

Updates on balloon/lidar activities in La Réunion

S. Evan, J. Brioude, V. Duflot, F. Posny, J.-P. Cammas (LACy)

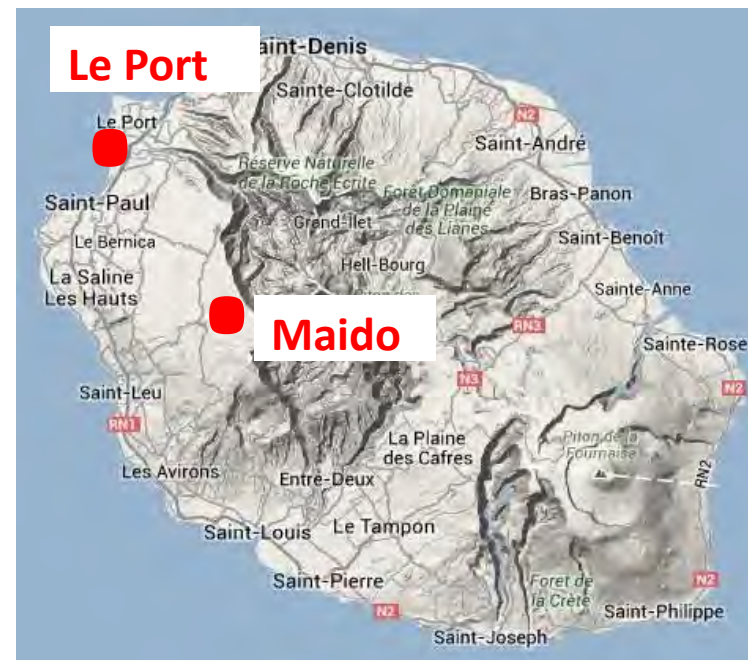
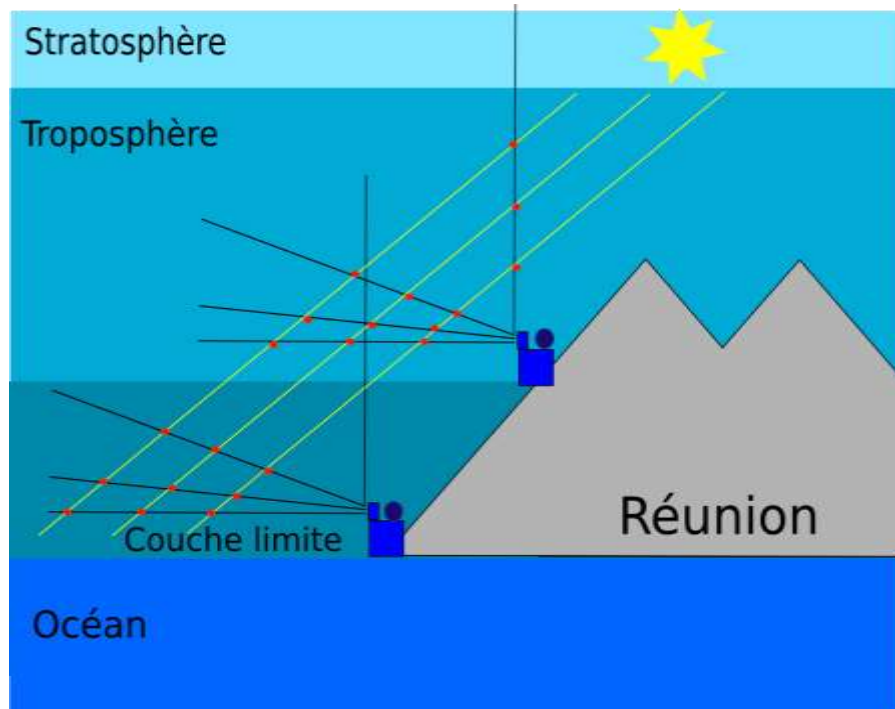
G. Payen, N. Marquestaut, J.-M. Metzger (OSU-R)

R. Dirksen (DWD), F. Wienhold (ETH), H. Vömel (NCAR)



Feb 2017: MAX-DOAS spectrometer at Maïdo

Measurements of: BrO, IO, IO₂, NO₂, SO₂, glyoxal, ozone, AOD, etc.



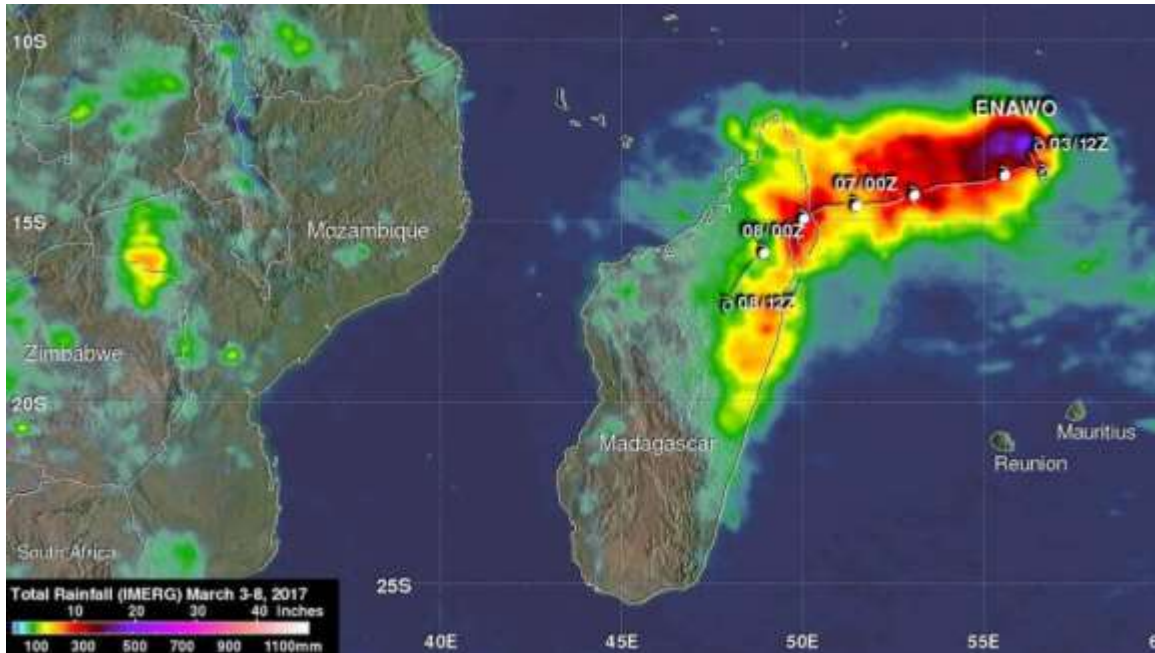
At Le Port: PI: M. Van Roozendaal (IASB), J. Brioude(LACy). Measurements since June 2016

At Maïdo Observatory: PI: R. Volkamer (CIRES), J. Brioude(LACy). Measurements since Feb. 2017. Funded by NSF

MAX-DOAS measurements are funded for at least 2 years.

The synergistic use of 2 MAX-DOAS at Reunion will allow the retrieval of 5 to 6 independent points in the troposphere and stratosphere.

Mar 2017: Tropical cyclone Enawo



GPM total rainfall March 3-8 2017



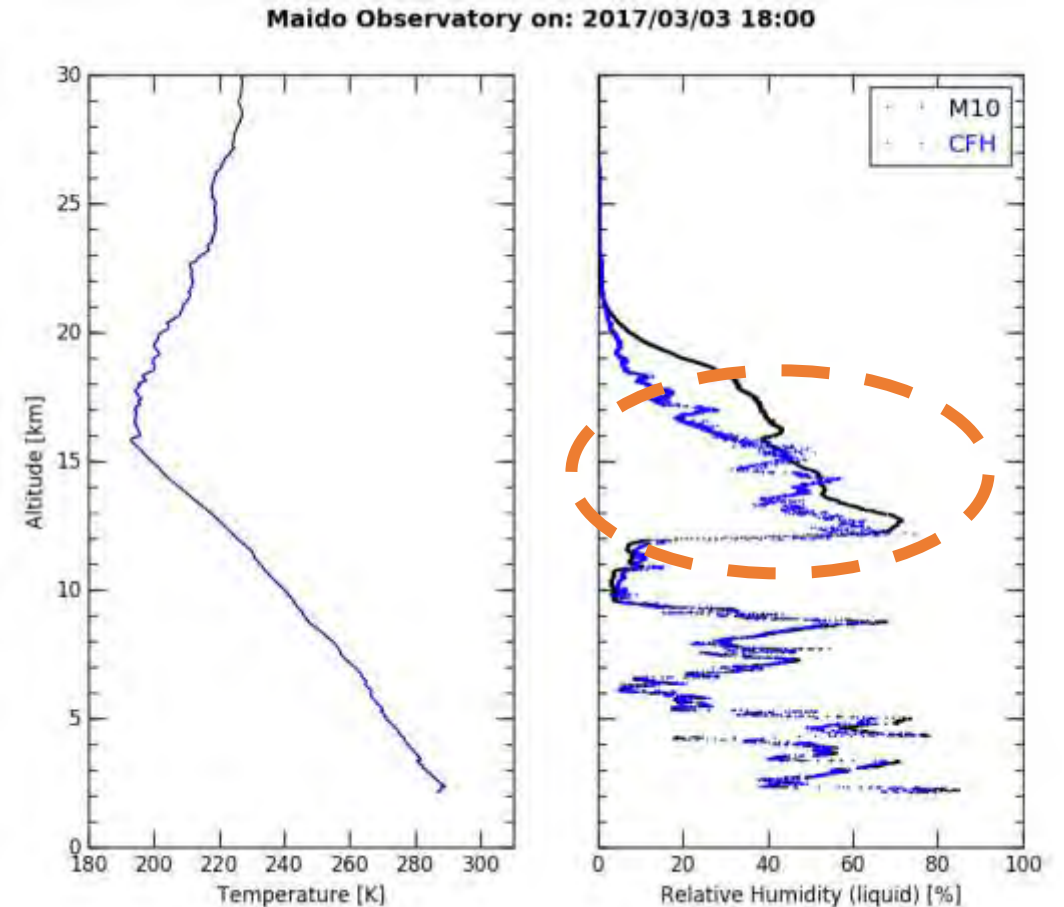
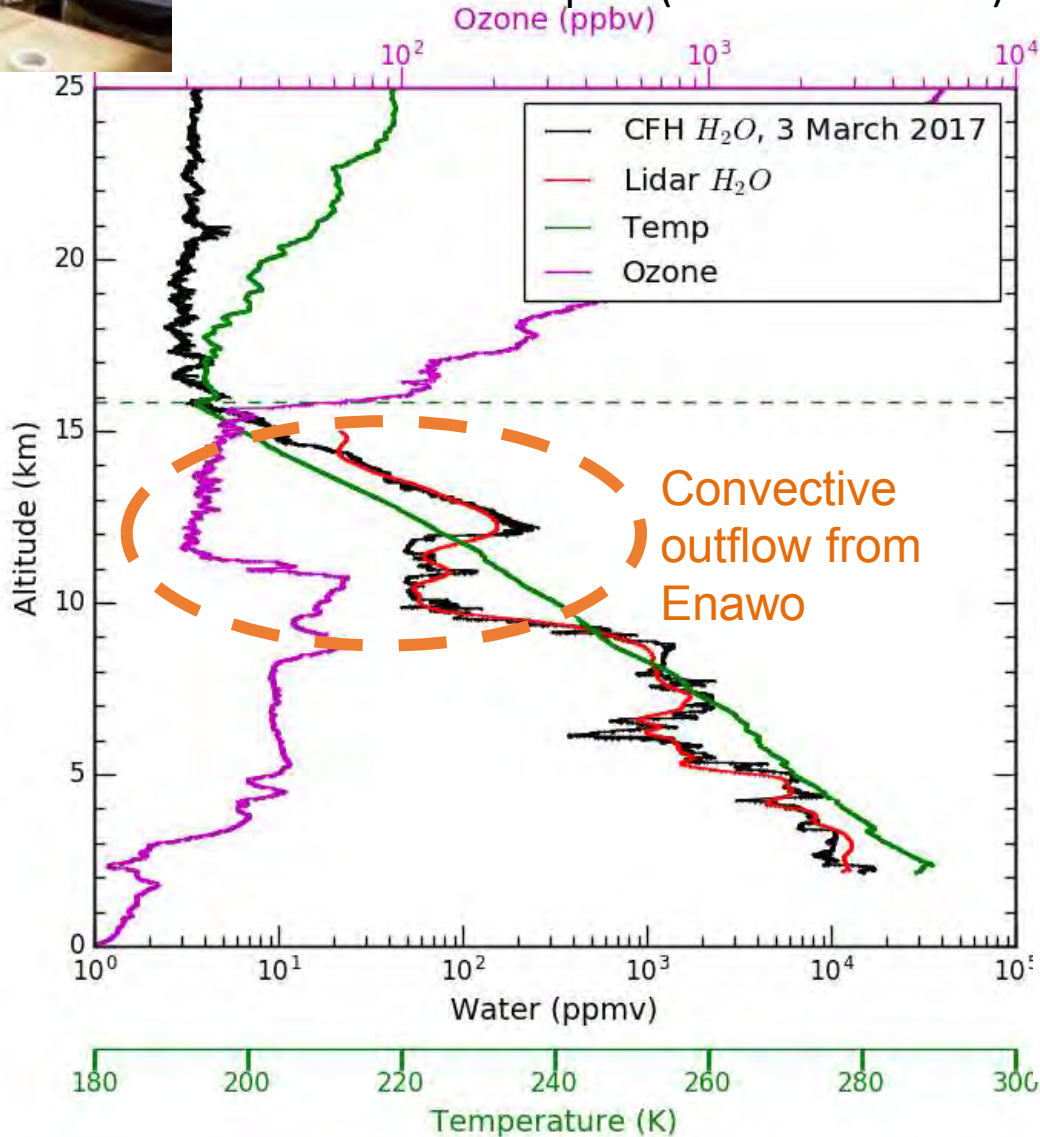
TC Enawo on March 3 at 09:54UTC

