

Interactive comment on “Analysis of the decrease in the tropical mean outgoing shortwave radiation at the top of atmosphere for the period 1984–2000” by A. Fotiadi et al.

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I. General Comments

The work presented by Hatzianastassiou et al. (2004) (H04) focused on the long-term global distribution of reflected outgoing shortwave radiation (OSR) at the top of atmosphere (TOA), though it also dealt with the examination of trends in OSR, but to a lesser extent. There was a sub-section (2.2) in H04 dealing with time-series, but these results were only based on an analysis performed at global scale. Also, the study period in H04 extended from 1984 to 1997. In the present study, the time period was extended up to the end of year 2000, i.e. it consists now of 17 years. Furthermore, this

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study focuses on tropical regions (30degS–30degN). In addition, not only the possible trends in OSR are computed and studied, but also a detailed analysis is performed to investigate the causes of the detected trends, which had been also discussed in H04, but to a much lesser extent and, simply based on the sensitivity analysis performed in that study. Moreover, the detected trends in OSR by means of this modelling study are extensively validated through detailed comparisons against best quality OSR data from ERBE-S4. The above have been clearly stated in the Introduction (e.g. page 459, line 8), according to the referee comments. Also, the paper length has been reduced by removing repetitions in the work by Hatzianastassiou et al. (2004).

II. Specific Comments

1. The lines 8-13 of the Abstract were removed. Also, only the decadal trends are now quoted, while the 17-year trends were removed from the text.
2. Much of section 2 was removed (e.g. page 459, lines 24-27, page 460, lines 1-6 and 12-29, etc), as suggested by the referee, in order to shorten the manuscript.
3. Lines 16-20, page 463, discussing the variability of OSR due to ENSO and Pinatubo eruption were replaced by a sentence making reference to Wielicki et al. (2002a), as suggested by the referee.
4. The uncertainty of trends in ISCCP cloud data, related with the view angle dependence, was stated at the end of section 4, making reference to the work by Campbell (2004), which was also included in the list of references. This work was also reported in page 466, line 8. Intercomparison and inconsistency between trends in ISCCP low-level cloud amounts and those in SAGE II and synoptic observations were discussed in section 4, page 468, line 5. Also, the uncertainty in the main conclusion of the paper was noted in the Abstract (page 457, line 4), and in Conclusions (page 470, line 1), according to the comment of the referee.
5. Page 465, line 7, “unlike climate models” was removed as regard to the referee’s

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comment, to avoid unfair comparison with climate models. The inability of climate models to reproduce observed changes either in cloudiness or in radiative fluxes, due to missing forcings or processes in those models, is reported in the Introduction, page 458, lines 15-20. Further discussion on the existence and the causes of OSR trends, was added in Conclusions, page 470, line 1.

6. Indeed, changes in ISCCP radiances that are not related to clouds may be identified incorrectly as a cloud effect by ISCCP. This is the case of the strong positive anomalies of ORS fluxes during Pinatubo eruption (page 464, lines 6-14), which are mainly attributed to low-level clouds, but incorrectly, since the extra visible reflectance added to the thin cirrus cloud layers by Pinatubo aerosols caused the reassignment of thin cirrus to lower-level cloud types. A point was made to the text (page 464, line 14) according to the comment of the referee. Nevertheless, such temporary and local effects do not refute the significance of the long-term trends found in this study, especially given that their magnitude (e.g. 9.9% \pm 0.8% for low-level clouds) is larger than the uncertainty of ISCCP cloud data.

7. The reference to the IRIS effect (page 457, line 16-19) was removed from the text.

8. A note was made (page 468, line 17) on spurious trends in NCEP precipitable water compared to SSM/I data.

9. The large positive OSR anomalies during the 1998 El Nino in the zone 0deg-10degS were briefly discussed in page 467, line 4, as suggested by the referee.

III. Technical Corrections

a) Indeed, Figure 5 and 6 refer to whole hemispheres. Nevertheless, the rest of Figures, as well as the analysis and discussion of results focus on the region 30degS-30degN. Therefore, we preferred to keep the title as it is. b) New paragraphs start now at the locations indicated by the referee. c) In page 459, line 5, "ISCCP-D2" was corrected to "ISCCP-B3". Also, reference to the paper by Hodges et al. (2000) was

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made on page 459, line 5, and page 466, line 7, whereas this paper was added in the list of references. d) The part “as given by the International Satellite Cloud Climatology Project (ISCCP)”, page 457, lines 24-25, was removed from the text. e) The first long sentence of Conclusions (page 469, lines 9-14), was split in two smaller sentences, as suggested by the referee.

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