

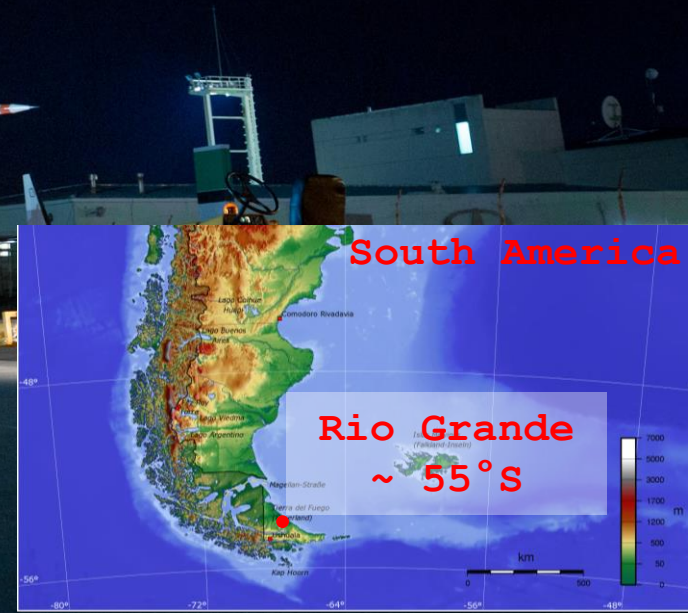
Mountain waves penetrating into the mesosphere observed by airborne lidar

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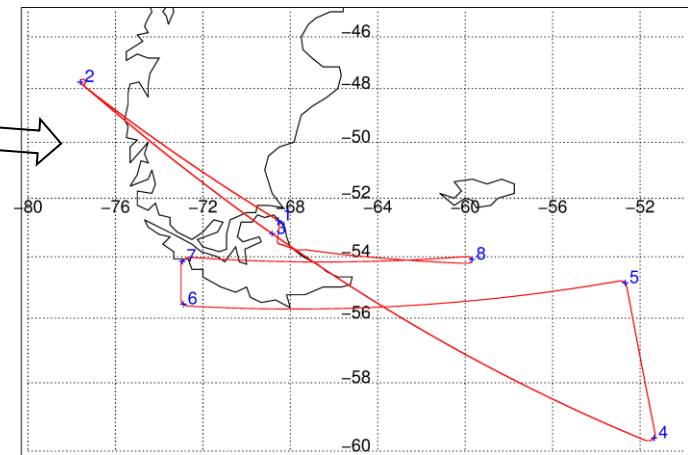
The ALIMA lidar
onboard the research
aircraft HALO



