

Voelger, P and P. Dalin, 2021: A case study of a quasi-stationary, very long polar stratospheric cloud layer edge. *J. Meteor. Soc. Japan*, **99**, <https://doi.org/10.2151/jmsj.2021-025>

**Plain language summary:** A very long (more 600 km) straight edge of a Polar Stratospheric Cloud (PSC), located at 24-26 km altitude, was observed east of the Scandinavian Mountain Range both by an optical camera and by lidar. The cloud edge remained unchanged for several hours. We investigated the atmospheric conditions during observation which led to the unusual feature.

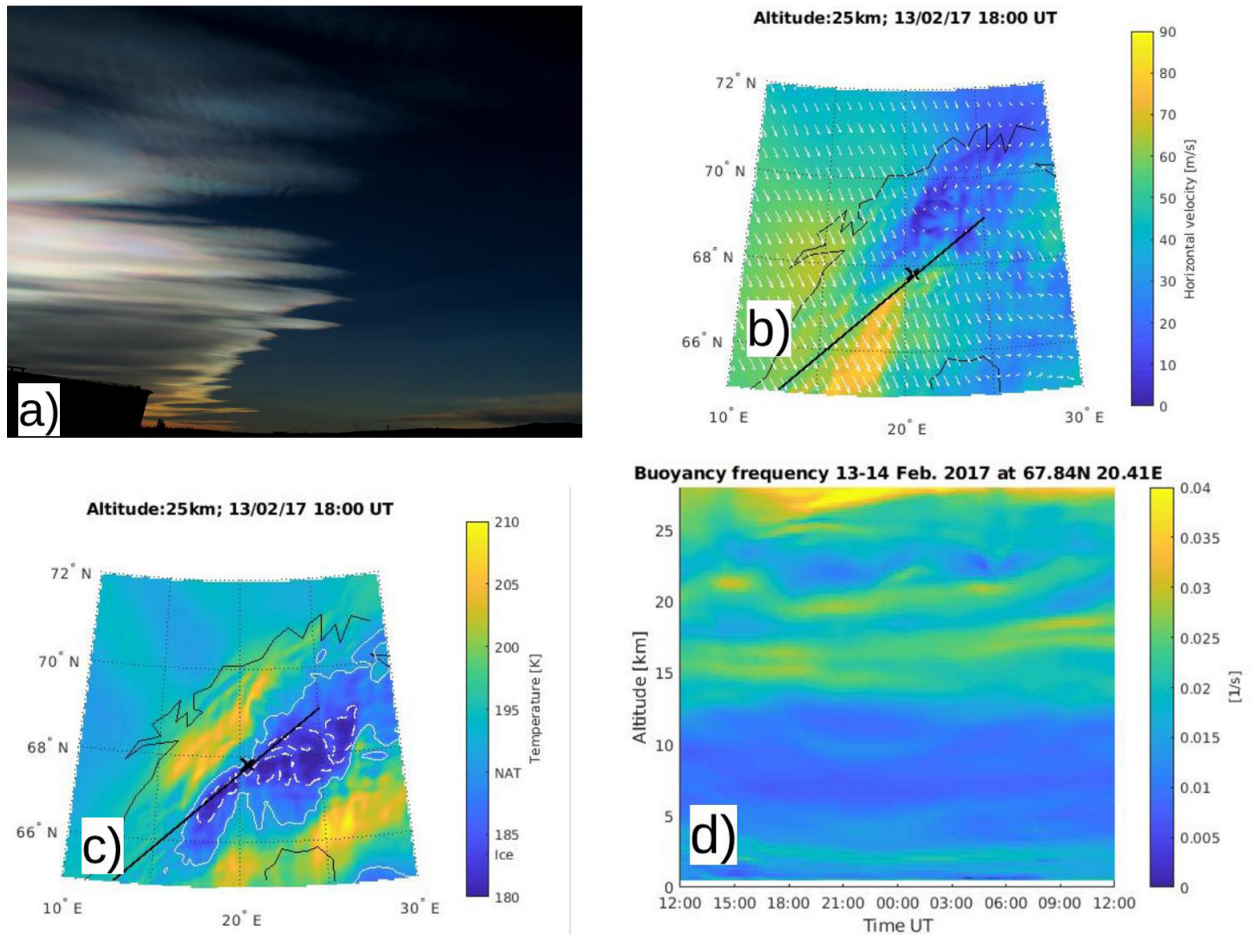


Figure 1: (a) Photographic image of the edge of the PSC as observed in Kiruna (Northern Sweden) at 15:41 LT (UT + 1 hour). (b) and (c) show horizontal wind speed and temperature, respectively, at 18 UT, as derived from global analysis data. The black line marks the cloud edge, the cross is the location of observation; white lines indicate existence temperatures for different PSC types. (d) displays the buoyancy frequency, indicating nearly unchanged conditions for several hours.

- We found that, during the period of observation, strong homogeneous winds were blowing across the mountain range. This triggered the formation of lee waves behind the mountains. The waves propagated from the lower troposphere up to the stratosphere where they resulted in a temperature modulation that caused the long cloud edge to form along the mountain range.
- For the observed quasi-stationary cloud edge a standing wave is required which needs horizontal winds with 40 m/s wind speed. Such wind speeds were present in the lower troposphere at about 3 km altitude.