

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

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We thank both reviewers and a reader for their very helpful comments. In the revised version, changes are made accordingly.

In addition to the changes corresponding to these specific comments, we also made a few major changes according to Reviewer #1's suggestion.

First, a paragraph on the mechanism of the broadening of the Hadley circulation is added to the revised version, i.e., the second paragraph in the section of Discussion and Conclusions. In this paragraph, we provide some qualitative discussion on factors influencing the width of the Hadley circulation, based on the theoretical arguments by Held and Hou (1980) and Held (2000).

Second, we add a short paragraph at the end of the paper, in which we point out that the

expansion of the Hadley circulation may also have important impacts on stratospheric climates changes by referring the works by Rosenlof (2002), Fueglistaler and Haynes (2005) and Hudson et al. (2006).

Third, the speculation that ozone depletion could be one of the causes for the expansion of the Hadley circulation is kept. Two references are added to support the speculation. One is by Santer et al. (2003). They found that the tropopause height increased by several hundred meters for 1979-1999, and their simulations showed that about 80% of the simulated rise of the tropopause height is due to ozone depletion and increasing greenhouse gases. The other one is by Polvani and Kushner (2002) who showed that stratospheric polar cooling can cause a poleward shift of subtropical jet streams.

Zhang et al. (2007) is referred in the second last paragraph of the paper.

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

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