Water vapor, ozone and cirrus in the Asian monsoon

New results from Kunming, China

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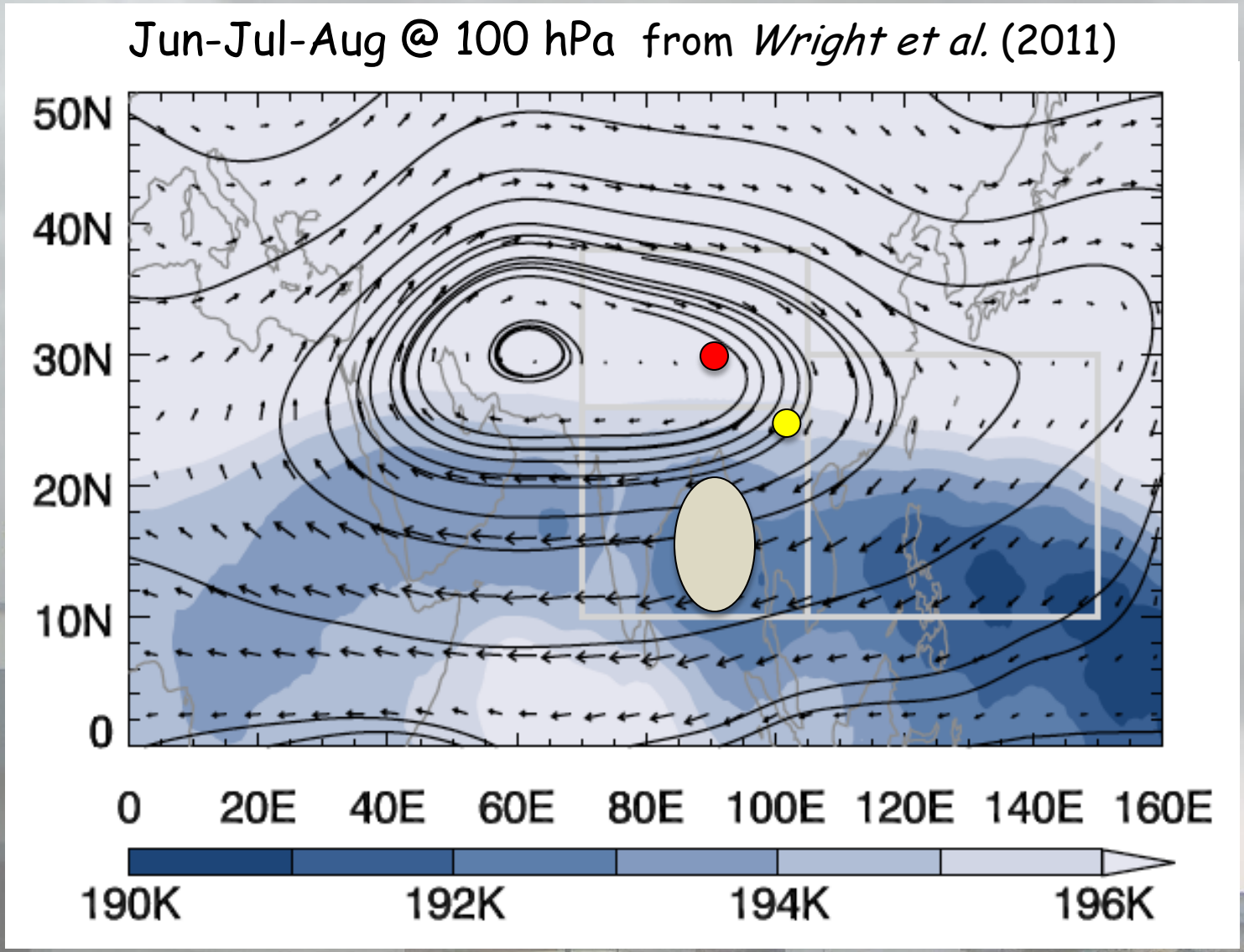
The Research Plan – August 2012

