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Atmospheric Chemistry and Physics Discussions

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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II. Specific Comments

1. The SW radiative transfer model used in this study is a compromise between the accuracy of a full spectral model and speed of computation of simple algorithms. Nevertheless, the range of uncertainty of the model has been tested by comparing the model results with those of line-by-line computations for various atmospheric conditions, according to the Intercomparison of Radiation Codes in Climate Models (ICRCCM) program (Fouquart et al., 1991). More specifically, the model results were found to be different to those of line-by-line models by up to 7%. Of course, spectral models perform always better and have higher accuracy, but they demand much longer computing time, which makes them difficult to use routinely. We have taken into account the

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referee's comments by including an appropriate discussion in the text (first paragraph of section 2, line 6).

2. The treatment of aerosols is kept simple in this study. This is done by using a modified two-stream approximation, in contrast to the more detailed treatment of aerosols in the work by Hatzianastassiou et al. (2004), where emphasis was given to the aerosol SW radiative forcing. This is justified by the secondary role of aerosols compared to the effects of clouds on OSR, as shown in this study (Table 4). Nevertheless, the treatment of aerosols in our model allows for a strong forward scattering peak in the phase function for scattering by aerosols, with values of the aerosol asymmetry parameter ranging from about 0.6 up to 0.85. A relevant discussion has been added in the text (section 3.5, line 7).

3. We have added in the text comments (section 3.5, line 22) clarifying that the computed monthly mean AOT values vary at the pixel level up to about 0.5, while the aerosol single scattering albedo ones range from 0.65 to 1. A more detailed discussion of GADS aerosol data is given by Hatzianastassiou et al. (2004).

4. The bias is the difference between the averaged model and ERBE OSR values over the total 511172 pixel level matched data pairs. This is now clarified in the text (section 4.1, 4th paragraph, line 5).

5. We agree with the Referee's comment that the description of Fig. 7b was not consistent with what was shown in the figure. Thus, the relevant text (section 4.3, line 11) was modified accordingly.

6. The values in Tables 2, 3 and 4 are now given to one decimal point only, as suggested by the Referee.

II. Technical Corrections

1. The change in wording to "... where the model results ... accuracy is limited", in the first paragraph of the Introduction (lines 17-18), has been adopted.

ACPD

4, S1325–S1327, 2004

2. In the 4th paragraph of the Introduction, 4th line, the word "insight" was replaced by "summary".

3. The reference D'Almeida et al. (1991) has been added in the list of references.

4. In section 4.1, 3d paragraph, 18th line, the word "underneath" has been dropped.

5. The first sentence "Our preliminary analysis ..." in section 4.2, 3d paragraph, has been rewritten.

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