

A tropopause inversion layer in the polar region

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An interface between the troposphere and stratosphere, i.e., tropopause, is characterized by a sharp transition of temperature gradient (i.e., stability). It also accompanies a sharp transition of long-lived chemical species such as ozone, water vapor, and methane. Thus the tropopause can be defined in several ways, i.e., thermal (lapse rate) tropopause, dynamical tropopause, and ozone tropopause.

Recent studies showed that there is a strong temperature inversion just above the midlatitude tropopause, which is called a tropopause inversion layer and has a stability much larger than the usual stratospheric one (Birner et al. 2002; Birner 2006). However, its existence and behavior in the polar region, especially over Antarctica, have not been clarified, because the thermal tropopause inside the polar vortex could not be well defined.

This study defines the ozone tropopause using the ozonesonde data in the polar region. Then the tropopause inversion layer is investigated in a coordinate relative to the ozone tropopause. It is shown that, while a sharp transition of the temperature gradient still exists across the tropopause, the tropopause inversion layer does not appear over Antarctica during austral winter and spring. This result implies easier transport and mixing of chemical species across the Antarctic tropopause during austral winter and spring than in the midlatitude.