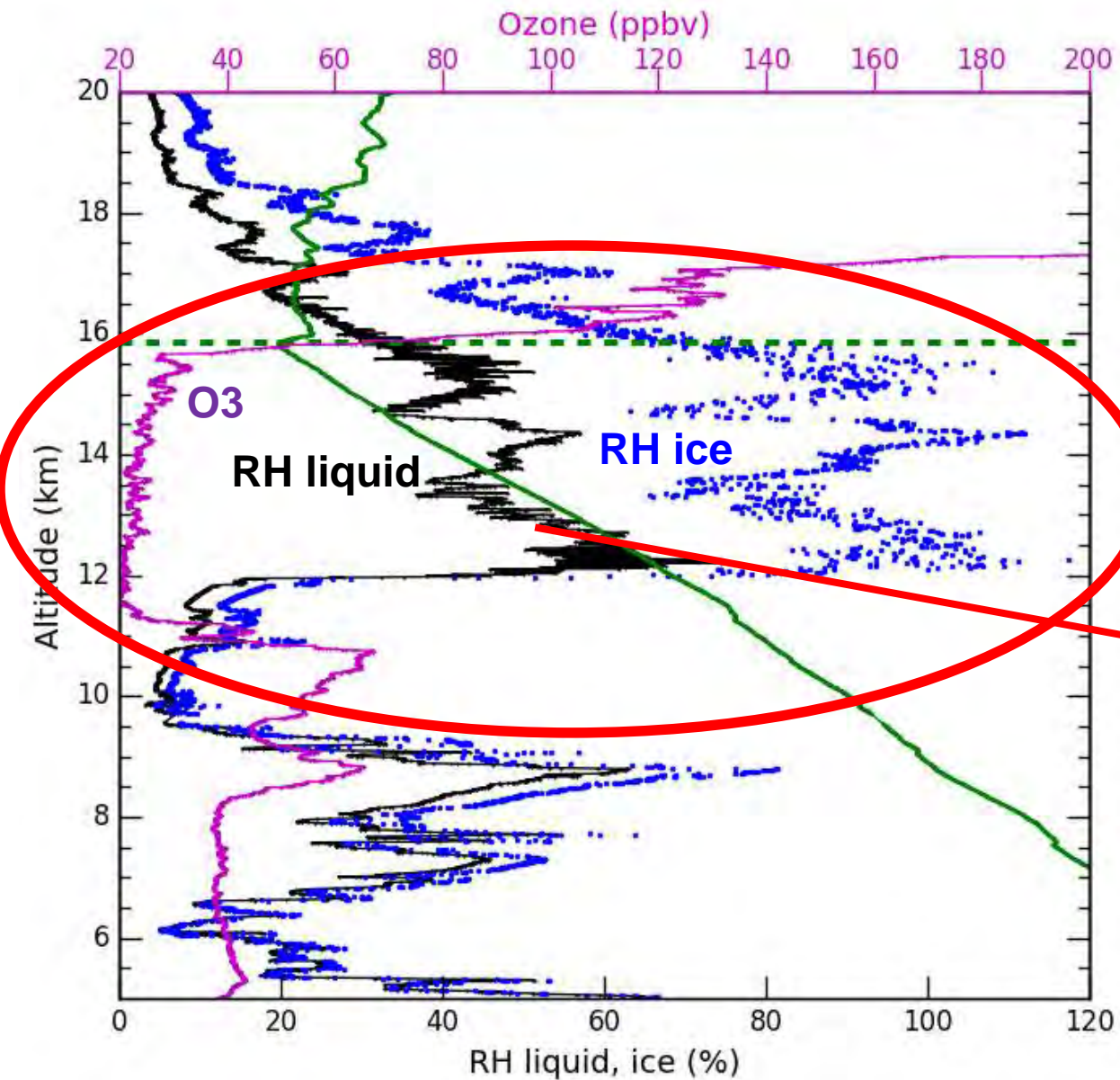
Tropical cyclone Enawo formed northeast of Madagascar on 3 March (moderate tropical storm) and strengthened into an intense tropical cyclone on 6 March (max winds at 205km/h)



Balloon launch on 3 Mar 2017

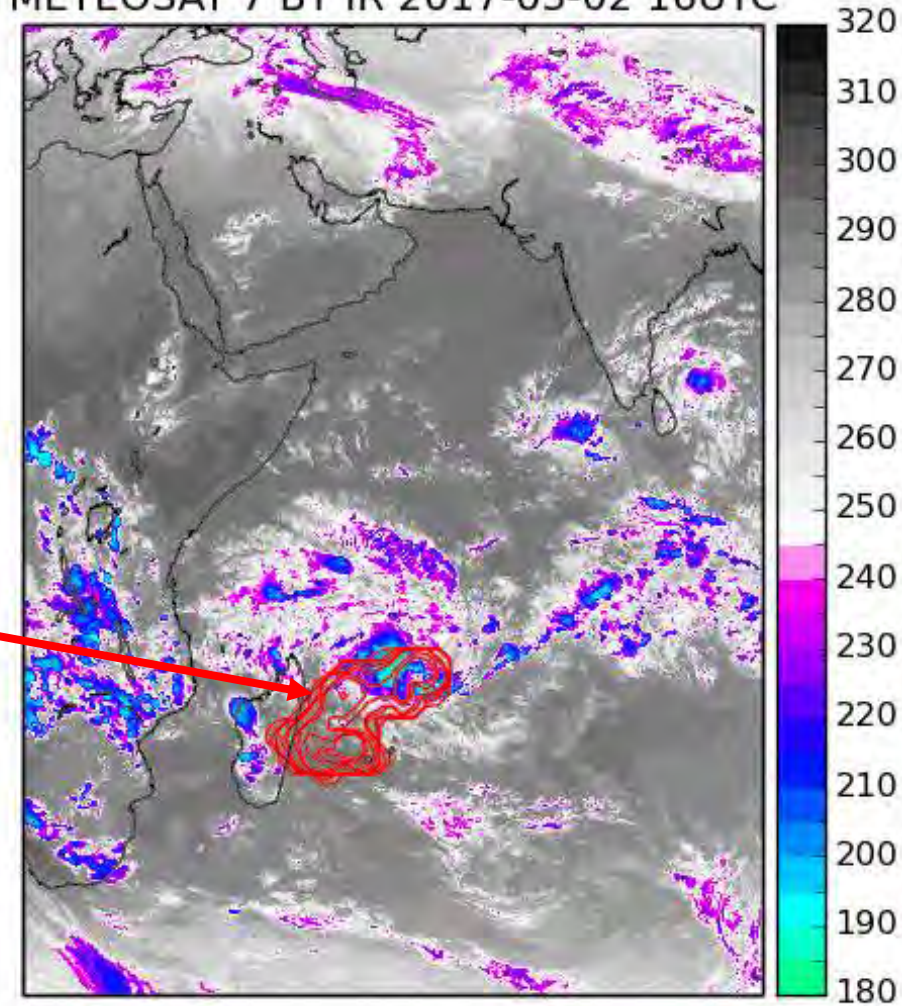
First CFH launch of the year at the observatory (night) coordinated with a NDACC/SHADOZ O₃ launch at the airport (in the afternoon) and lidars at the observatory.





**Low O3, High humidity =
Convective outflow**

FLEXPART TIME=2017-03-03 16UTC 15500m
resid. time at 15500m, analysis=20170303 12UTC
METEOSAT 7 BT IR 2017-03-02 16UTC



Dispersion of air mass at 15 km, 24h before launch time, from FLEXPART backtrajectories initialized at 15km from Maïdo

TNA ACTRIS SHUTLS May 2017

Visits of Ruud Dirksen and Frank Wienhold from ETH.

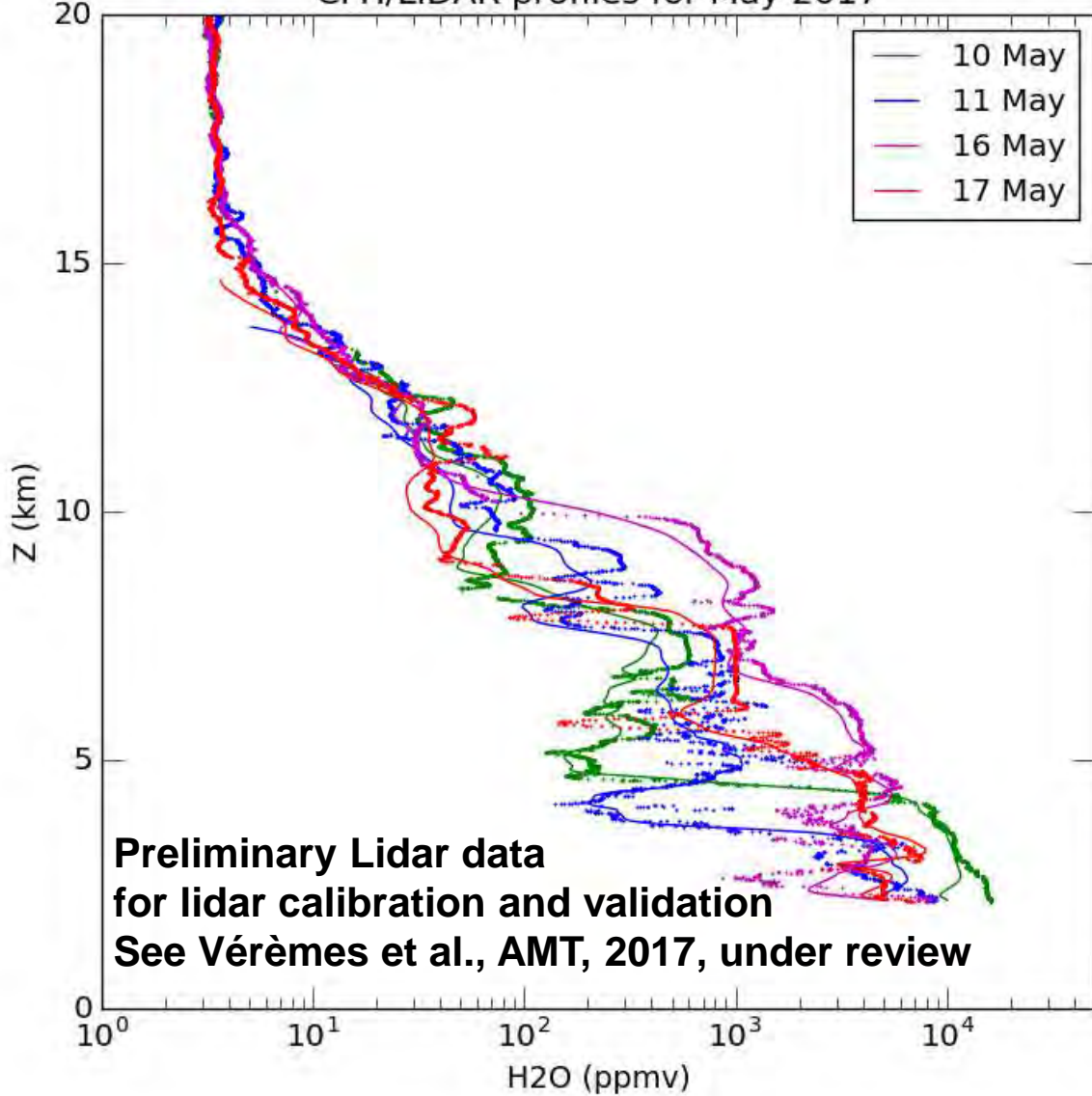
- 4 soundings during two weeks (May 9 to May 18) with CFH, COBALD, POPS and O3 in coordination with lidar measurements
- Continue training on COBALD/CFH
- Comparison Lidar+CFH+M10
- Test COBALD+POPS
- Meeting with local Météo-France and staff from LACy/OSU-Réunion to discuss about GRUAN in La Réunion



Water vapor Lidar integration time

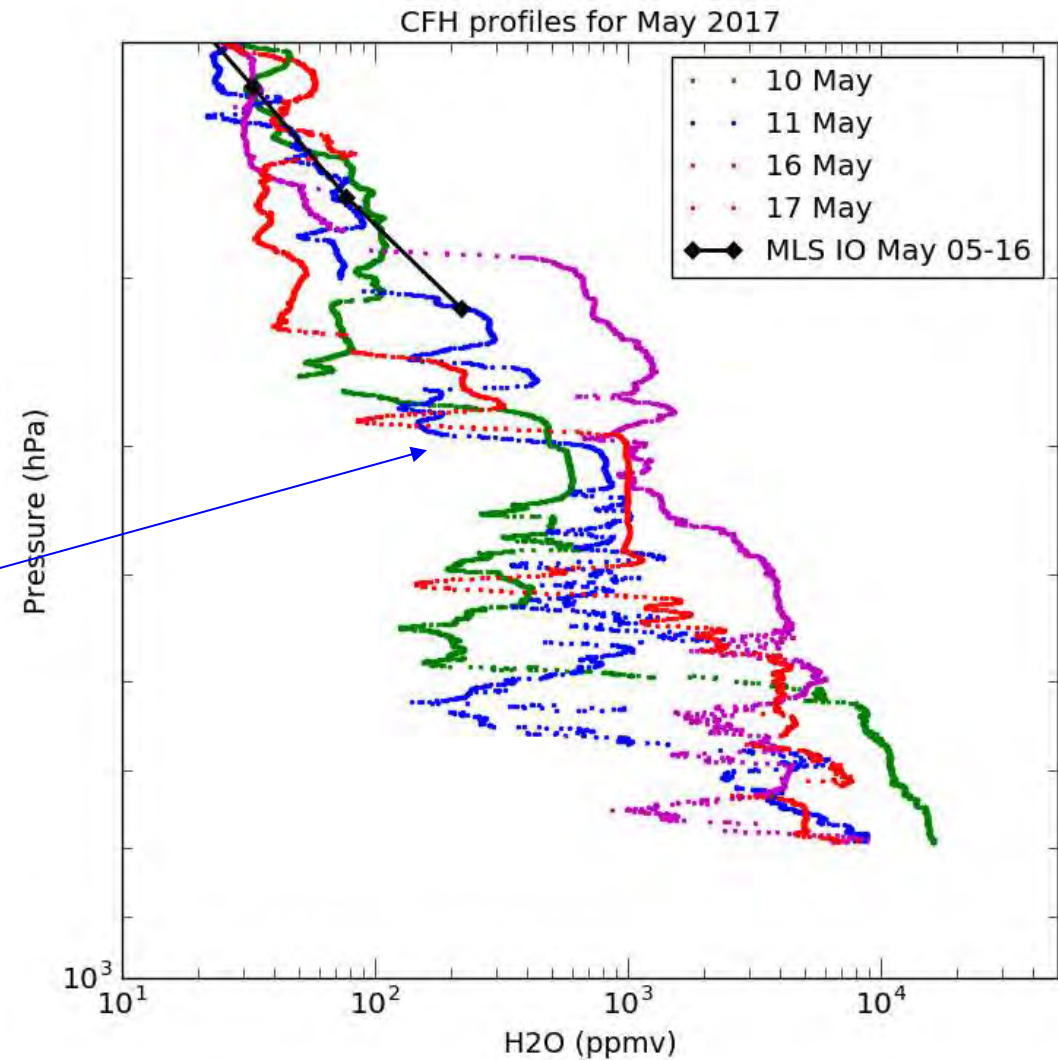
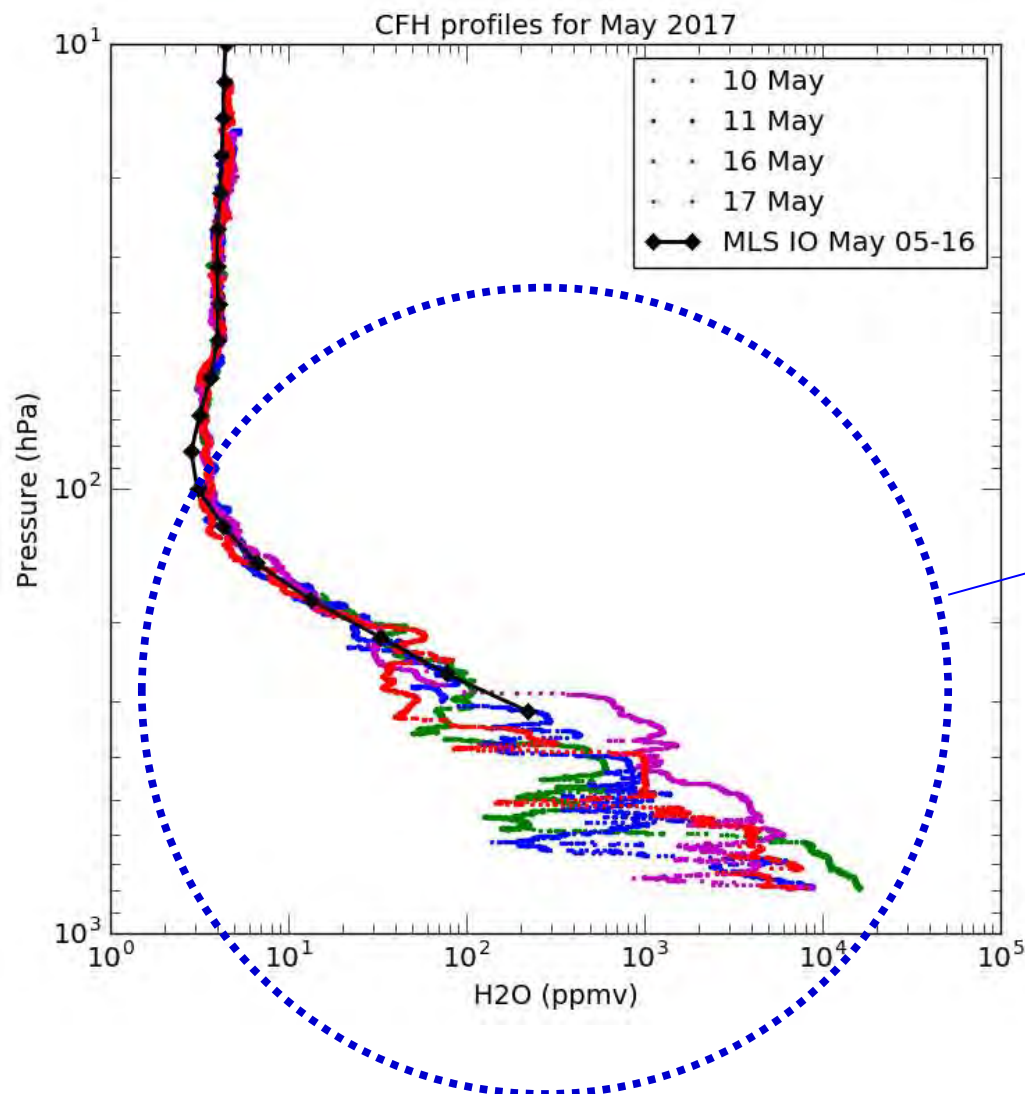
9 May	10 May	11 May	15 May	16 May	17 May	18 May
378min	266min	490min	359min	471min	374min	316min
x	CFH	CFH	x	CFH	CFH	x