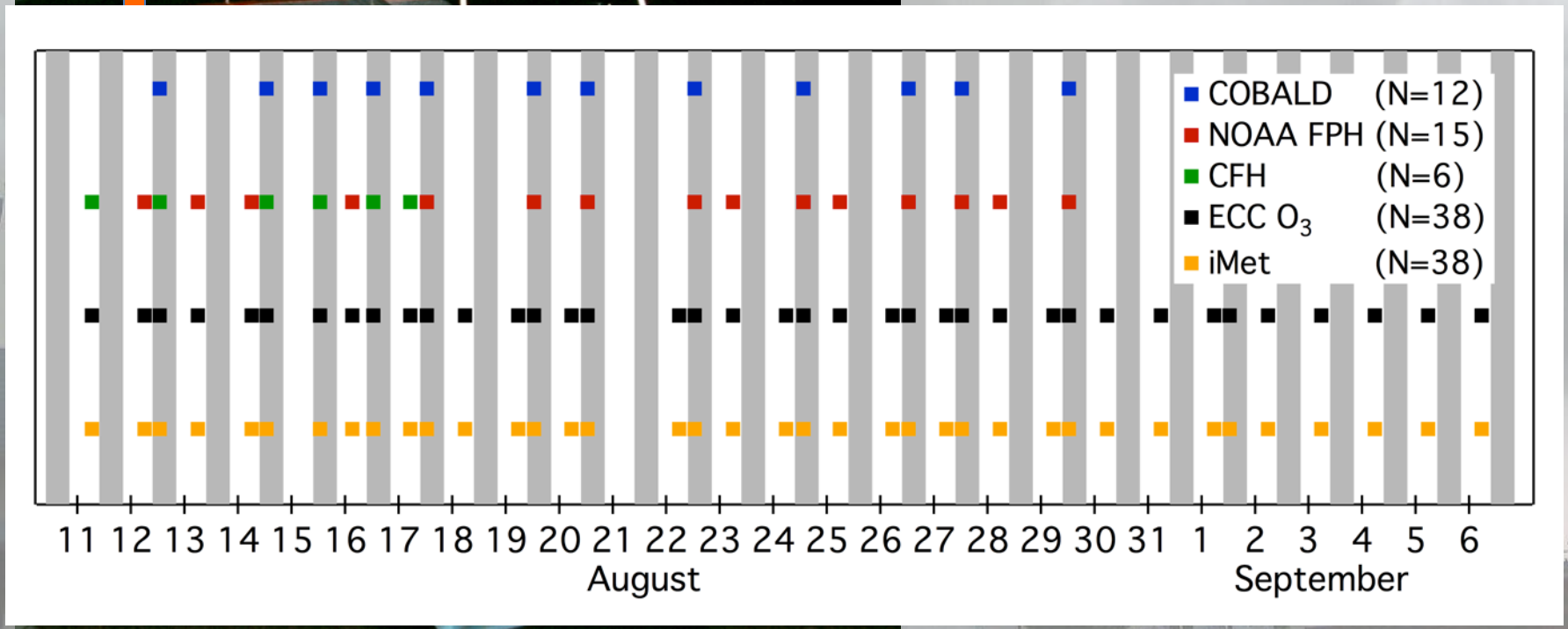
Kunming & Lhasa 350+ balloon launches

SEAC^{4}RS: Bay of Bengal – 3 aircraft from LT to UTLS

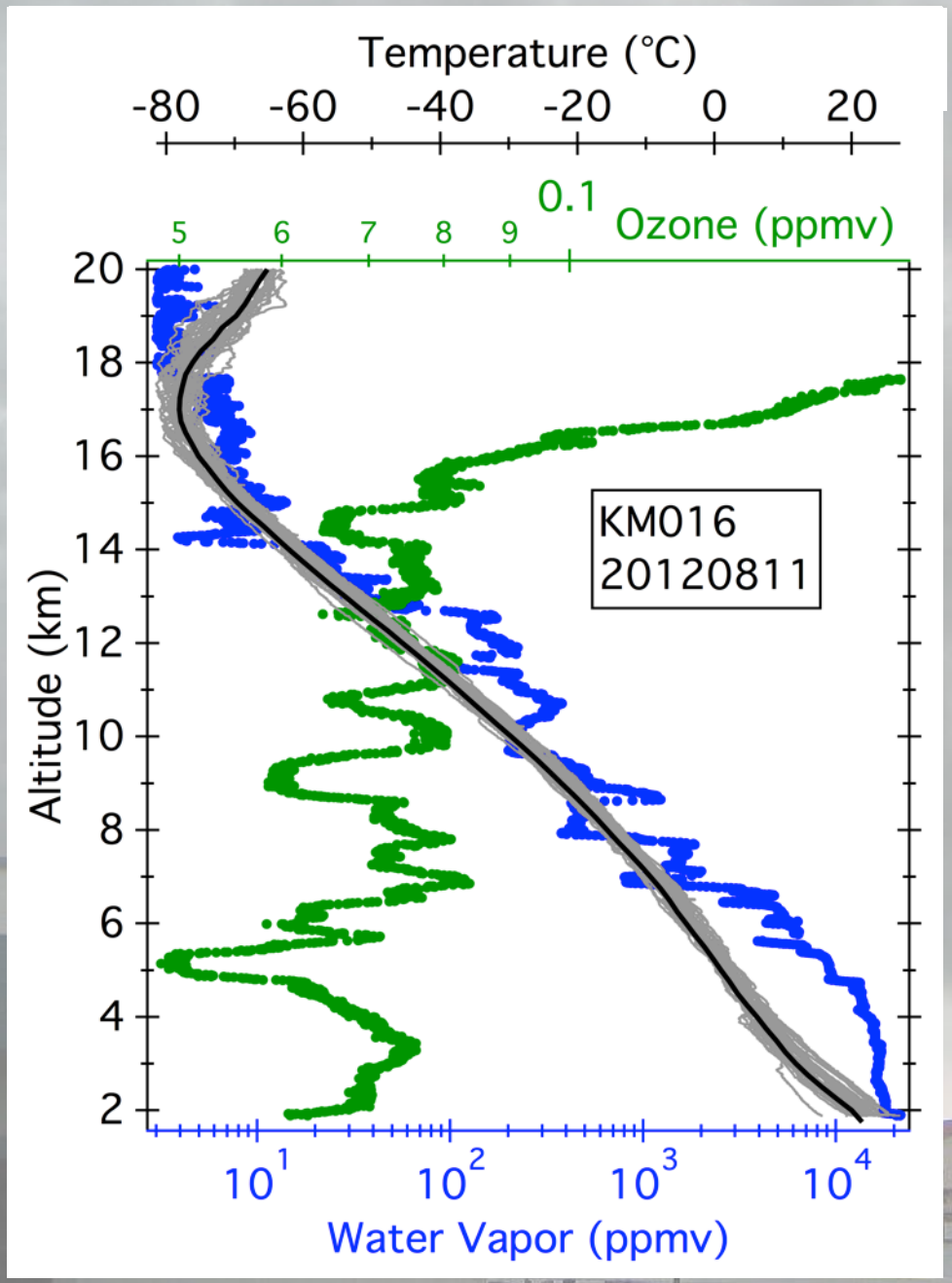


Instrumentation and Launch Schedule

- Compact Optical Backscatter Aerosol Detector (ETH)
- NOAA Frost Point Hygrometer (NOAA GMD)
- Cryogenic Frost Point Hygrometer (Vömel - DMT)
- Electrochemical Concentration Cell Ozonesonde (DMT)
- Radiosonde: P, T, U, winds (u,v) (InterMet)