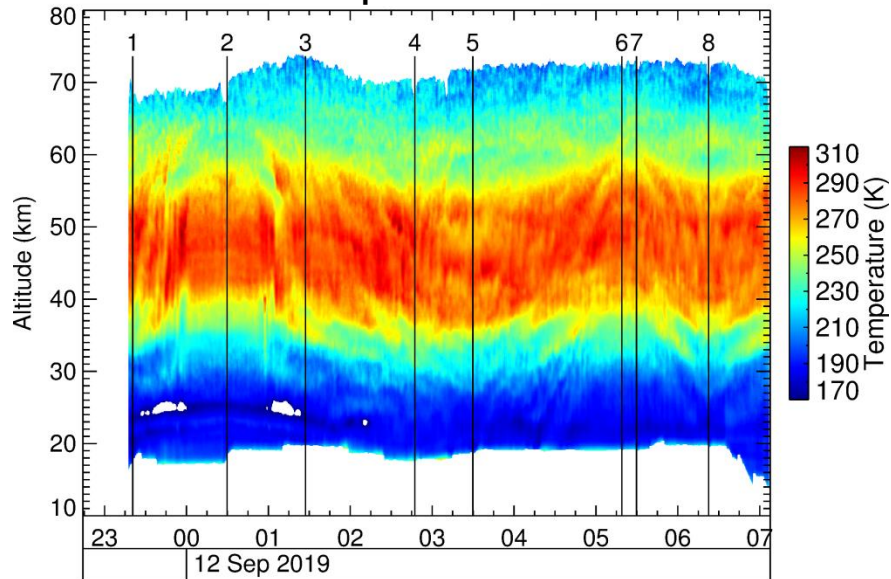
Flight ST08

11/12 September

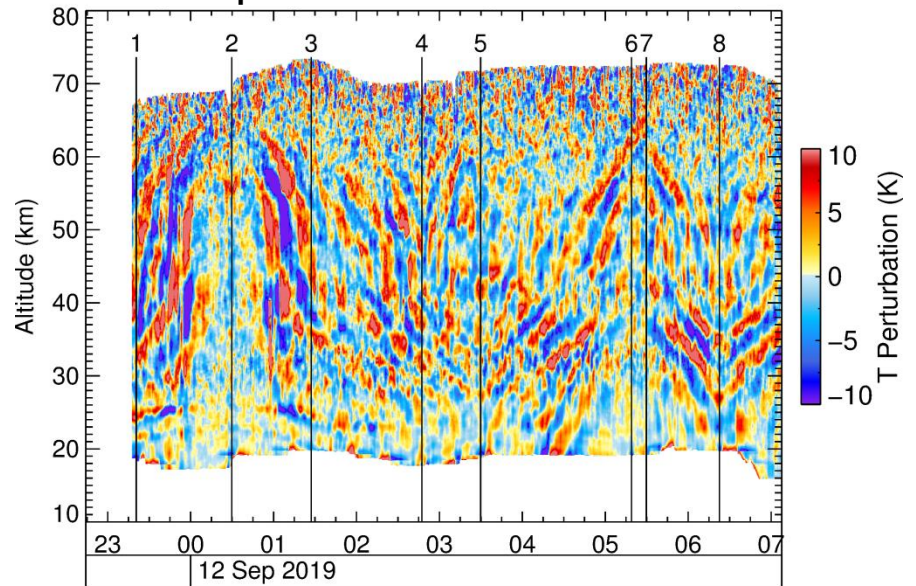
Wind



Temperature



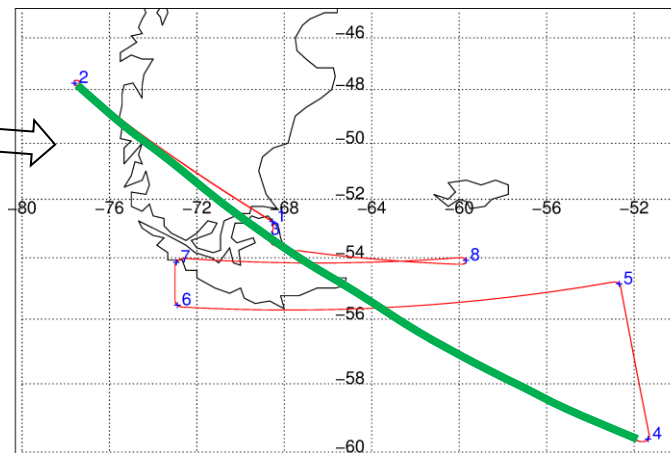
Temperature Perturbations



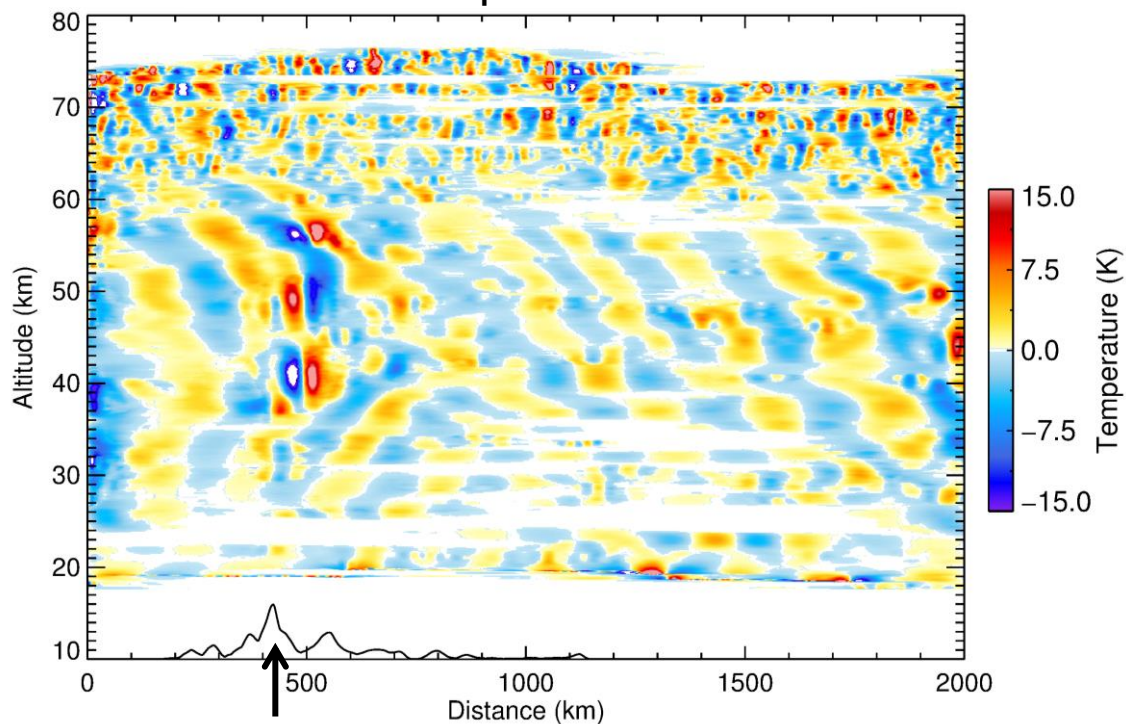
Flight ST08