CFH/LIDAR profiles for May 2017

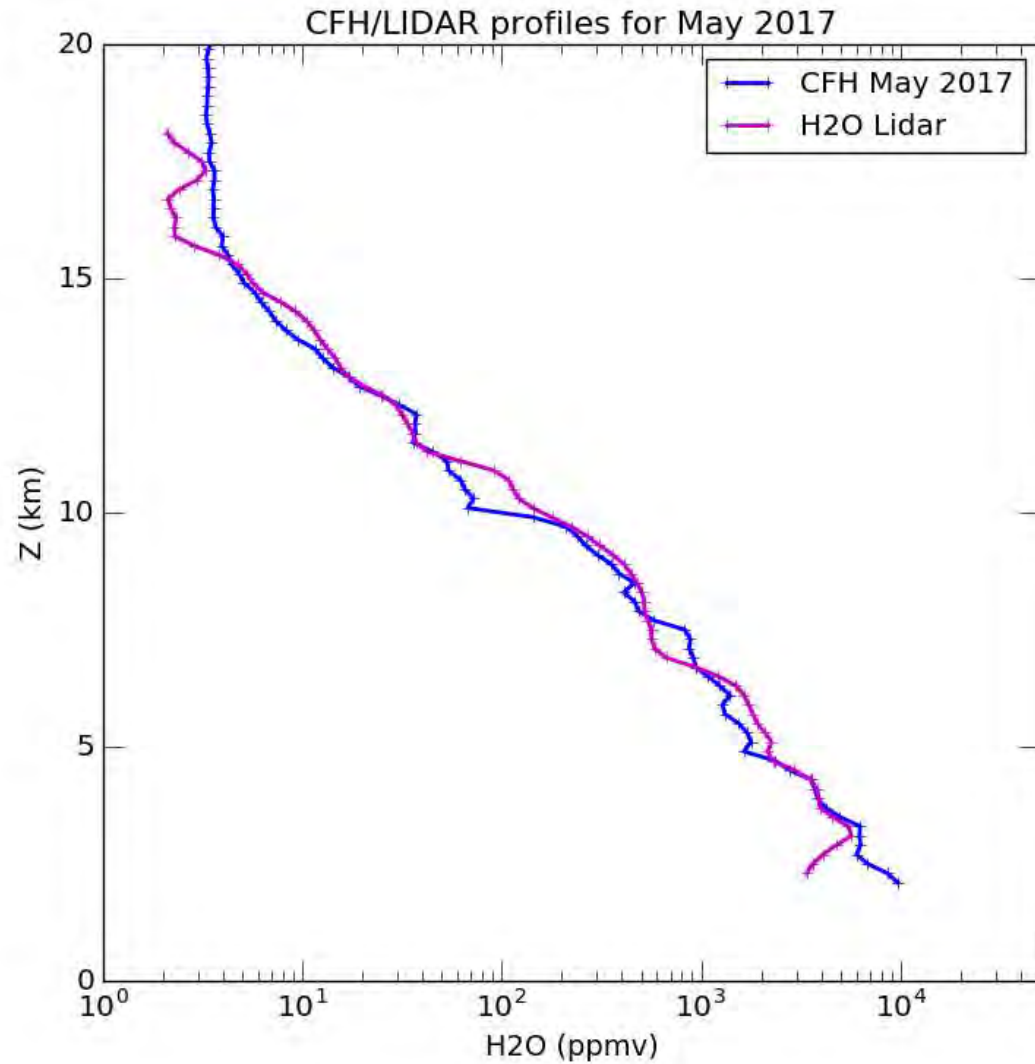


TNA ACTRIS SHUTLS May 2017 : Water vapor

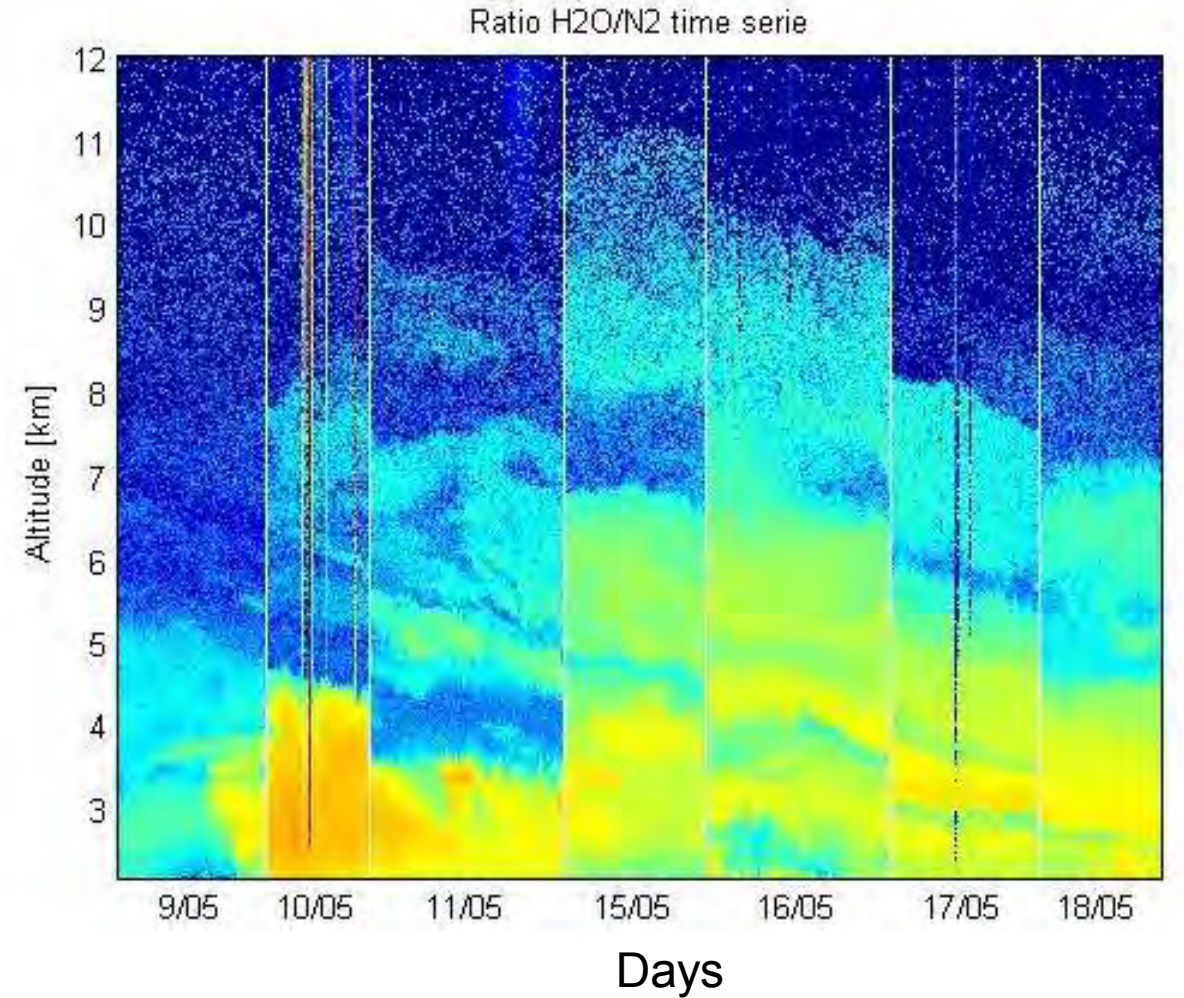
MLS data from SWOOSH (Davis et al., 2017)



Mean Lidar/CFH H₂O profile for May 2017



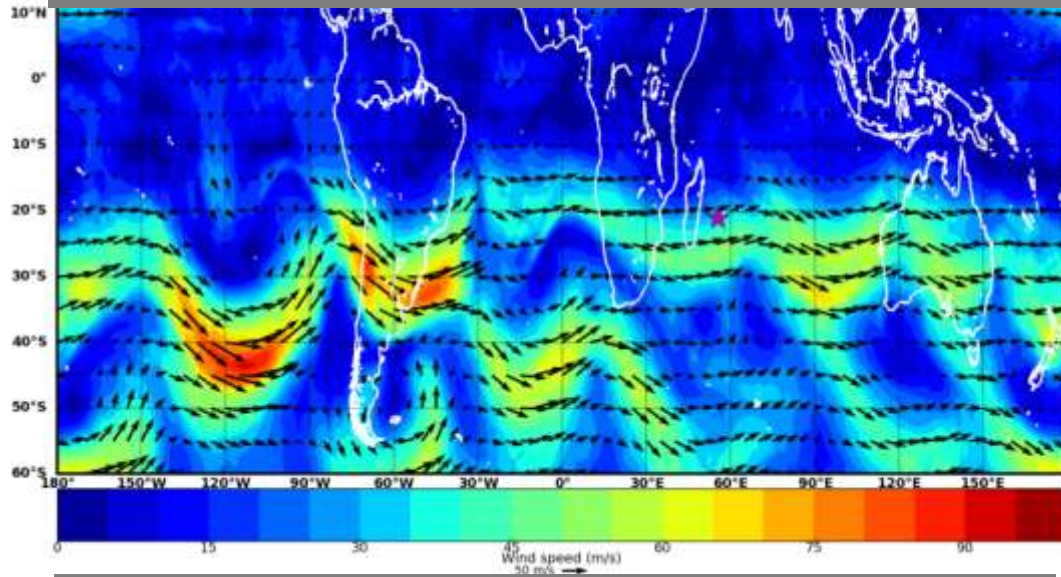
Campaign mean water vapor profiles



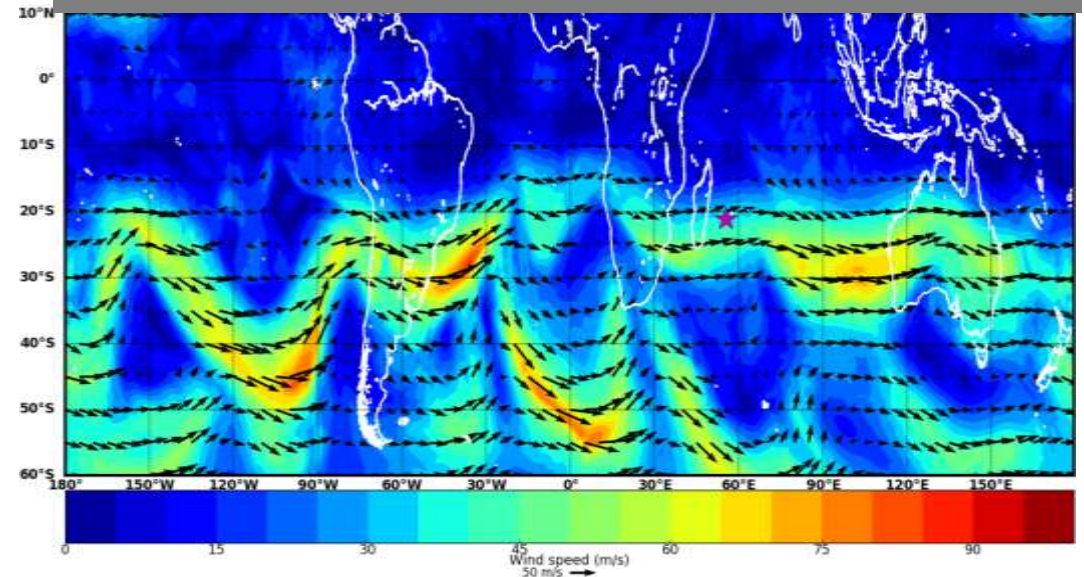
Time series of individual non calibrated Lidar profiles

