Radiative budget in the lower tropical stratosphere from the combination of balloonborne lidar and radiometric measurements

F. Ravetta, T. Lesigne, J. Bureau, A. Hauchecorne, J. Pelon

30th ILRC 2022

BeCOOL : **B**alloonborn**e** **C**irrus and convective oversh**OO**t **L**idar

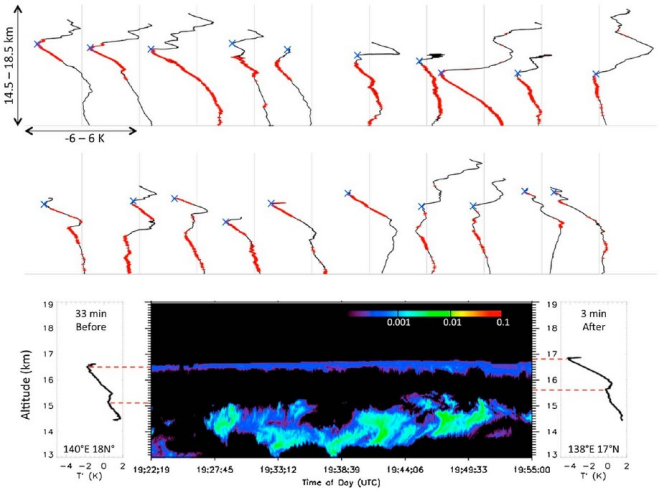
Scientific issues to be adressed with BeCOOL measurements

Life cycle of cirrus clouds and their modulation by atmospheric waves

Detection of thin clouds and satellite validation

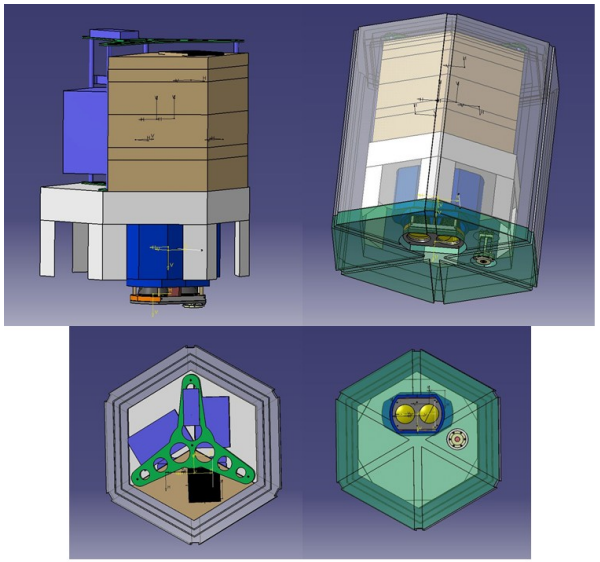
Stratospheric variability induced by volcanic and biomass burning plumes

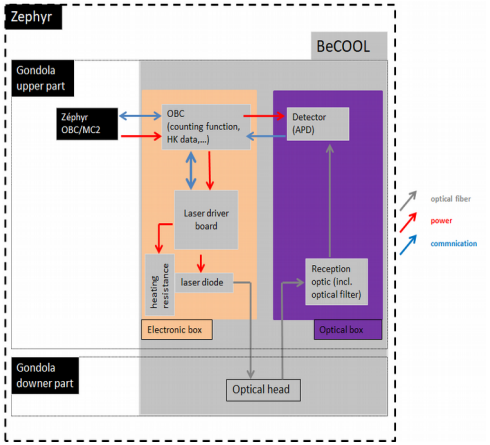
Heating rates and radiative forcing by cirrus, convective overshoot and water vapor anomalies

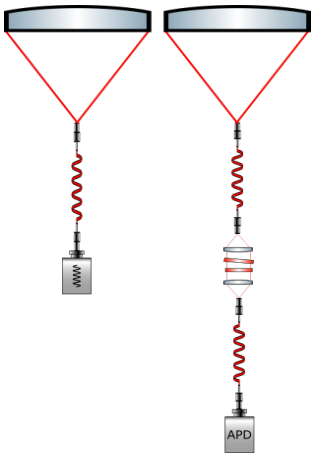


Kim et al. GRL 2016

BeCOOL : **B**alloonborn**e** **C**irrus and convective overs**OO**t **L**idar







Repetition rate/impulsion length	4.8 kHz / 150 ns
Wavelength/FWHM	~802 nm / ~0.3 nm
Impulse energy	10 µJ
Lens diameter (emission/reception)	70 mm
FOV	~ 660 µrad
Filter FWHM	0.6 nm
Optical transmission (receiver)	15-20 %