Second mountain leg

Wind →



Filtered Temperature Profiles



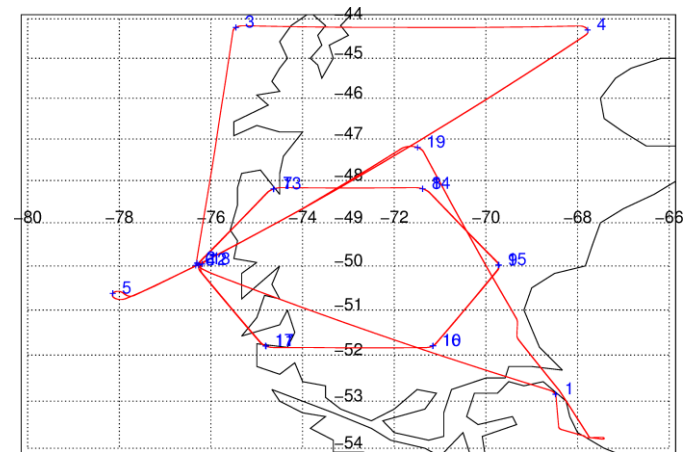
Southern Andes

- Mountain waves reach about 60 km altitude before breaking
- Excitation of secondary waves
- Mountain waves extend several hundred kilometers downstream