May 2017 : Synoptic conditions

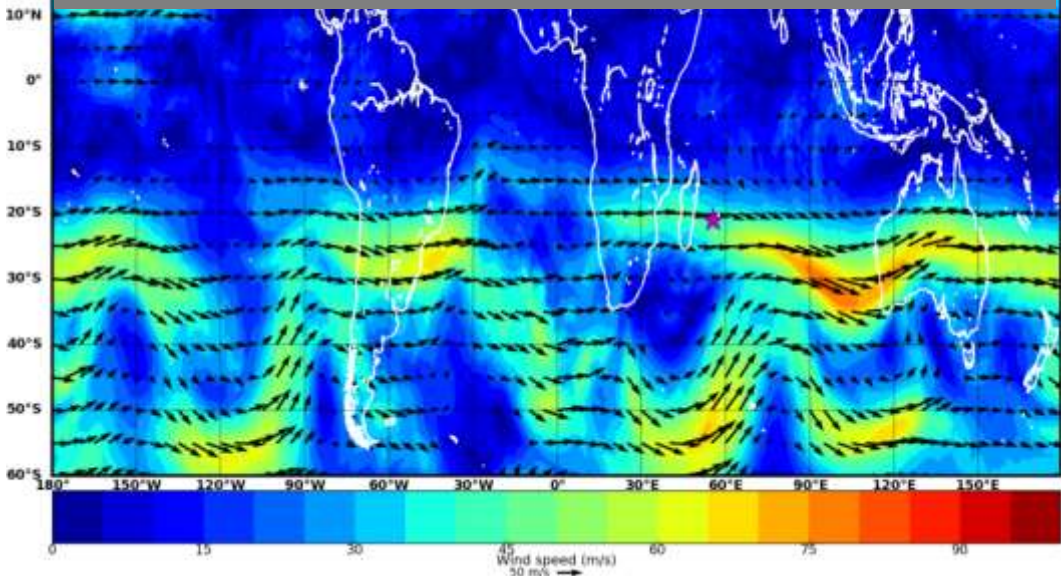
ECMWF winds @200hPa 10/05 18UTC



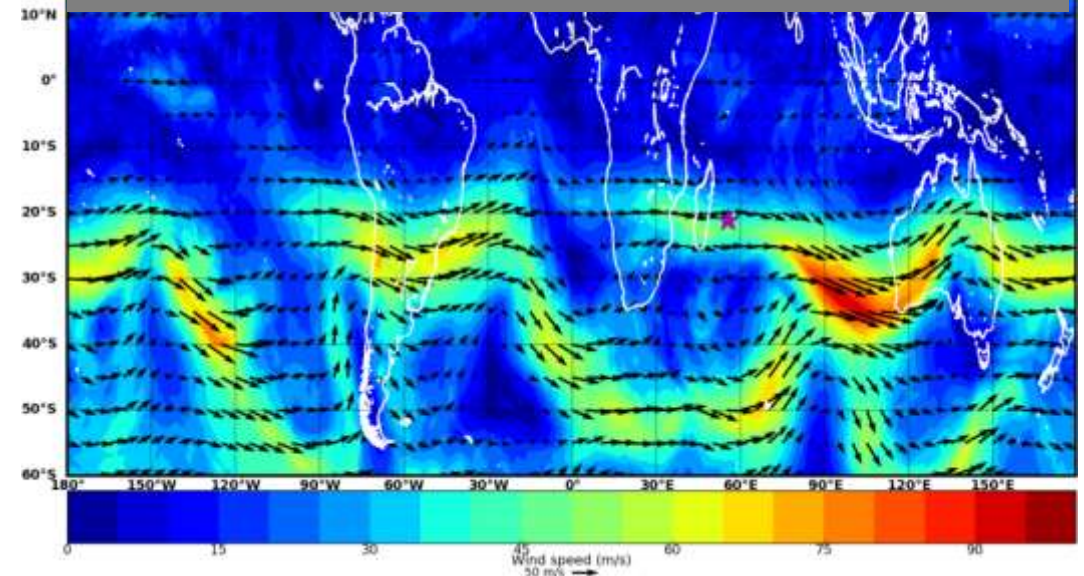
ECMWF winds @200hPa 11/05 18UTC



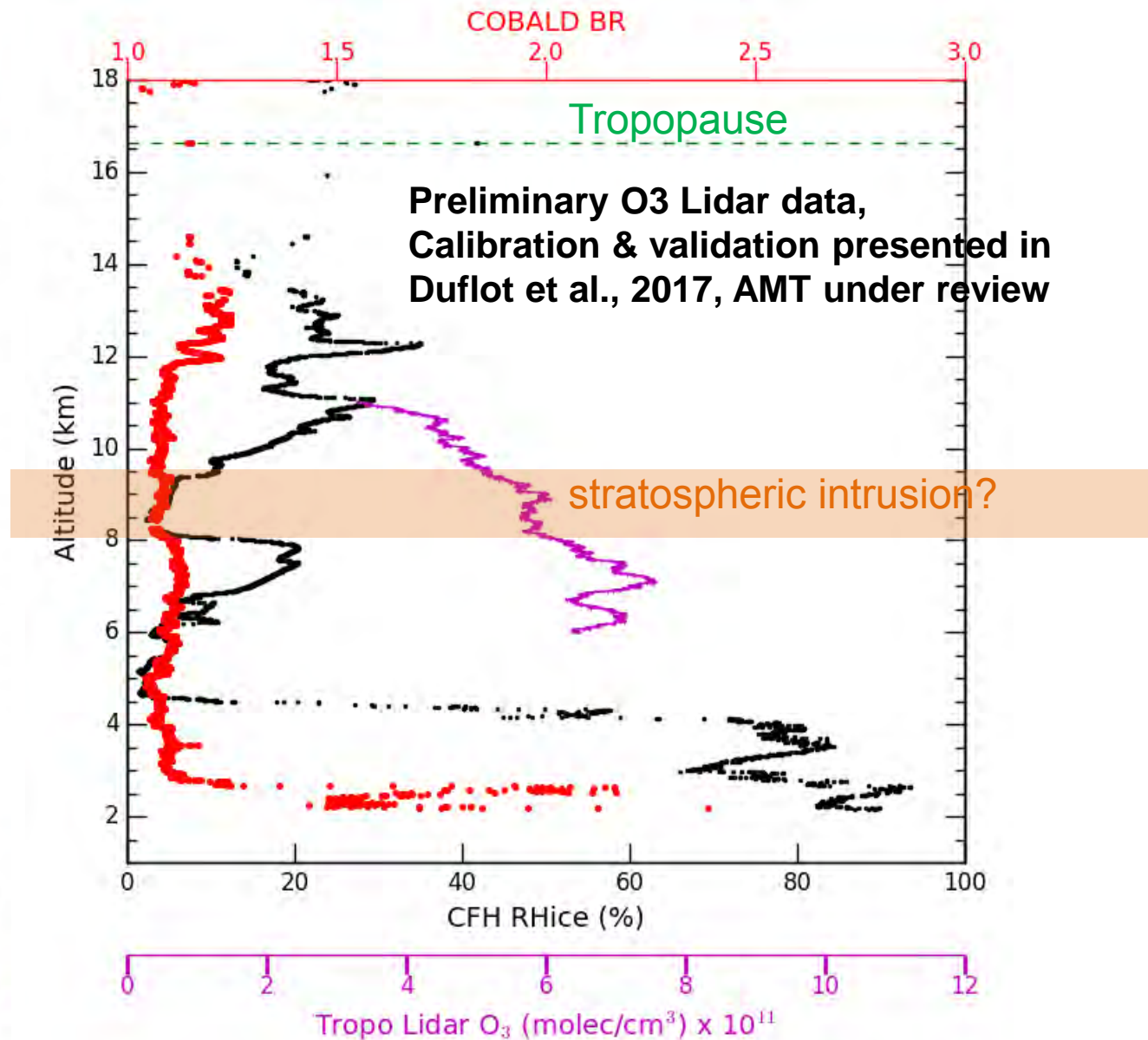
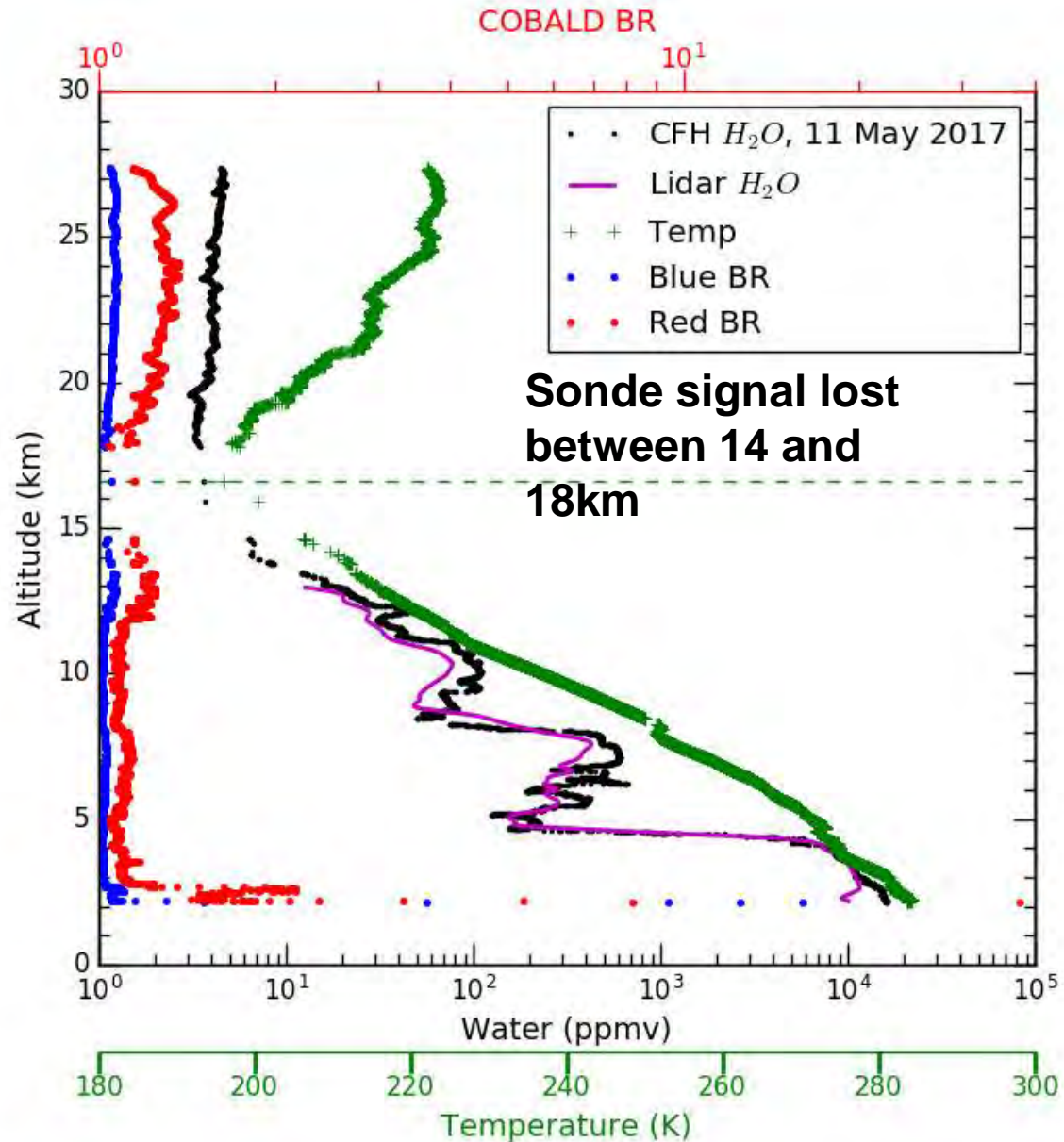
ECMWF winds @200hPa 16/05 18UTC



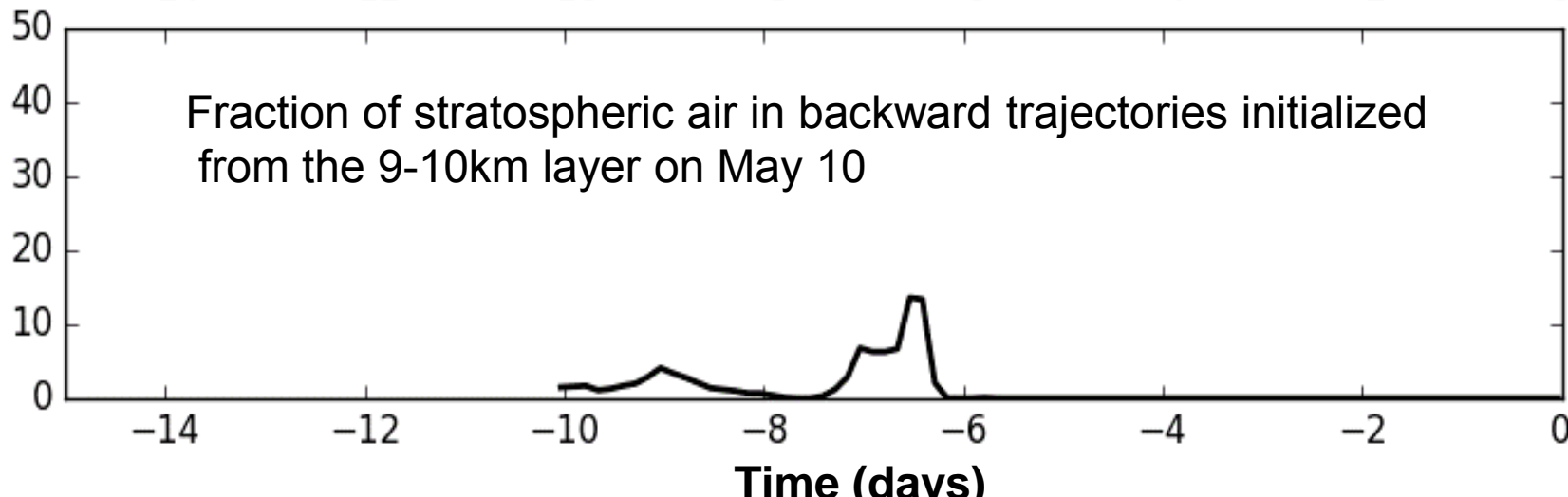
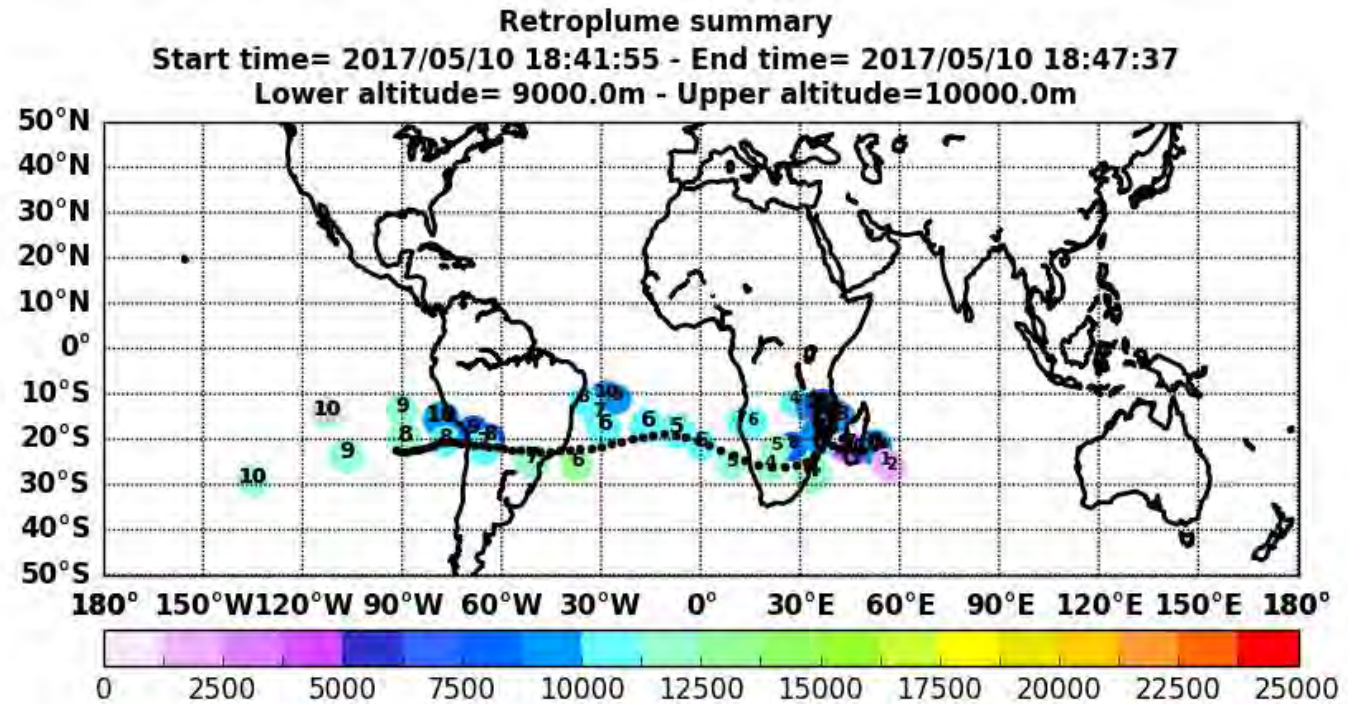
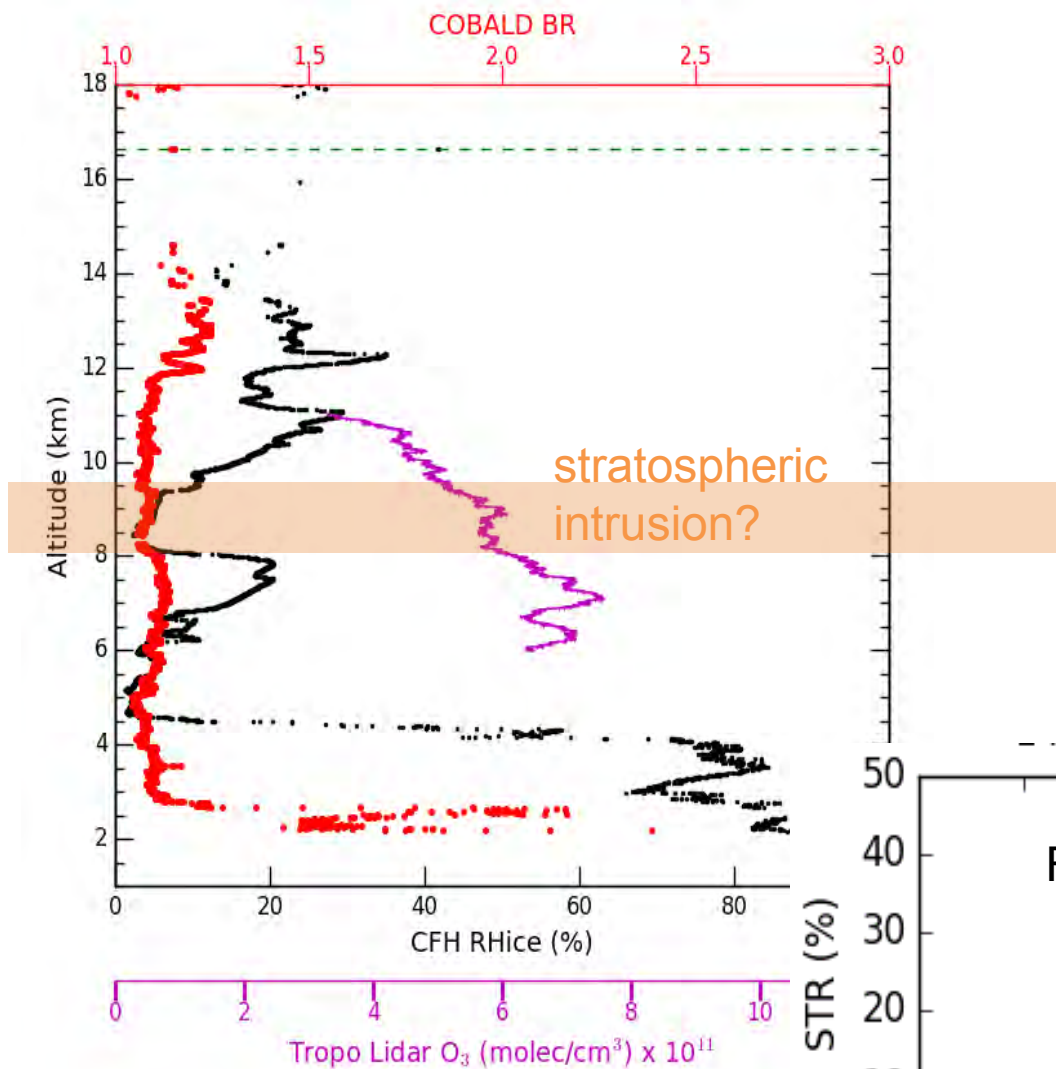
ECMWF winds @200hPa 17/05 18UTC