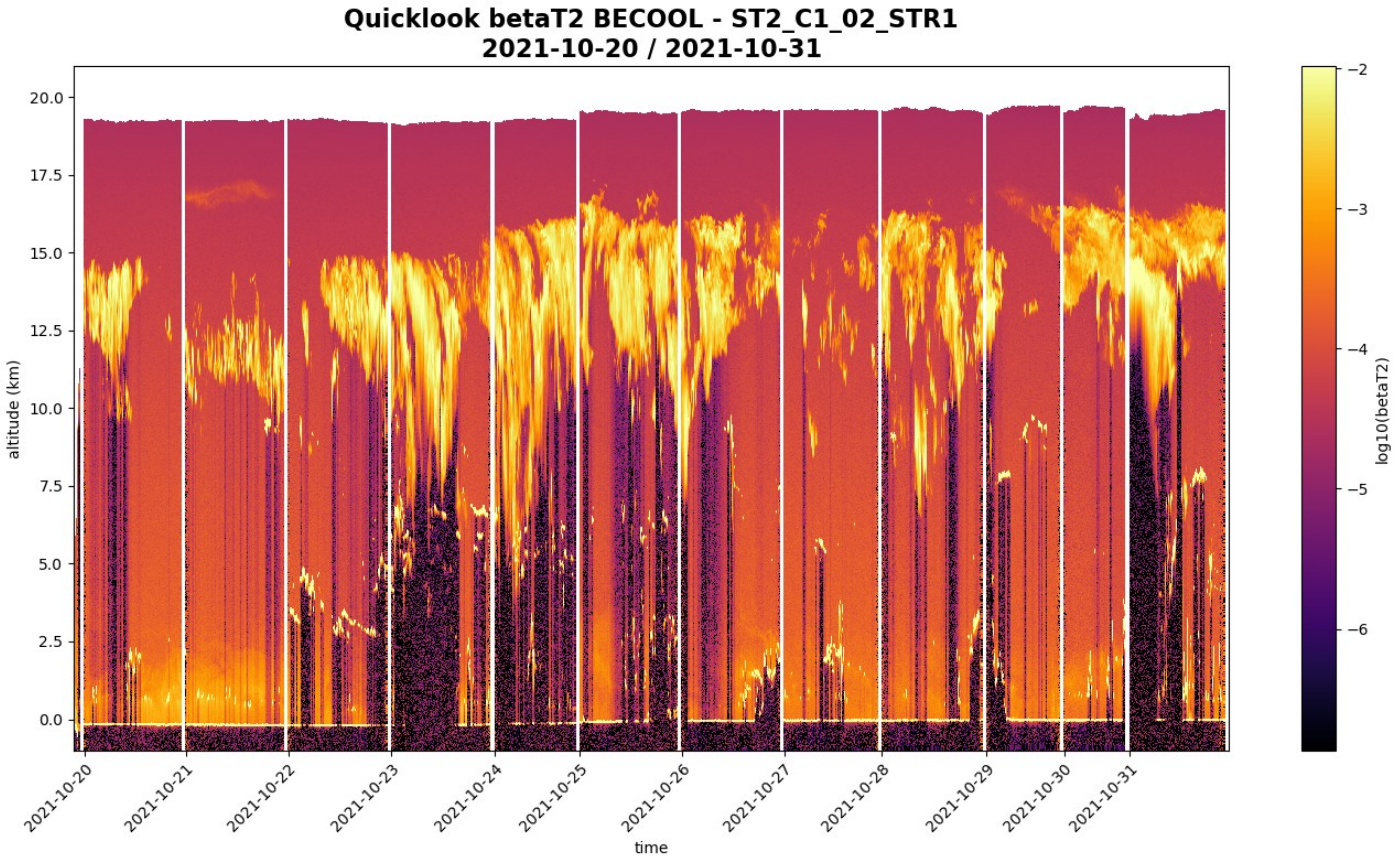
Mass 6.5 kg

Size : one third of the Zephyr gondola

Power supply : 7 W

Environment : optical head alignement optimized for stratospheric temperatures

Data flux 2 Mo per day



Vertical sampling : 15 meters

Horizontal resolution (Balloon drift) : 0.1-1 km

Nighttime observations of Cirrus, Convective clouds and overshoot, Aerosol layers, Marine boundary layer

