Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 4, 1419-1425, 2004
www.atmos-chem-phys.net/4/1419/2004/

On the decadal increase in the tropical mean outgoing longwave radiation for the period 1984-2000

D. Hatzidimitriou[1,2], I. Vardavas[1,2], K. G. Pavlakis[2], N. Hatzianastassiou[2,3], C. Matsoukas[2], and E. Drakakis[2,4]
[1]Department of Physics, University of Crete, Heraklion, Crete, Greece
[2]Foundation for Research and Technology-Hellas, Heraklion, Crete, Greece
[3]Department of Physics, University of Ioannina, Greece
[4]Department of Electrical Engineering, Technological Educational Institute of Crete, Greece

Abstract. In the present paper, we have calculated the outgoing longwave radiation at the top of the atmosphere (OLR at TOA) using a deterministic radiation transfer model, cloud data from ISCCP-D, and atmospheric temperature and humidity data from NCEP/NCAR reanalysis, for the seventeen-year period 1984-2000. We constructed anomaly time-series of the OLR at TOA, as well as of all of the key input climatological data, averaged in the tropical region between 20°N and 20°S. We compared the anomaly time-series of the model calculated OLR at TOA with that obtained from the ERBE S-10N (WFOV NF edition 2) non-scanner measurements. The model results display very similar seasonal and inter-annual variability as the ERBS data, and indicate a decadal increase of OLR at TOA of $1.9\pm0.2 Wm^{-2}$/decade, which is lower than that displayed by the ERBS time-series ($3.5\pm0.3 Wm^{-2}$). Analysis of the inter-annual and long-term variability of the various parameters determining the OLR at TOA, showed that the most important contribution to the observed trend comes from a decrease in high-level cloud cover over the period 1984-2000, followed by an apparent drying of the upper troposphere and a decrease in low-level cloudiness. Opposite but small trends are introduced by a decrease in low-level cloud top pressure, an apparent cooling of the lower stratosphere (at the 50mbar level) and a small decadal increase in mid-level cloud cover.

Final Revised Paper (PDF, 2470 KB) Discussion Paper (ACPD)

Citation: Hatzidimitriou, D., Vardavas, I., Pavlakis, K. G., Hatzianastassiou, N., Matsoukas, C., and Drakakis, E.: On the decadal increase in the tropical mean outgoing longwave radiation for the period 1984-2000, Atmos. Chem. Phys., 4, 1419-1425, 2004. Bibtex EndNote Reference Manager