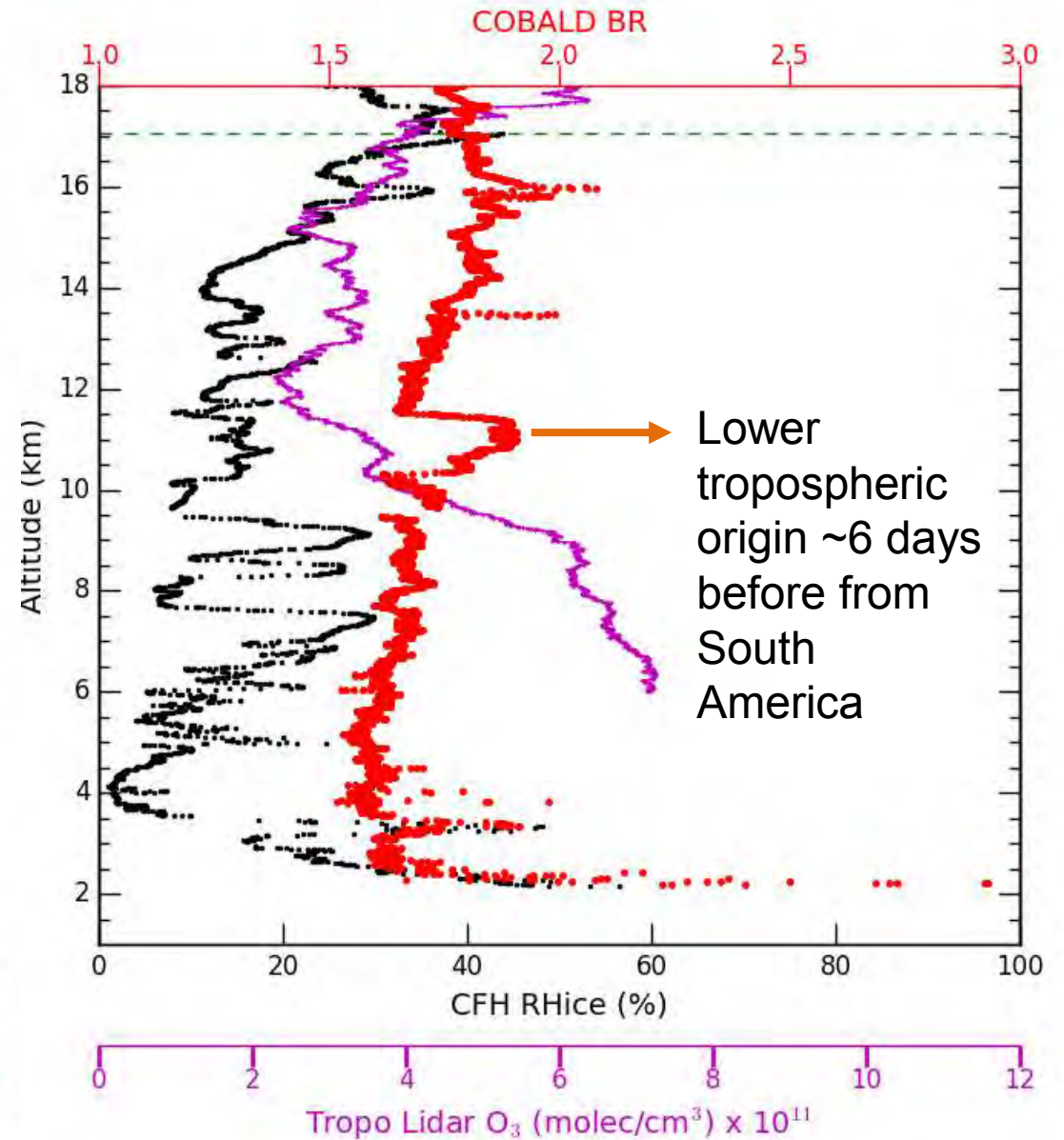
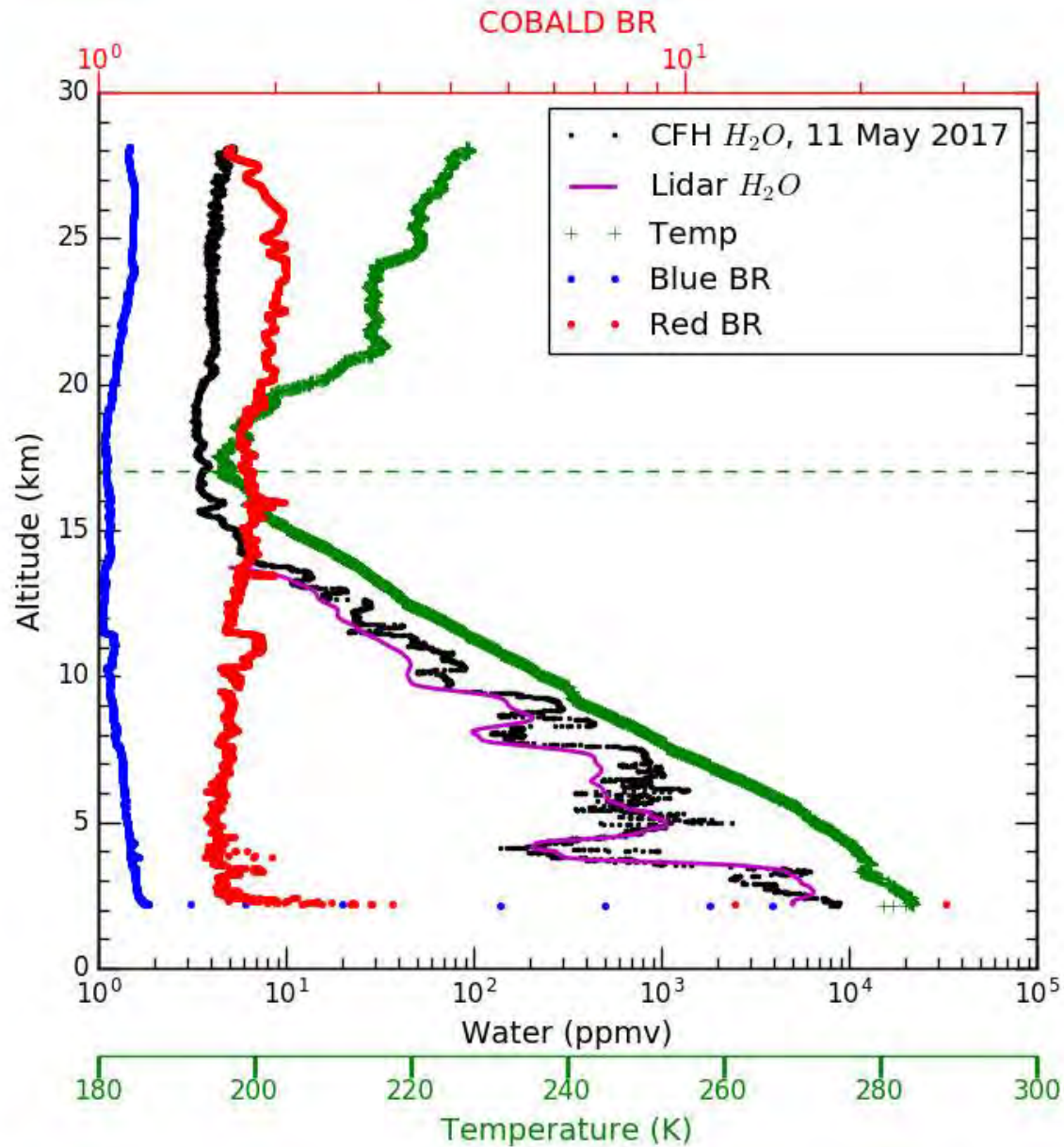
May 10, payload CFH+COBALD+M10



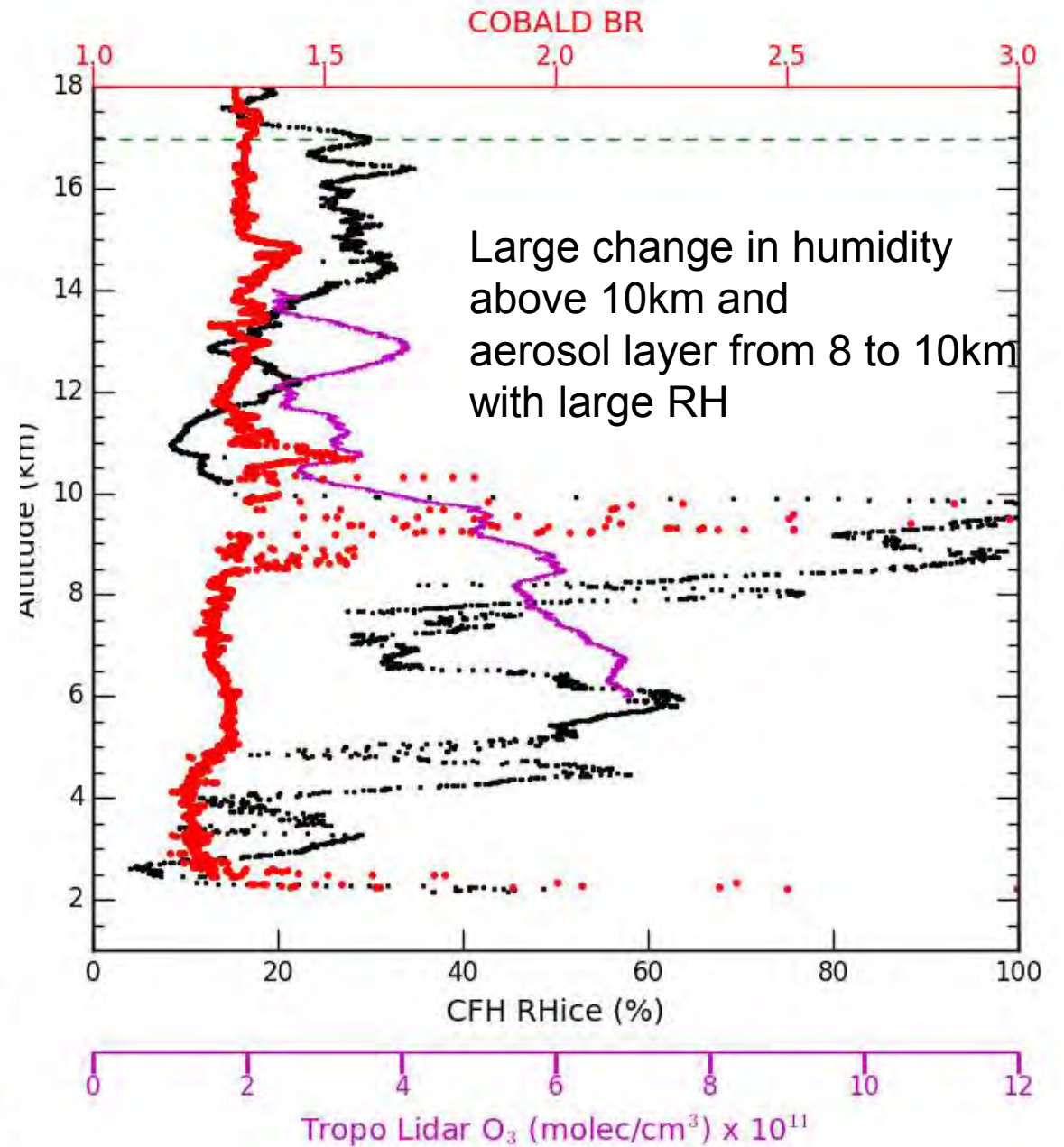
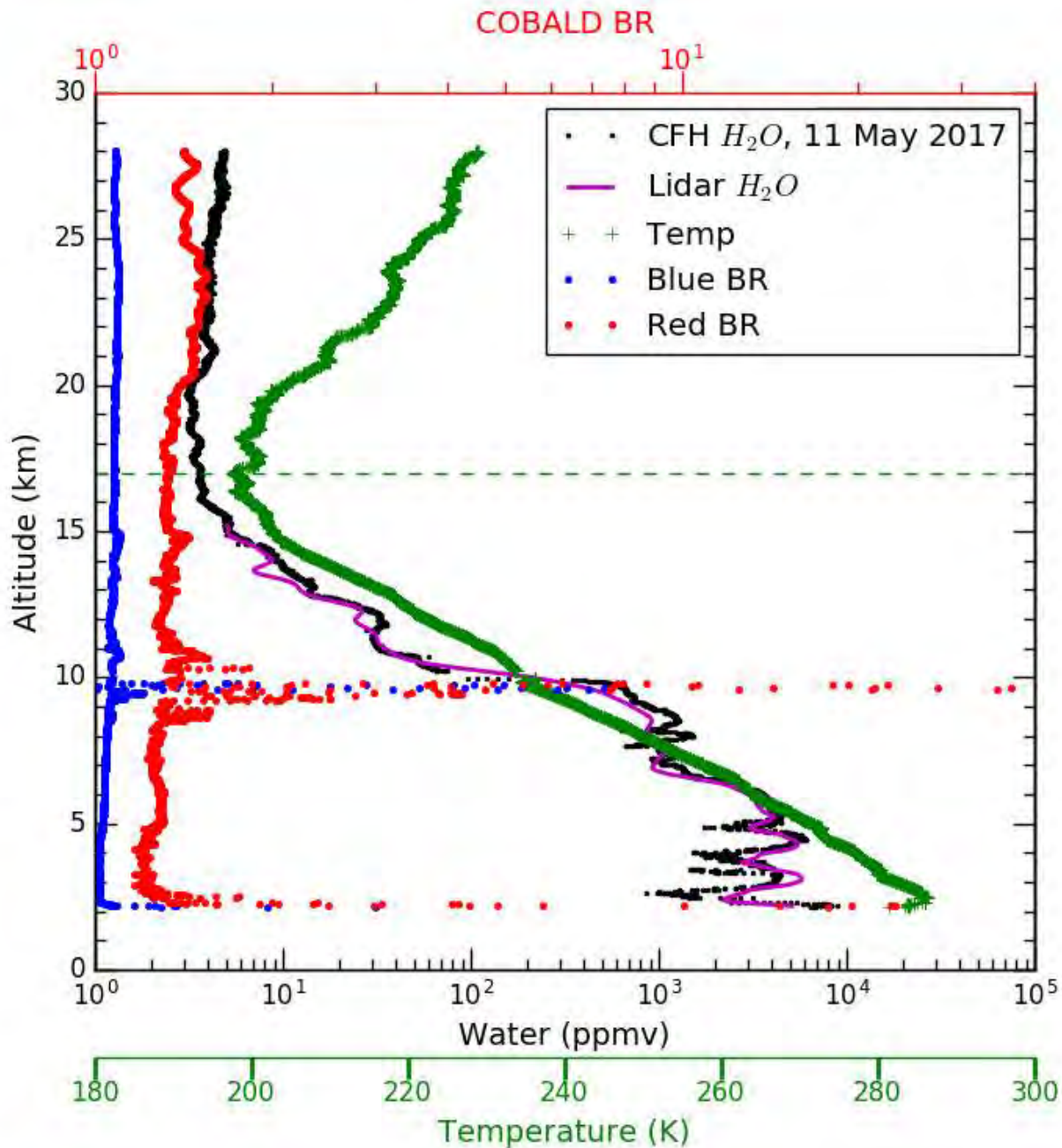
May 10, payload CFH+COBALD+M10