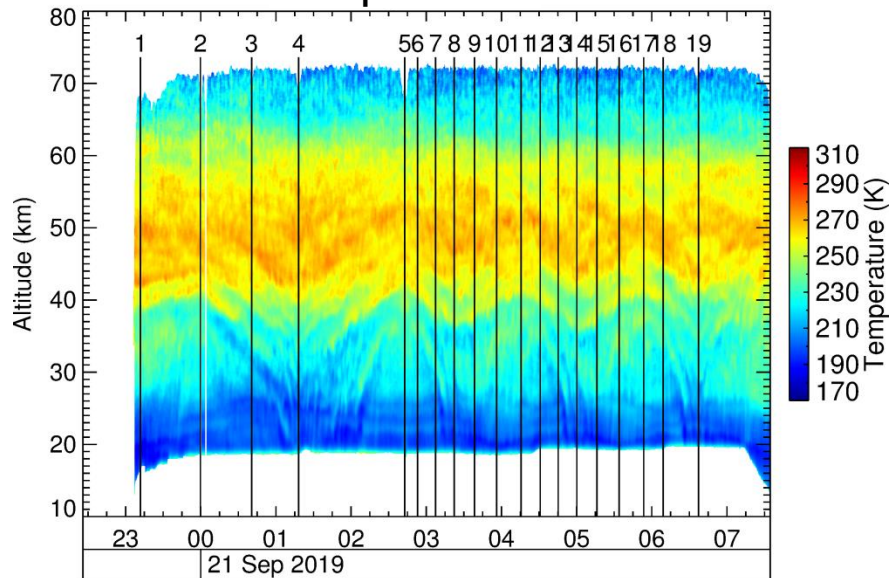
Flight ST12

20/21 September

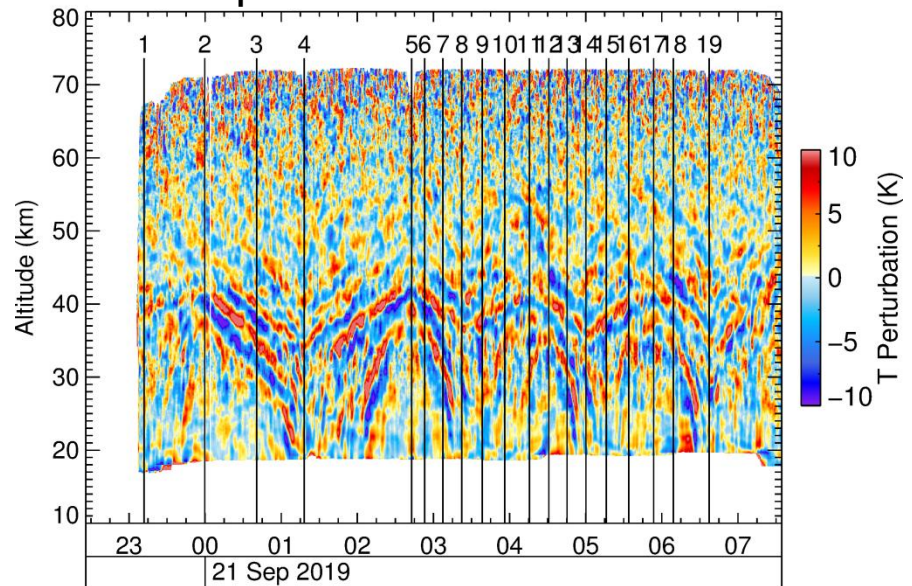
Breakdown of the vortex;
Low horizontal wind speeds in the
mesosphere



