

Interactive comment on “Observed poleward expansion of the Hadley circulation since 1979” by Y. Hu and Q. Fu

Anonymous Referee #1

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General comments Overall I think this is an interesting and solid paper which deserves to be published with only minor amendments. The main finding of a poleward expansion of the Hadley Cell appears convincing, since it is found in all three reanalyses and the three OLR datasets. If possible, some additional discussion of the possible mechanism underlying this change, and implications of these findings would make the paper stronger. Questions to address:

How does the poleward expansion of the Hadley Cell relate to variations in its intensity, if at all? The authors mention that the poleward expansion of the Hadley Cell could result in decreasing subtropical precipitation. Could the discrepancy between the rate of expansion of the Hadley Cell identified here, and that simulated by GCMs have implications for the disagreement between simulated and observed precipitation changes

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identified by Zhang et al. (Nature, 448, 461-465, 2007)? (both show drying of the Northern subtropics, but the effect is much larger in the observations).

Specific and technical comments: Pg 9368, ln 11: 'air rises by releasing latent heat' -> 'air rises due to the release of latent heat' Pg 9368, ln 26: 'suggested' -> 'suggest' Pg 9370, ln 5: Since the NCEP/DOE reanalysis is new it deserves some more description and a reference. How different is it to the NCEP/NCAR reanalysis? Pg 9371, ln 2 and elsewhere: 'poleward' is one word. Pg 9371, ln 20: How reliable are these data in the early parts of the reanalysis? A brief comment is needed. Pg 9372, ln 24: But there are also many problems with the NCEP reanalysis. Pg 9372, ln 25-26: I didn't understand the bracketed phrase. Pg 9373, ln 4: Insert 'that' before 'the Hadley circulation'. Pg 9373, ln 9-10: Give the exact definition of the poleward edge of the Hadley cell used here. (The most poleward latitude at which the zonal mean OLR is equal to 250 W m^{-2} ?). Pg 9373, ln 22-23: 'with a magnitude of about 2 degrees latitude'. Pg 9375, ln 15-17: What is the mechanism behind the role for ozone depletion in the poleward expansion? What is the evidence? Give refs if possible.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 9367, 2007.

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