

Interactive comment on “Hydration of the lower stratosphere by ice crystal geysers over land convective systems” by S. Khaykin et al.

Anonymous Referee #2

Received and published: 7 October 2008

The paper is well written and provides interesting and unique observations of water vapor and particles in the tropical UT/LS region from balloon born in-situ instruments. Such comprehensive measurements in this particularly interesting geographic region have not been obtained to date. The analysis of data from a highly sophisticated water vapor sensor and a backscatter sonde together with radar observations and trajectory studies provide evidence that overshooting convection hydrates the lower tropical stratosphere.

However, I have problems understanding some of the conclusions and suggest that the paper should be published when the concerns described below are addressed.

1. The observed water vapor enhancements are rather low and particles are observed

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



in air that is far from saturation. I wonder how ice particles can survive in such an environment. The evidence that these particles are ice is based on depolarization measurements from an instrument that was flown on another balloon (except for the 23rd of August case). How do these observations relate to each other? How can the authors explain the existence of ice in sub-saturated air that according to the trajectories has been dwelling in these conditions since hours? I suggest that the particle observation should be explored more deeply and that other hypotheses than the occurrence of ice should be discussed.

2. The authors conclude that their observation give evidence that "geyser hydration across the tropopause" is an important mechanism for determining the water vapor concentration of the stratosphere on a global scale. However, no attempts have been made to quantify the amount of water vapor that is transported that way and compare it to other potential mechanisms. Also, the region and its special characteristics (with a rather low tropopause and very strong convection) should be considered in this context. Up-scaling the properties of this region to a global perspective might bear issues. As mentioned earlier the water vapor enhancements observed are rather low. Given that special cases in a special region have been probed, I wonder if these observation do rather show the opposite of the claimed result, namely that the effect of overshooting convection on the water vapor budget of the lower tropical stratosphere are rather low?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 15463, 2008.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)