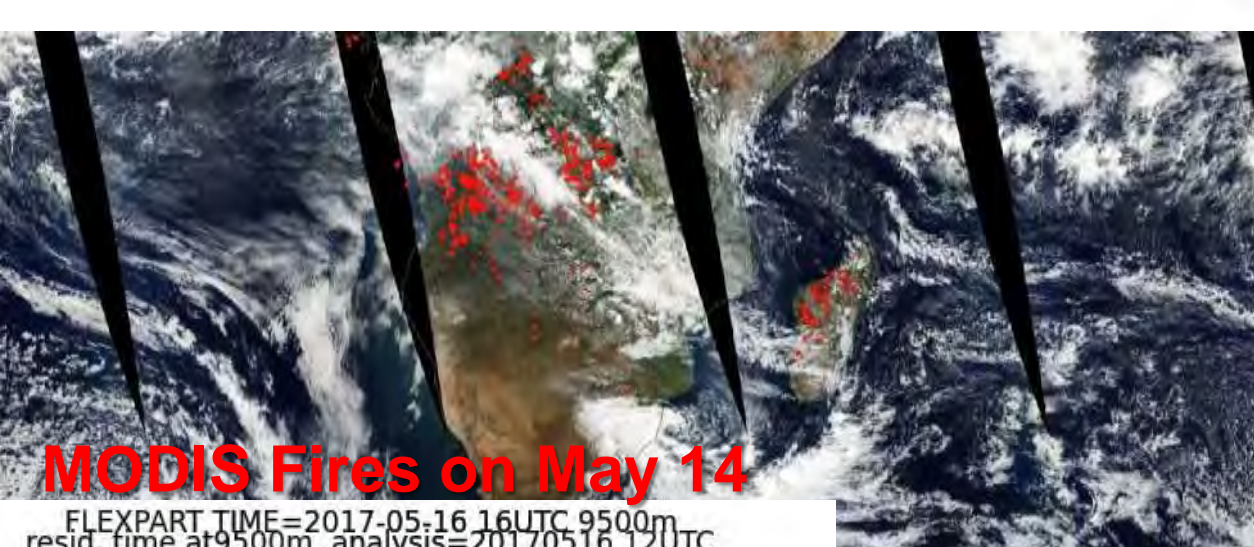


May 11, payload CFH+2COBALD+M10



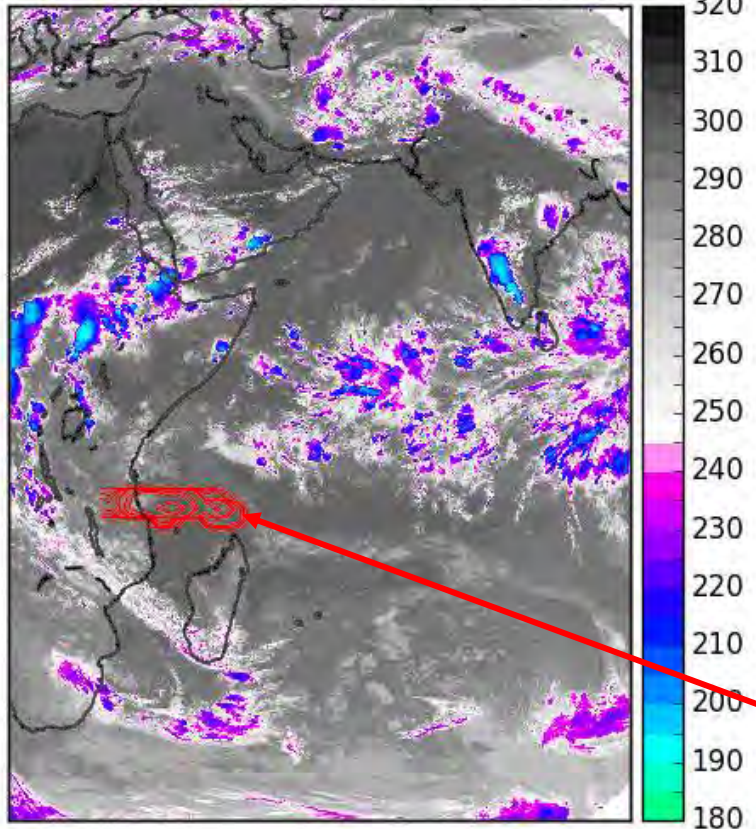
May 16, payload CFH+COBALD+M10



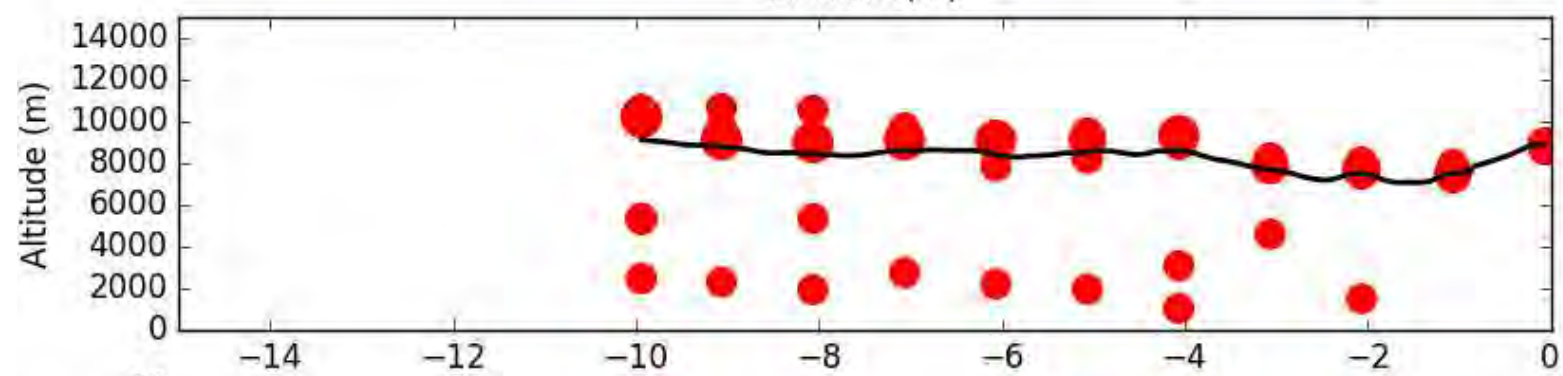
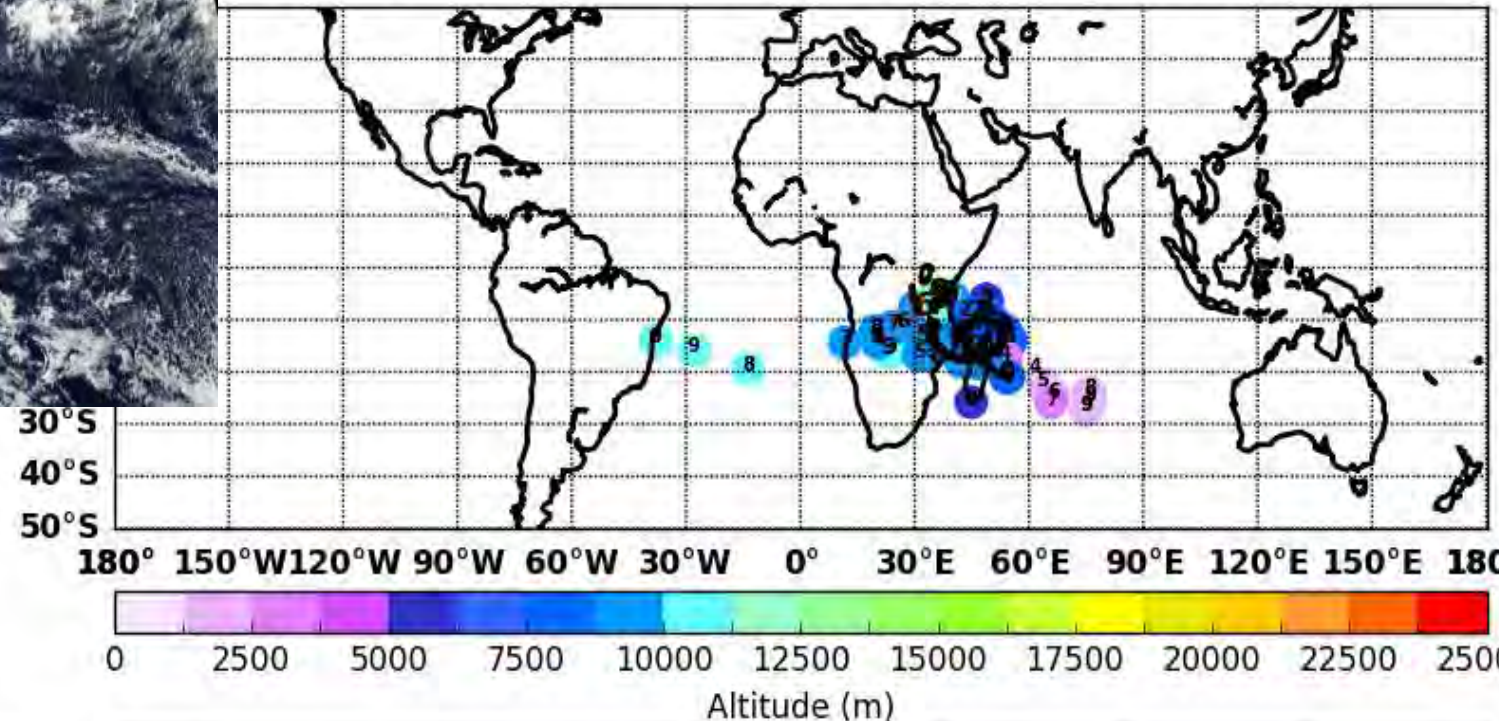


MODIS Fires on May 14

FLEXPART TIME=2017-05-16 16UTC 9500m
 resid. time at 9500m, analysis=20170516 12UTC
 METEOSAT 7 BT IR 2017-05-14 16UTC



Retroplume summary
 Start time= 2017/05/16 18:27:44 - End time= 2017/05/16 18:30:23
 Lower altitude= 9000.0m - Upper altitude=10000.0m



Dispersion of air mass at 9.5 km, 48h before launch time, from FLEXPART backtrajectories initialized at 9.5km above Maïdo on May 16.