Balloon-based Vertical Profile Measurements



Kunming 2012

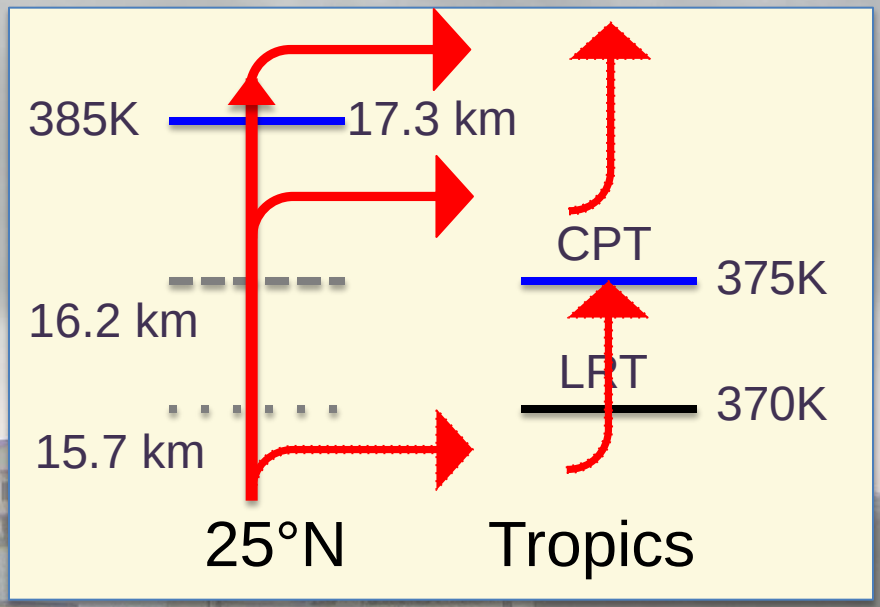
N: 38 Flights

CPT: 17.3 ± 0.5 km