Temperature

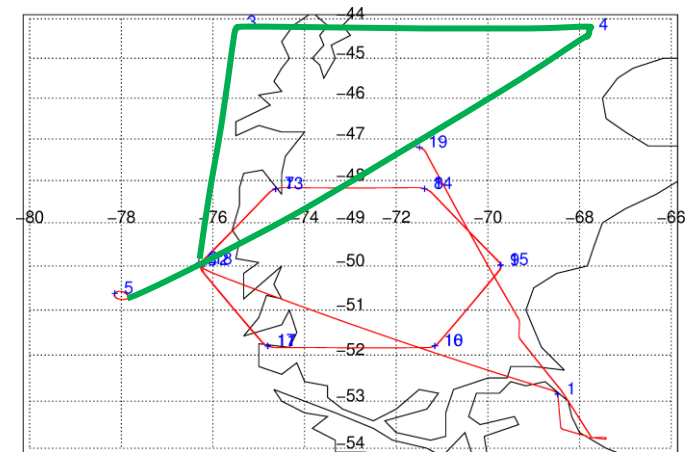


Temperature Perturbations

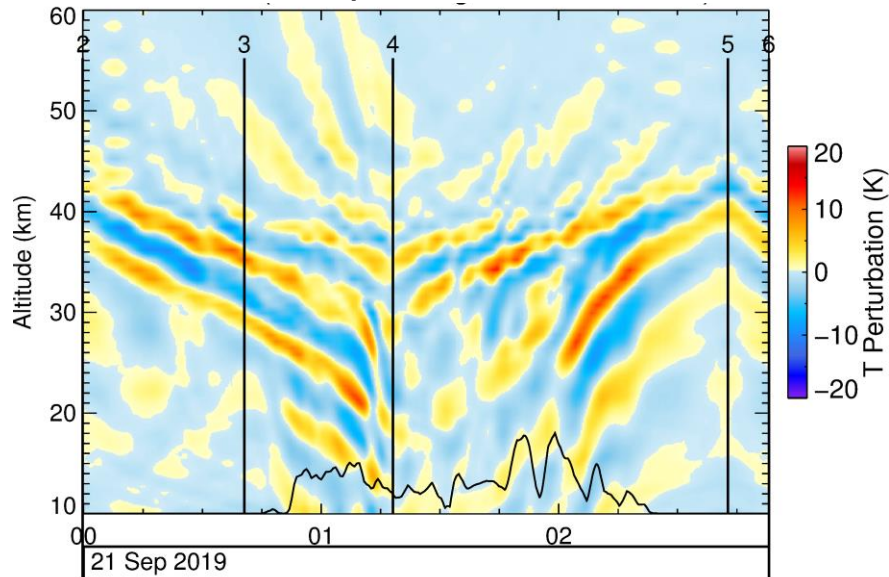


Flight ST12

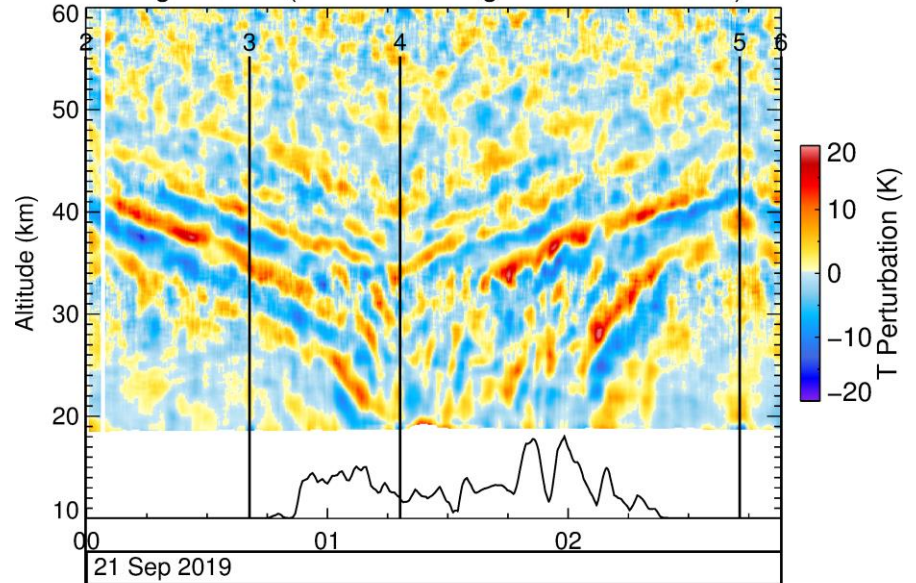
- Mountain waves upstream of mountains
- Critical level at approx. 40 km
- Good agreement with ECMWF forecasts