May 17, payload CFH+COBALD+POPS+M10+ECC O3

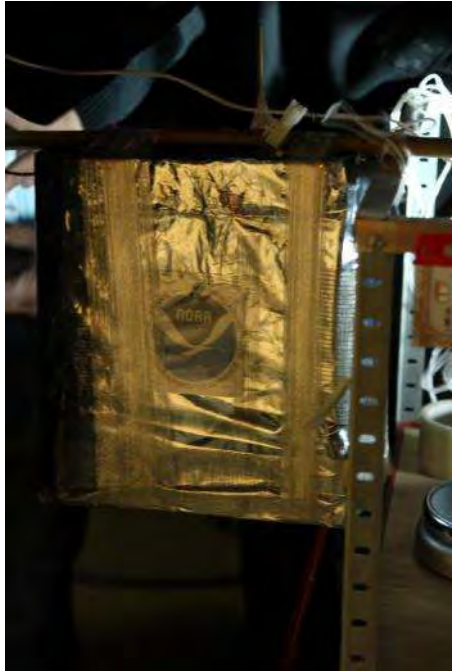
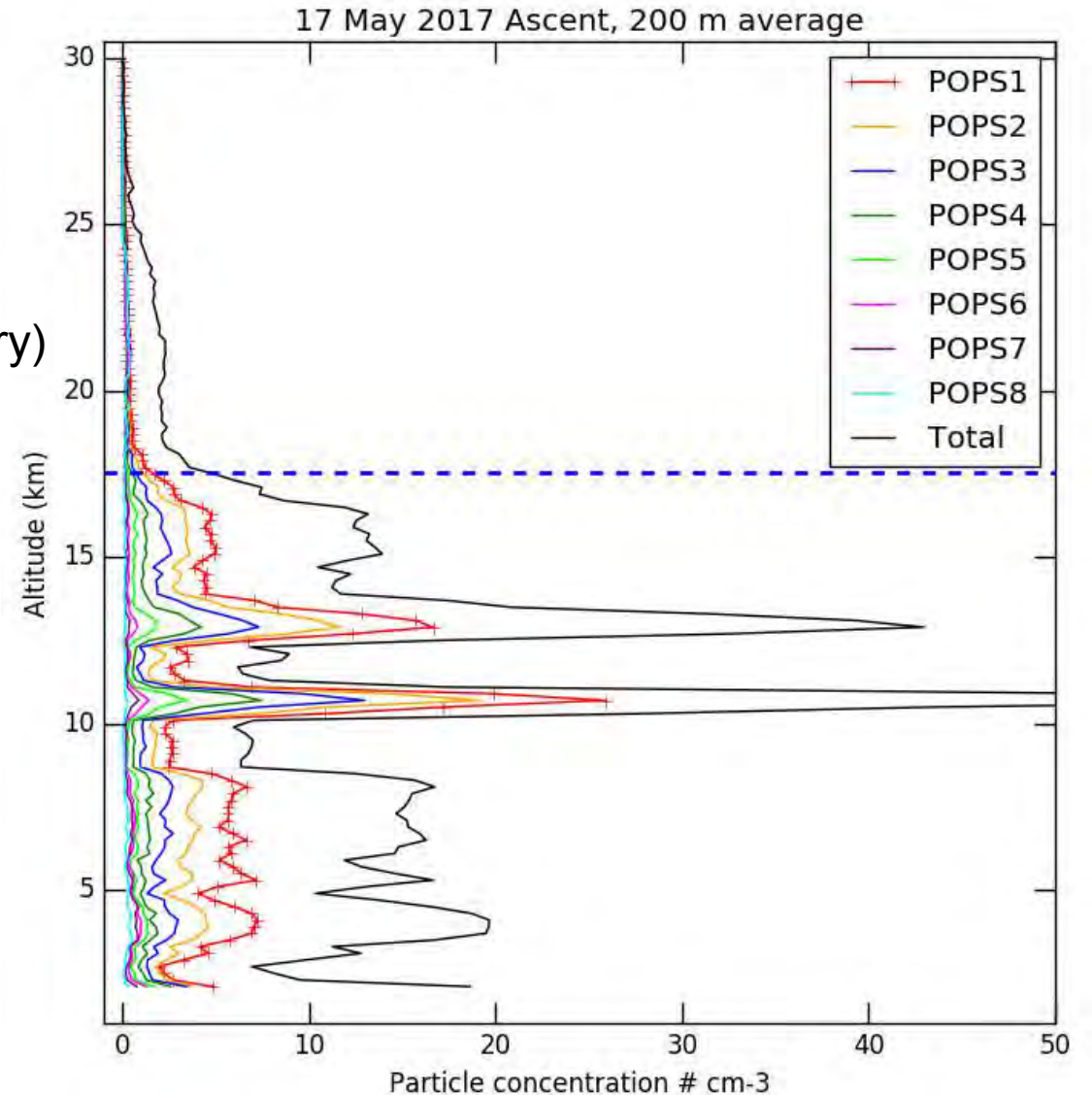
POPS: Printed Optical Particle Spectrometer

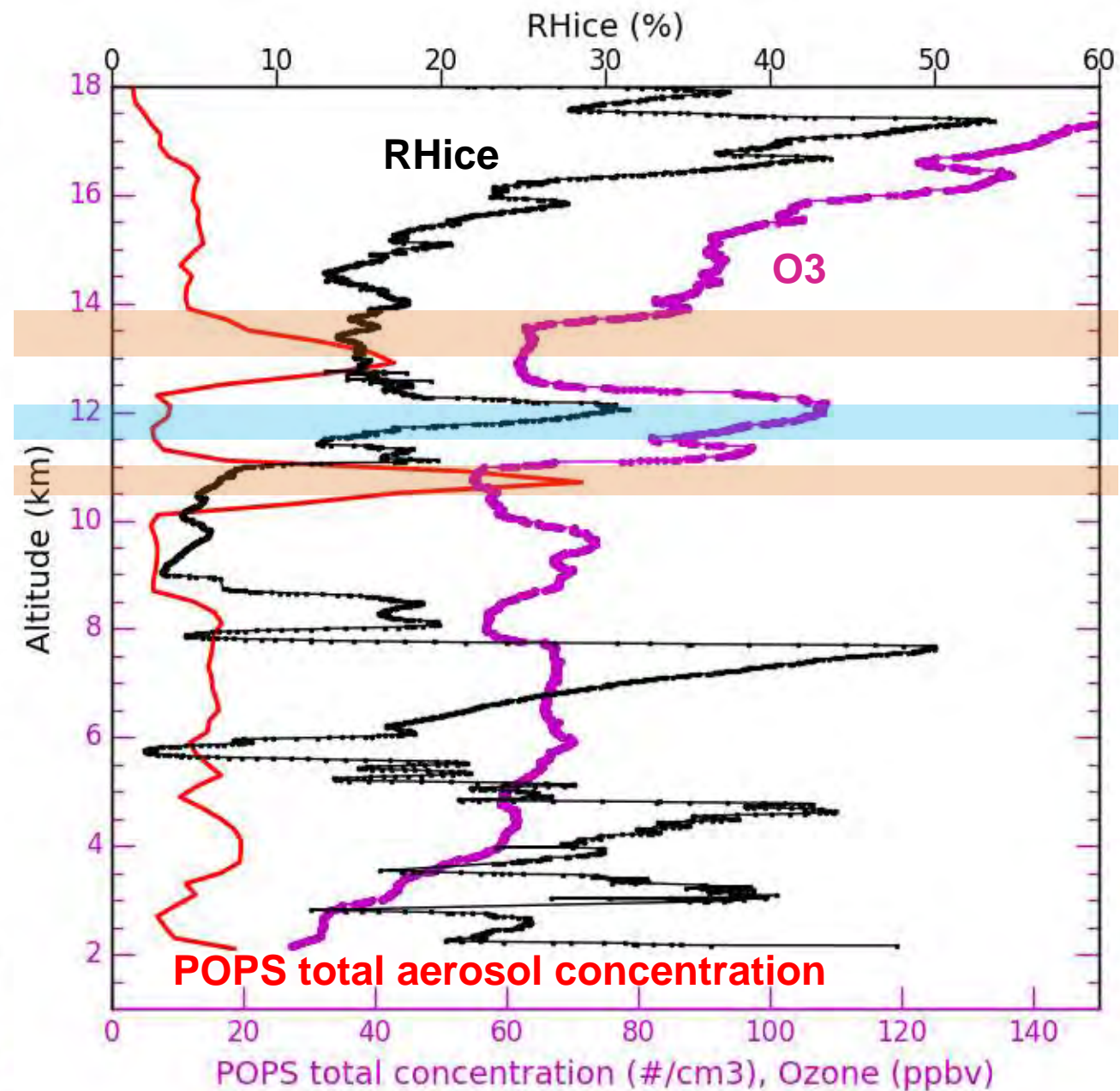
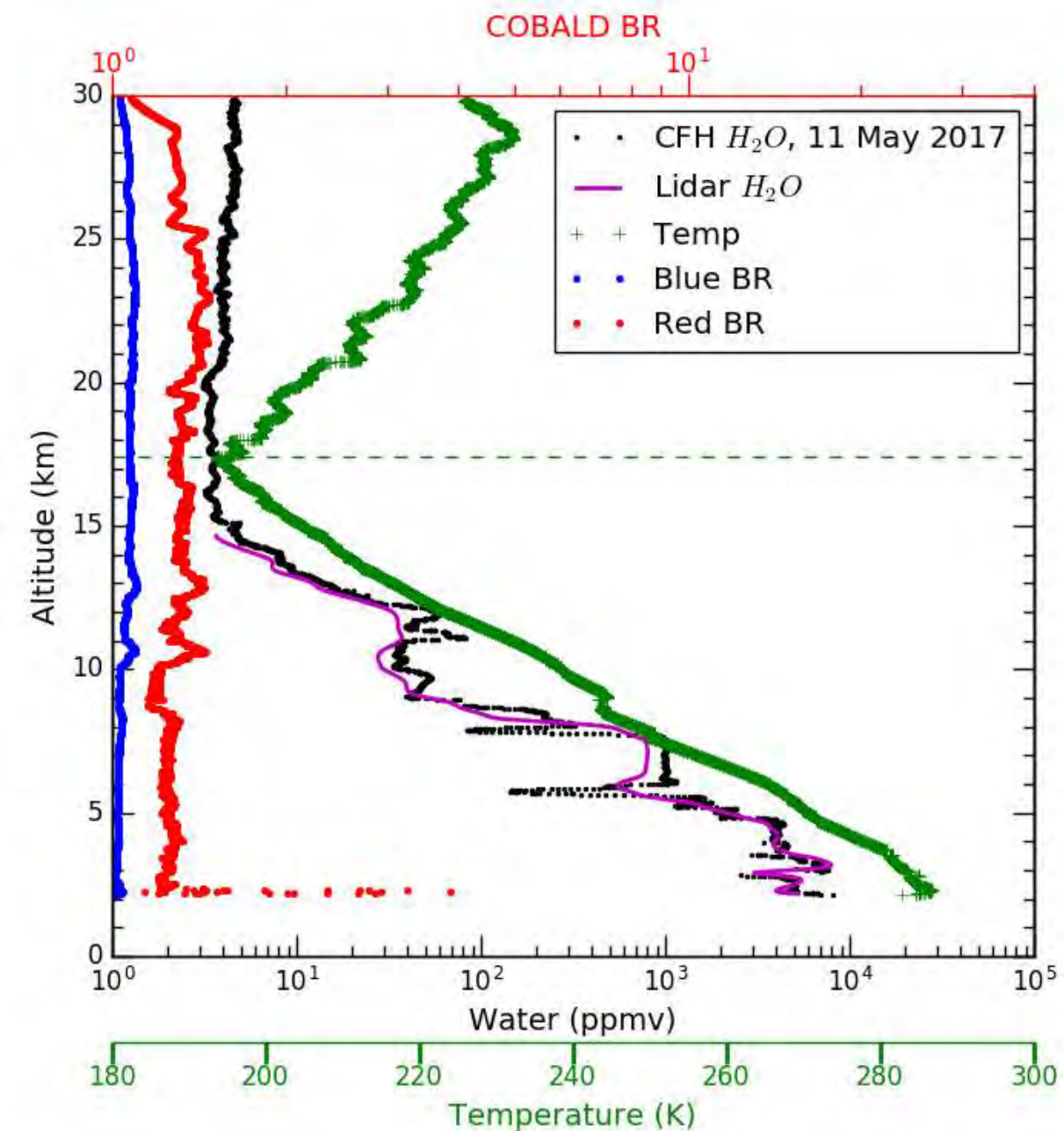
Gao et al., 2016 Aerosol Science and Technology

Weight 870g

Size range: 140nm – 3 μm diameter (dry)

Communication: 8 size bins (limited by the Imet bandwidth)

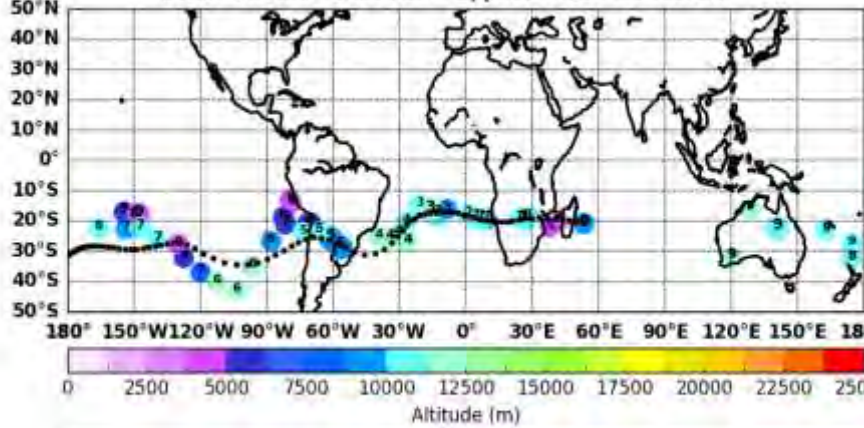




10-10.5km

Retroplume summary

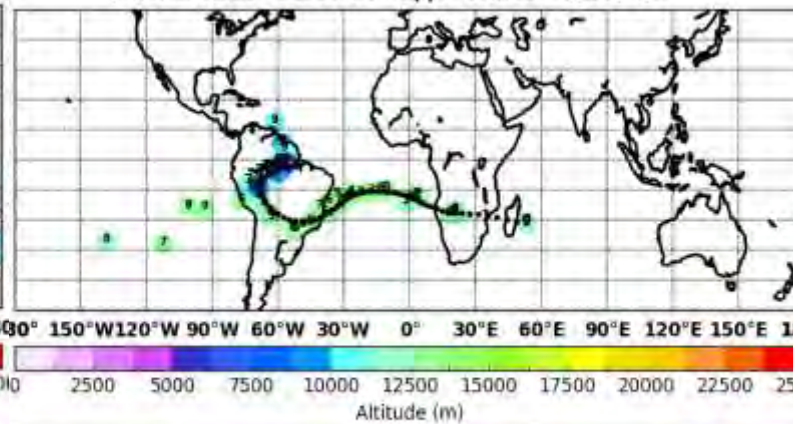
Start time= 2017/05/17 19:44:50 - End time= 2017/05/17 19:46:22
Lower altitude= 10000.0m - Upper altitude=10500.0m



