

Review of the paper by Corcos et al.

"On the Role of Atmospheric Waves in Governing the Persistence of Thin Cirrus Clouds in the Tropical Tropopause Layer"

This paper investigates the role of multiscale atmospheric waves in governing the persistence of thin tropical cirrus clouds. By combining a Lagrangian microphysical model with initial conditions from lidar observations, the authors demonstrate how gravity waves and low-frequency waves interact to shape cirrus lifetimes through a delicate balance between sedimentation, depositional growth and sublimation. The identification of a threshold behavior - where larger crystals resist sublimation and enter a sedimentation-dominated regime - provides some interpretation of the observed skewed lifetime distribution. My recommendation is accepting after minor revision.

Minor points:

- The model assumes a vertically homogeneous thermodynamic structure. Whereas this should be a reasonable assumption for the high-frequency GW, it becomes critical for the mid- and low-frequency GW. In particular, given the fact that the saturation layer extends up to 2 km, which can be comparable with the vertical wavelength of those waves. The resulting implications for the paper should be discussed more extensively in the conclusions than the brief mentioning at line 370, see also next point.
- Is the synthetic stochastic forcing restricted to the high-frequency GWs only, what is the spectrum of this forcing? Given the fact that it depends only on standard deviation and decorrelation time, it is not obvious that lower frequencies are not present. With this the separation between high and low frequency wave forcing in the paper is somewhat arbitrary.
- I am wondering why no information on the vertical structure of the cirrus is presented. Given the fact that the SIP are traced in the vertical, this information should be provided by the model.
- Fig.4: are the units in the color bar caption for the number-size distribution correct?
- Reference list: Kärcher, B. and Corcos, M., 2025 incomplete