ECMWF Temperature Perturbations

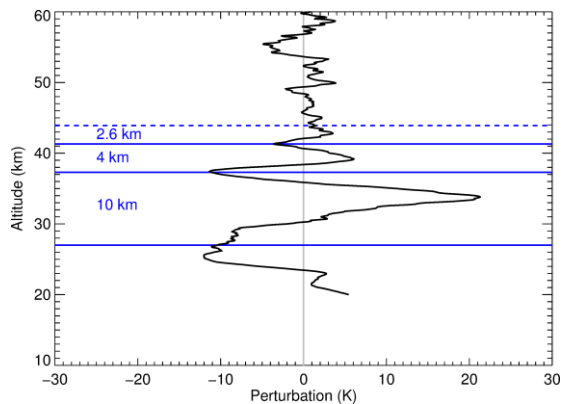


Lidar Temperature Perturbations

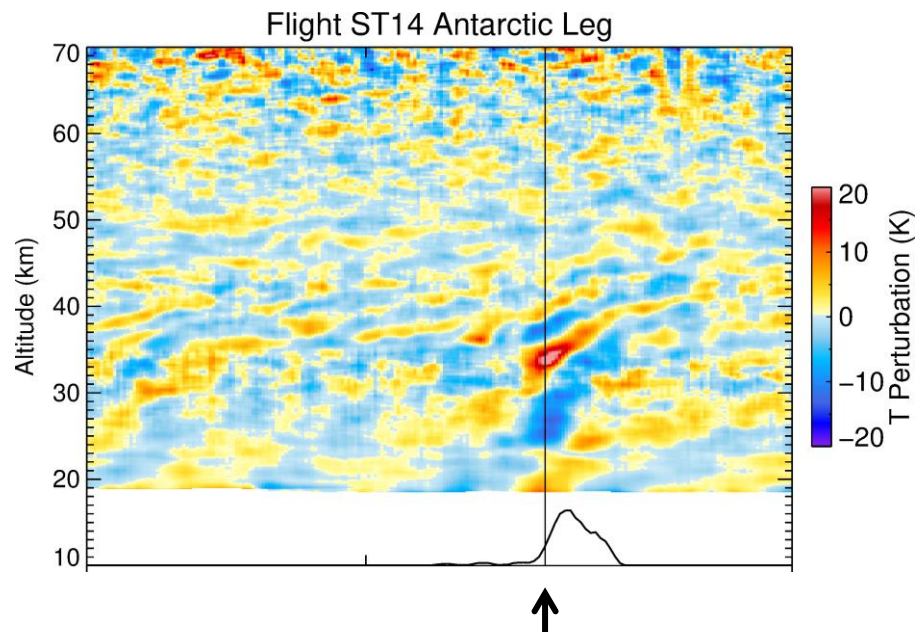
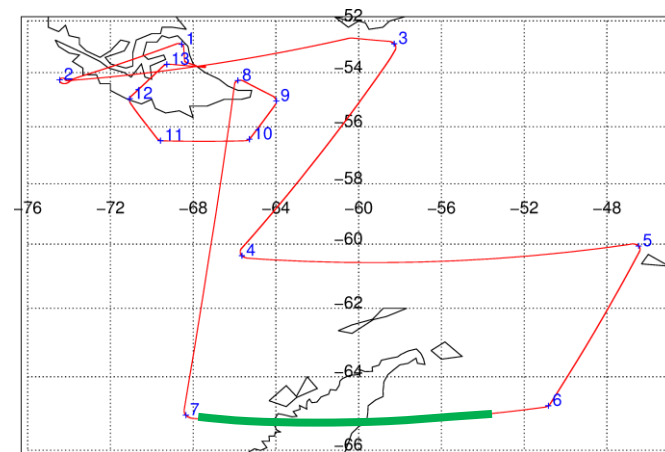
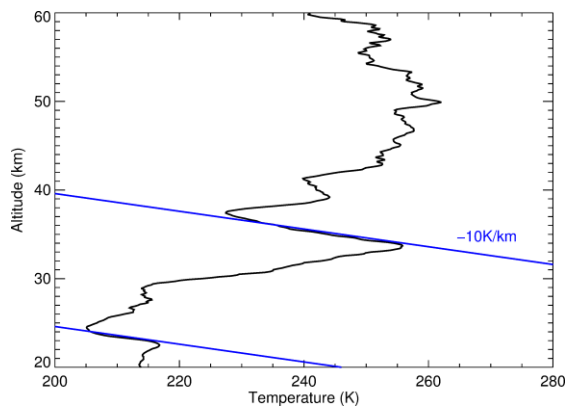


Flight ST 14 (26/27 September)

- Shortening vertical wavelength due to decreasing horizontal wind speed



- Adiabatic temperature gradient limits amplitude growth



Location of vertical profiles
(shown left)