11.5-12km

Retroplume summary

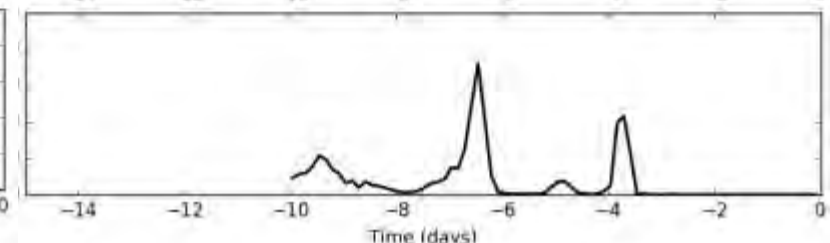
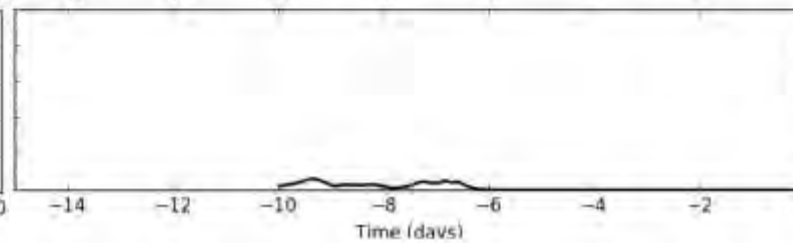
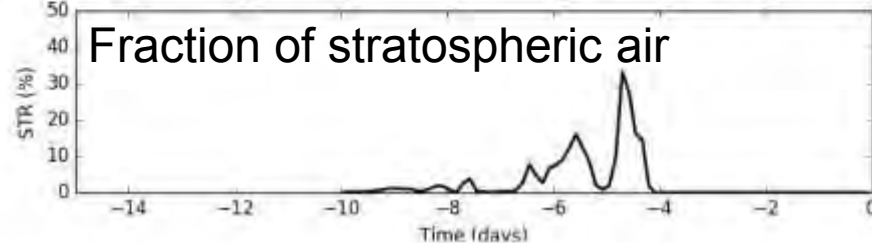
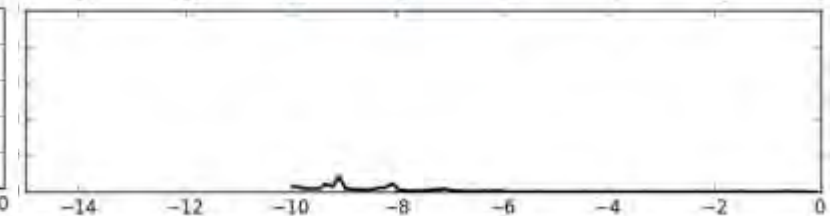
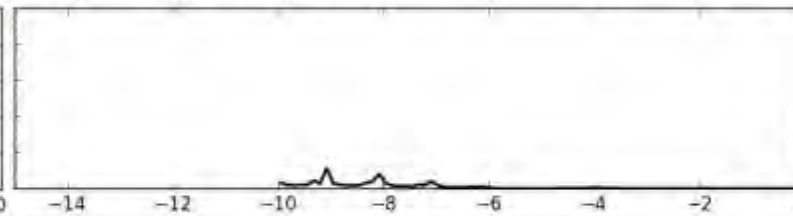
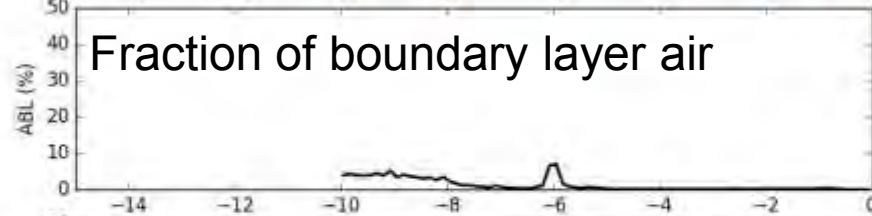
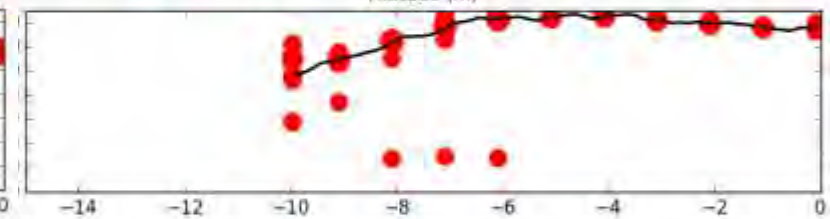
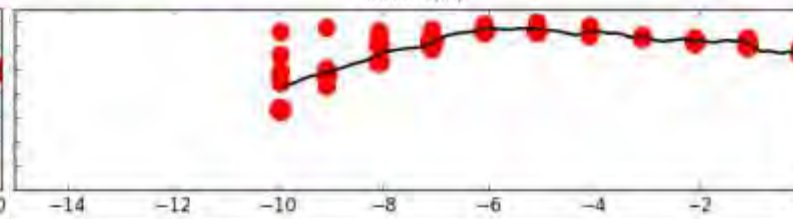
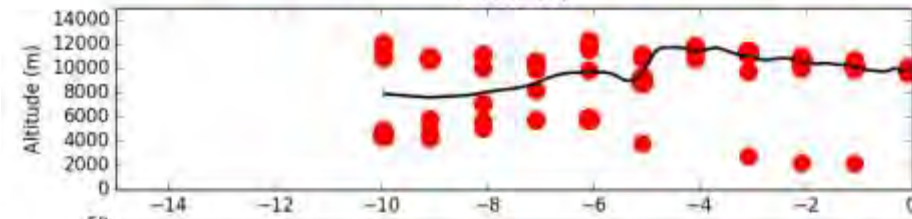
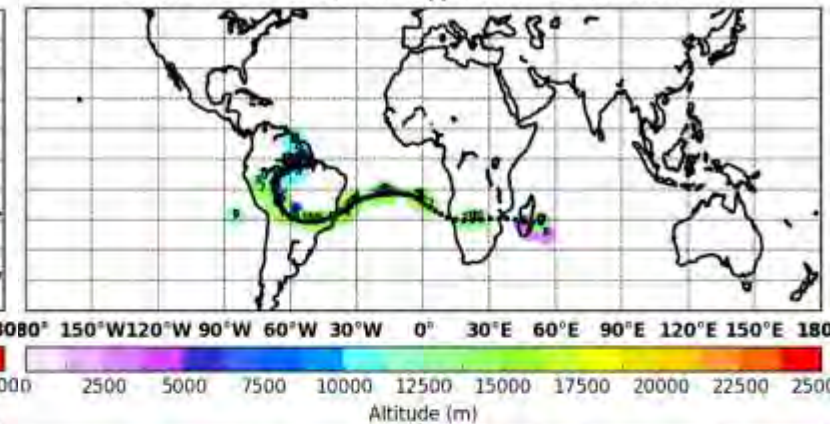
Start time= 2017/05/17 19:49:07 - End time= 2017/05/17 19:50:43
Lower altitude= 11500.0m - Upper altitude=12000.0m



13.5-14km

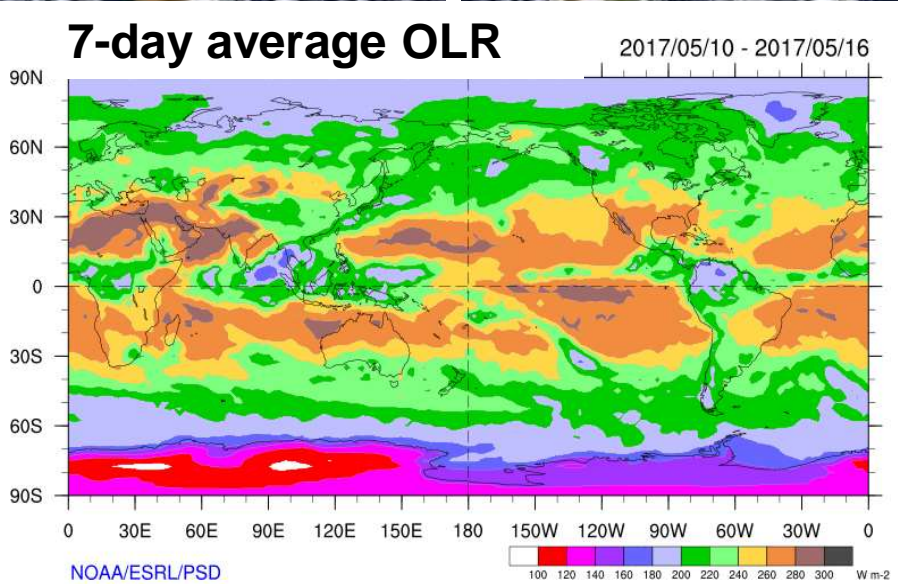
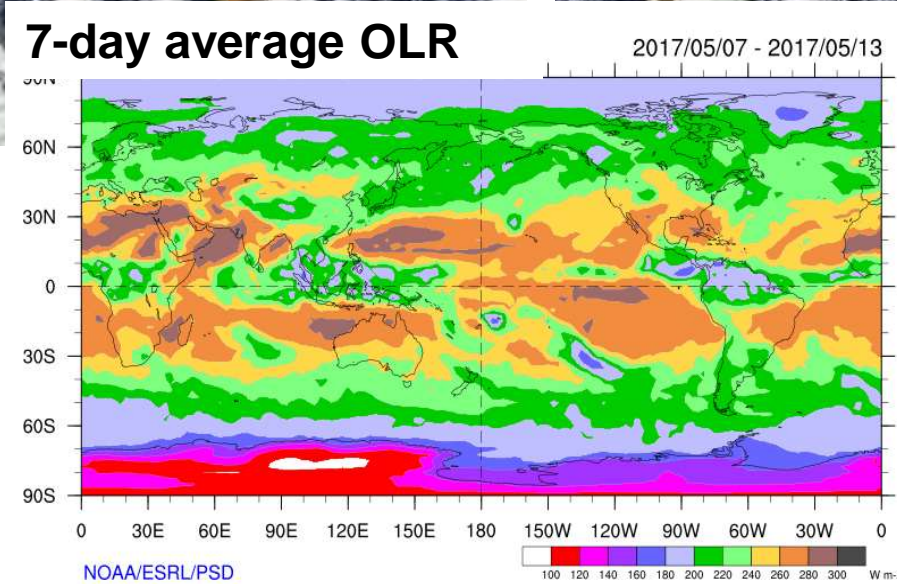
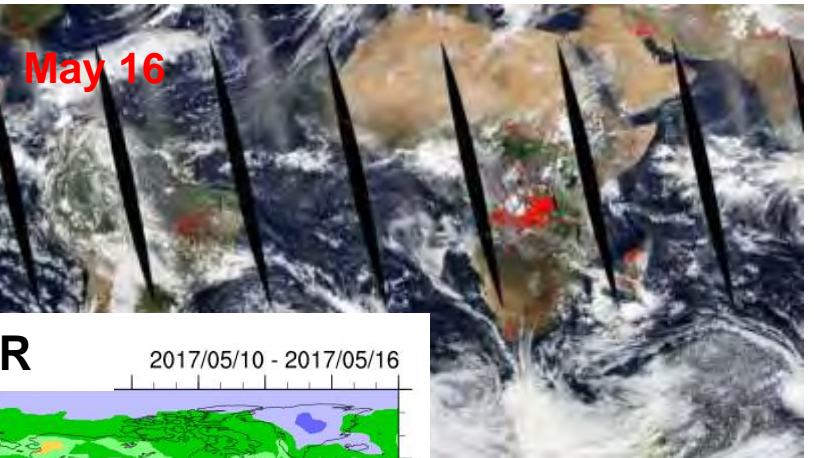
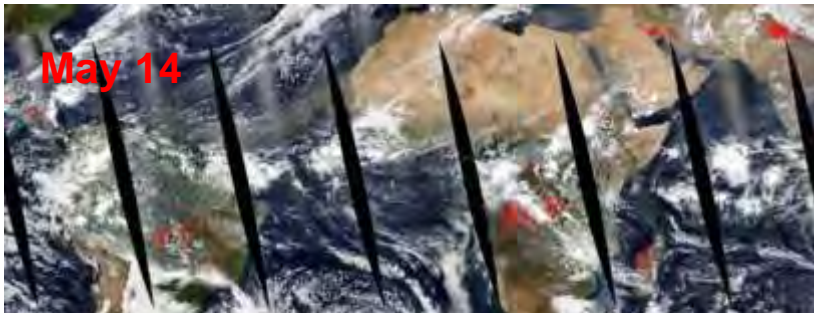
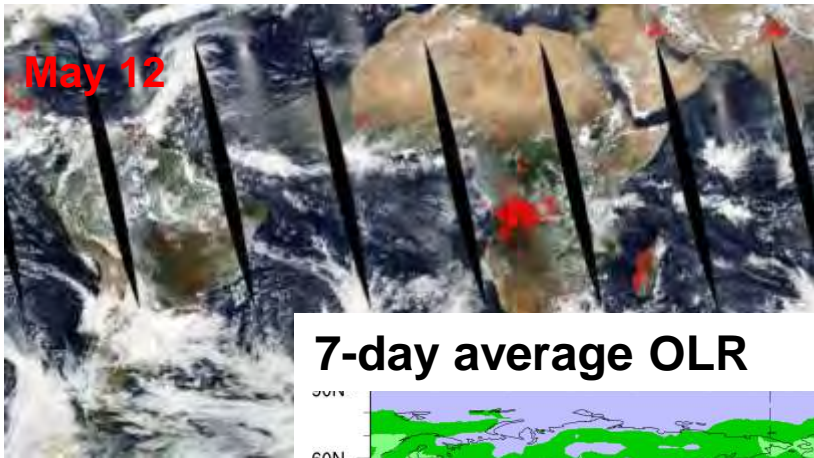
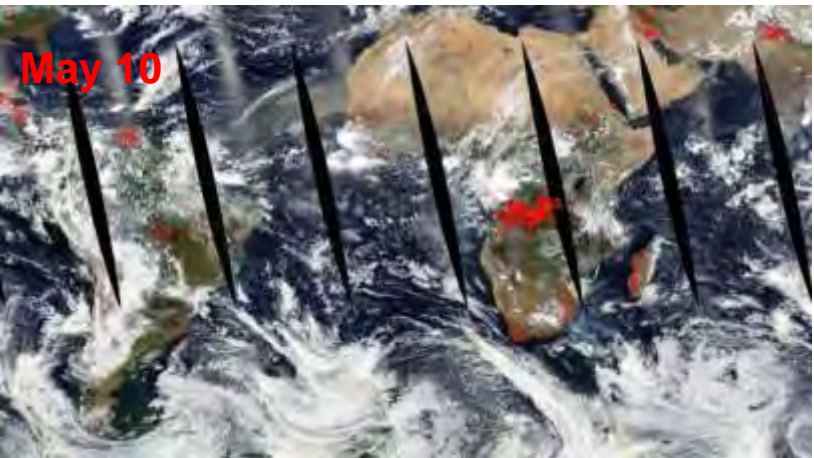
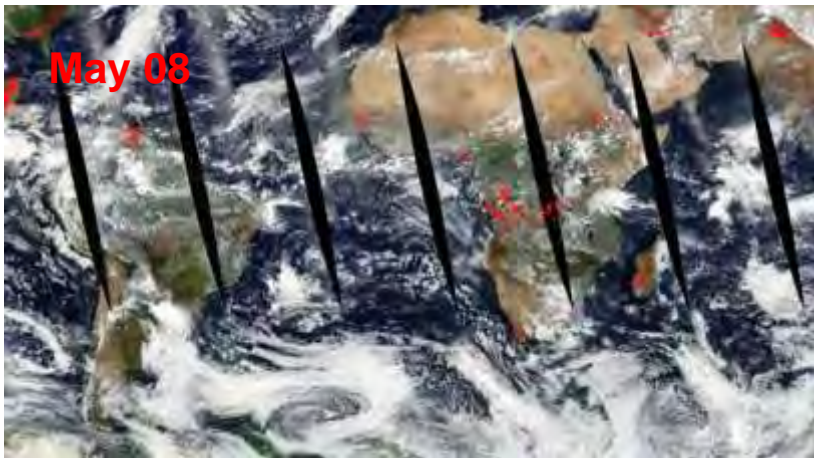
Retroplume summary

Start time= 2017/05/17 19:55:03 - End time= 2017/05/17 19:56:47
Lower altitude= 13500.0m - Upper altitude=14000.0m



Fraction of boundary layer air

Fraction of stratospheric air



Conclusions/Plans for 2017-2018

- 5 Good CFH profiles in 2017, in addition to those of 2016 & 2015 of the MORGANE Campaign, 12 CFH profiles and RS92 from MORGANE for validation of GRUAN correction of the M10 sondes for tropical conditions.
- 3 CFH soundings + M10 scheduled for summer 2018
- Start GRUAN ground-check procedure for weekly NDACC/SHADOZ M10/Ozone launch.
- ACTRIS-FR/OSU-R may support cost of 3 CFH soundings per year in the future but need to find another solution to meet the GRUAN monthly water vapor profile requirement.