

Interactive comment on “Long-term global distribution of earth’s shortwave radiation budget at the top of atmosphere” by N. Hatzianastassiou et al.

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1. The referee reasonably asks the question to what extent can one trust the variations found in the time series of global and hemispherical mean reflected solar radiation, as they are solely based on time series of model results computed by using ISCCP data. The ISCCP data, however, are based on calibrated narrowband measurements from meteorological satellites whose orbits and calibrations vary during the period of interest (e.g. Klein and Hartmann, 1993). Although some of the most serious calibration changes have been adjusted for in the last ISCCP-D series data (Rossow and Schiffer, 1999), a question remains regarding the reliability of the ISCCP long-term trends. On the other hand, it is interesting that the model computed OSR fluxes are in remarkable agreement with direct radiation satellite measurements from ERBE. Apart from the validation of the model OSR against quality ERBE-S4 scanner data (which however cover

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the 5-year period 1985-1989), our model OSR has been further validated against long-term ERBE S-10N (WFOV NF Edition 2) non-scanner data covering the period from January 1985 to December 1997. Our model OSR fluxes are found to be in very good agreement with those of ERBE S-10N, either in terms of OSR fluxes or their anomalies. The results of this comparison are given in the new Figure 7. Both model and ERBE S-10N OSR fluxes show a decreasing trend from 1985 through 1997, equal to about 2 and 2.5 W m⁻² per decade, while the computed anomalies in both model and ERBE S-10N OSR fluxes are very similar. Nevertheless, note that the results of Fig. 7 refer to the tropical and sub-tropical regions (30°S-30°N) only, and not to the whole globe (as in Figs 5 and 6). This was done for two reasons. First, ERBE S-10N does not provide data poleward of 60°N and S, while there are missing data between 30° and 60°N and S. Secondly, the global decreasing trend in OSR was found to be largely attributed to the tropical and sub-tropical regions, as indicated in the last paragraph of section 4.2.

2. We have taken into account the suggestion of the Referee, and so Figs 5a, 8a and 9a (Figs 5b, 7b and 8b in the original manuscript) have been re-drawn to include information from ERBE. In Fig. 5a, the ERBE-S4 data cover only the 5-year period from 1985 to 1989, similarly in Figs. 8a and 9a. Despite the mostly similar features between the 14-year model and 5-year ERBE mean annual zonal OSR fluxes in Fig. 8a, there are some differences reaching about 10 W m⁻² in the sub-polar and polar areas.

3. The previous Figs. 7a and 8a (in the original manuscript) have been omitted, following the Referee's suggestion.

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