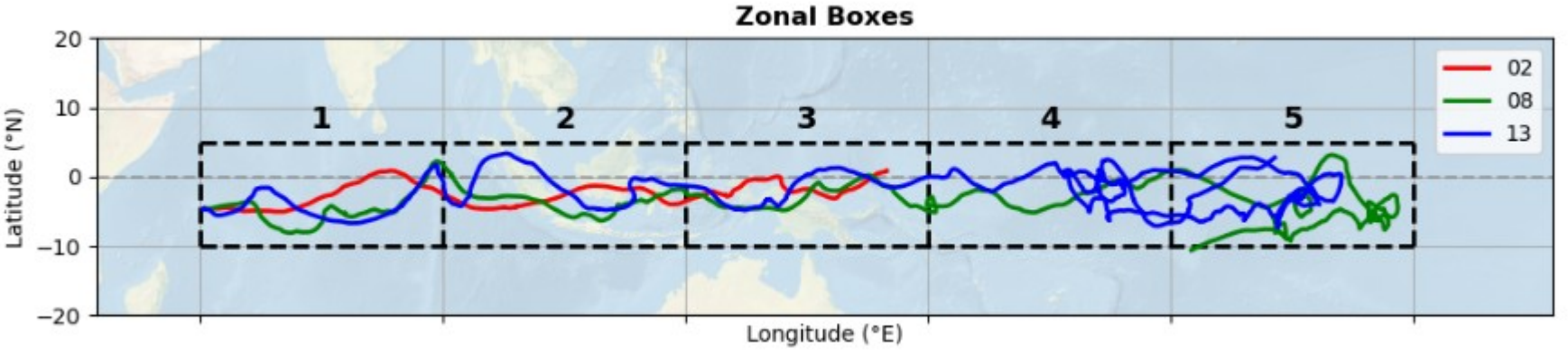
Geometrical characterization : altitude, thickness

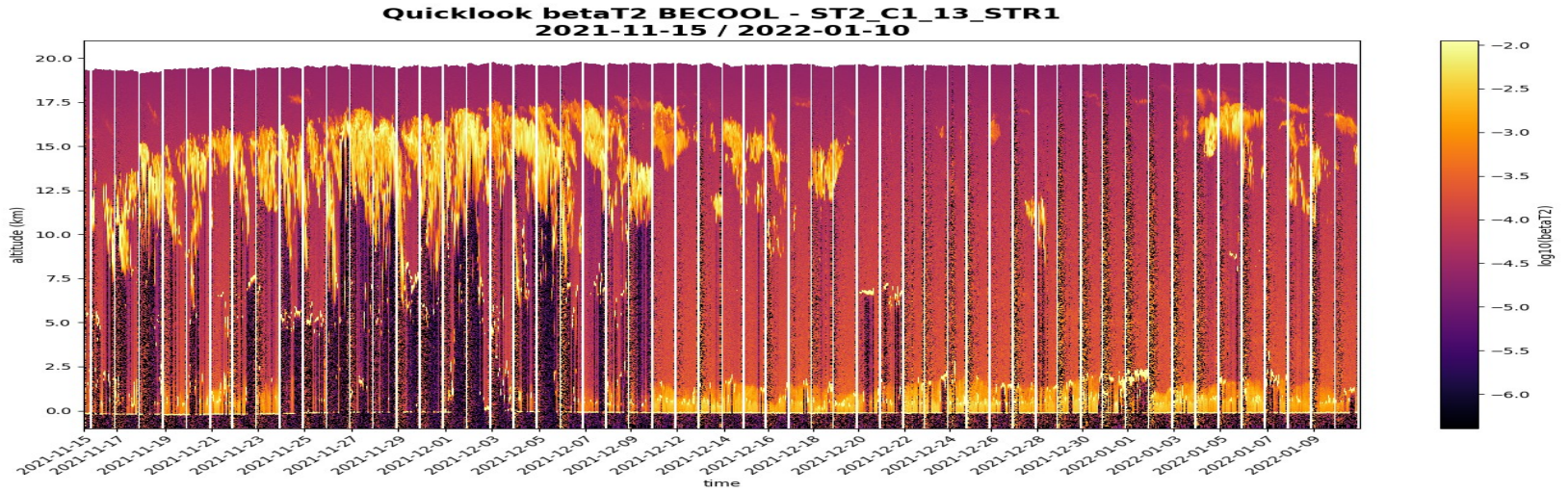
Optical characterization : backscatter profile, optical depth

