 months).

Technical Comments:

1. The paper has too many acronyms. The authors may consider to reduce some of them.

2. It is nice if the authors can let someone edit English before its final publication.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 6697, 2008.