Strateole2 C1 campaign

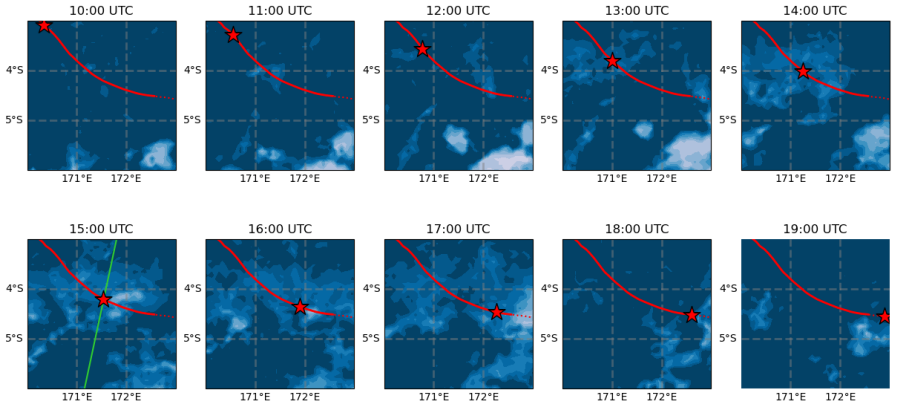
October 2021- February 2022 (December 2021-January 2022)

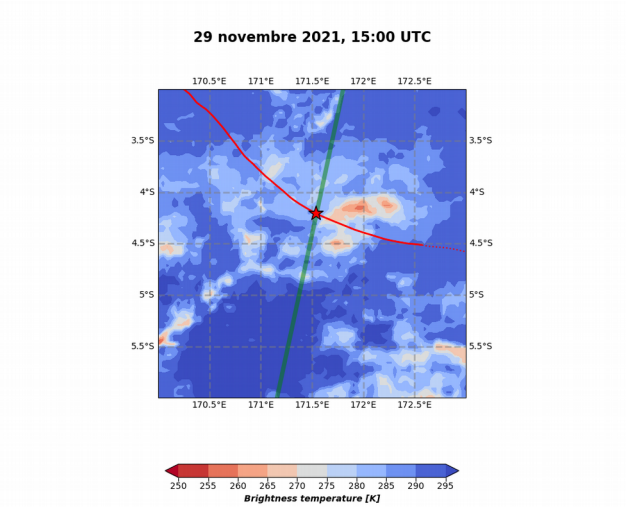
40 702 1-minute profiles (679 hours of nighttime measurements)

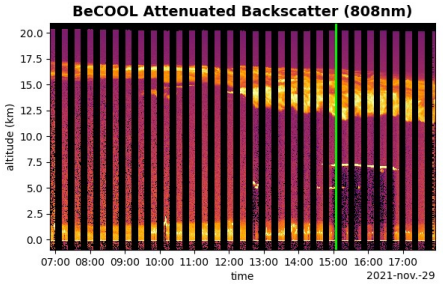


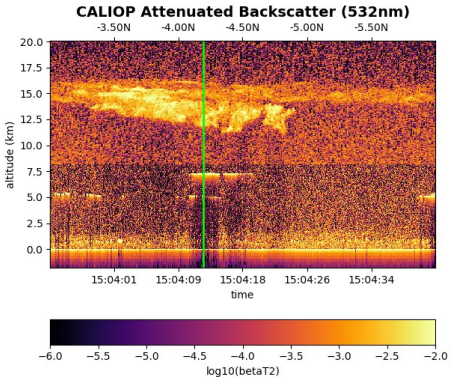


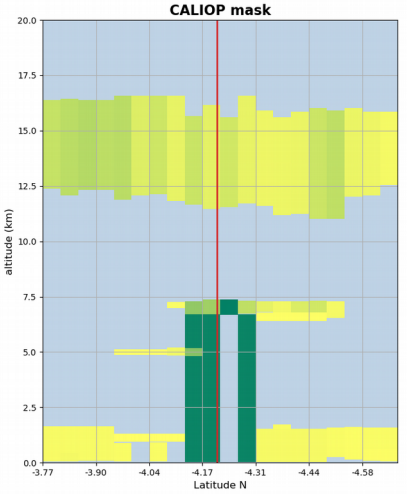
Comparison with CALIOP (case study)

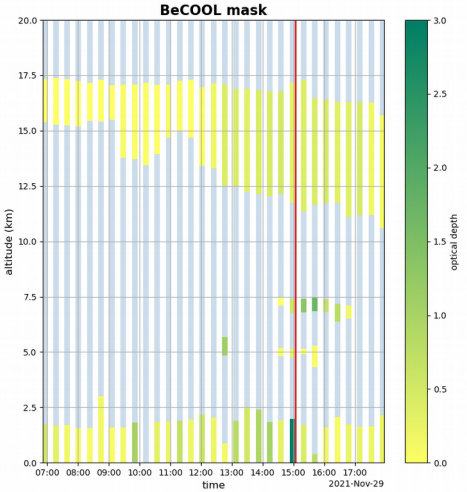












Modulation of OLR by upper clouds variability