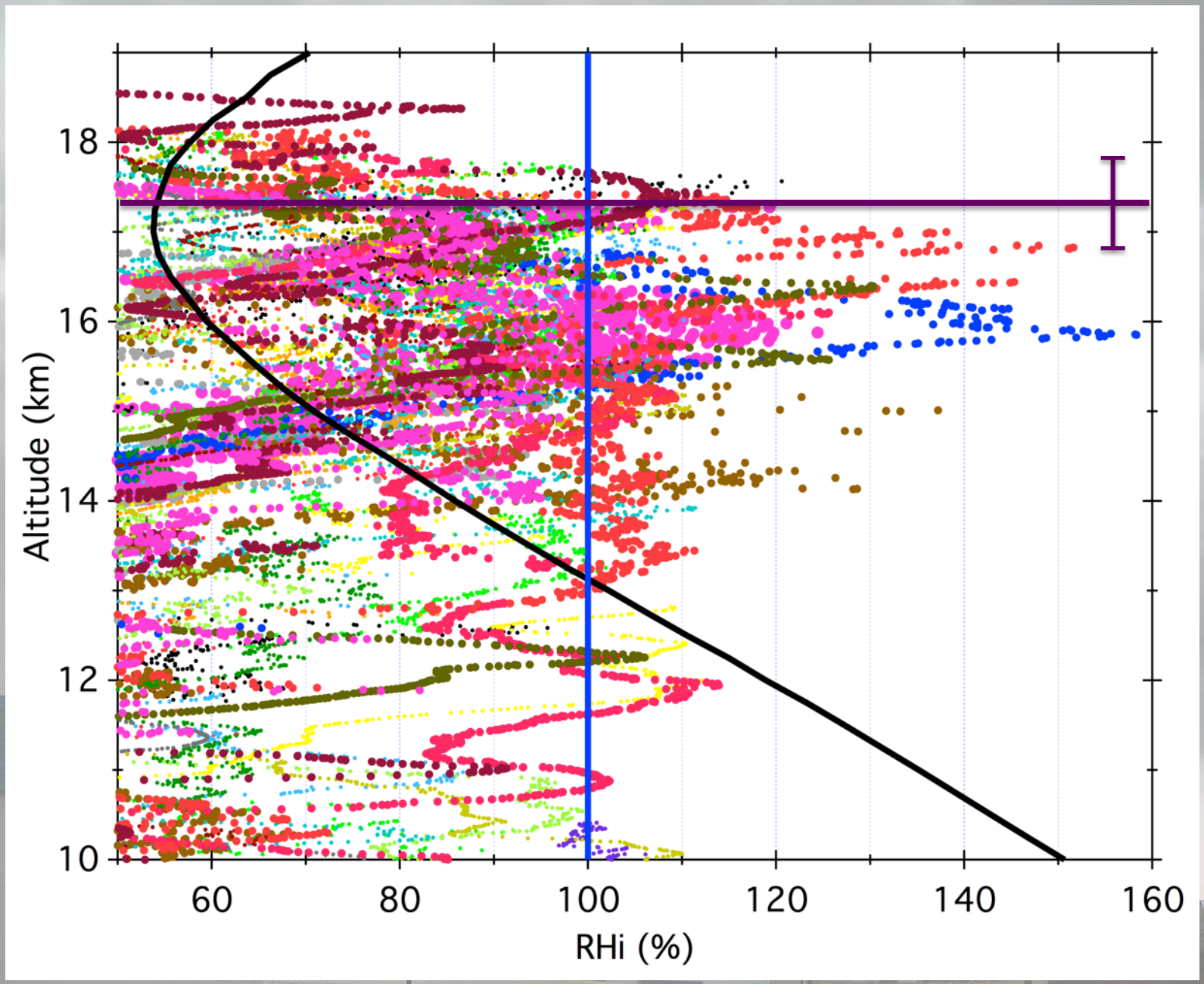
T: -79.3 ± 1.5 °C

θ: 385 ± 10 K

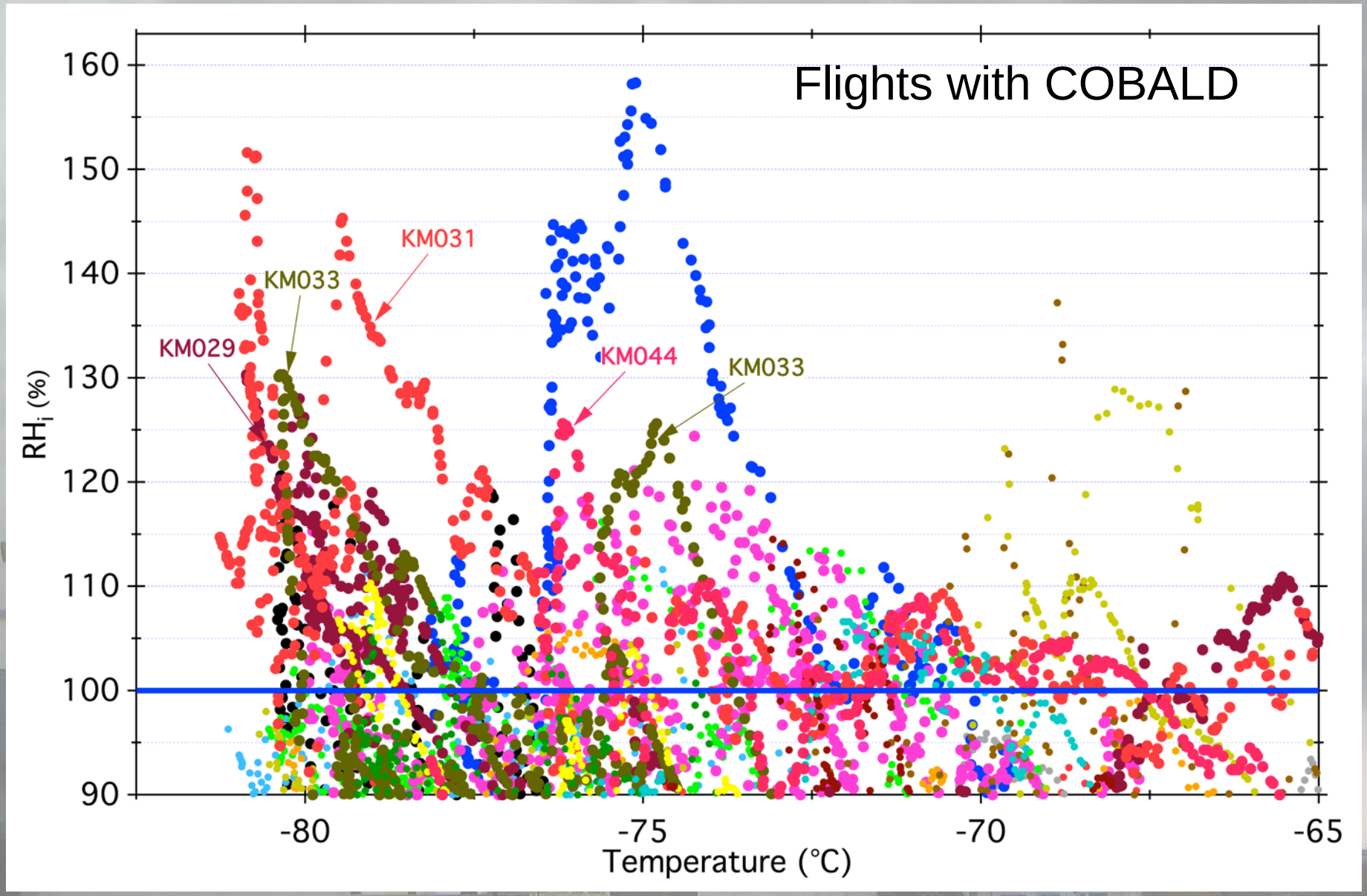
P: 91± 7 hPa



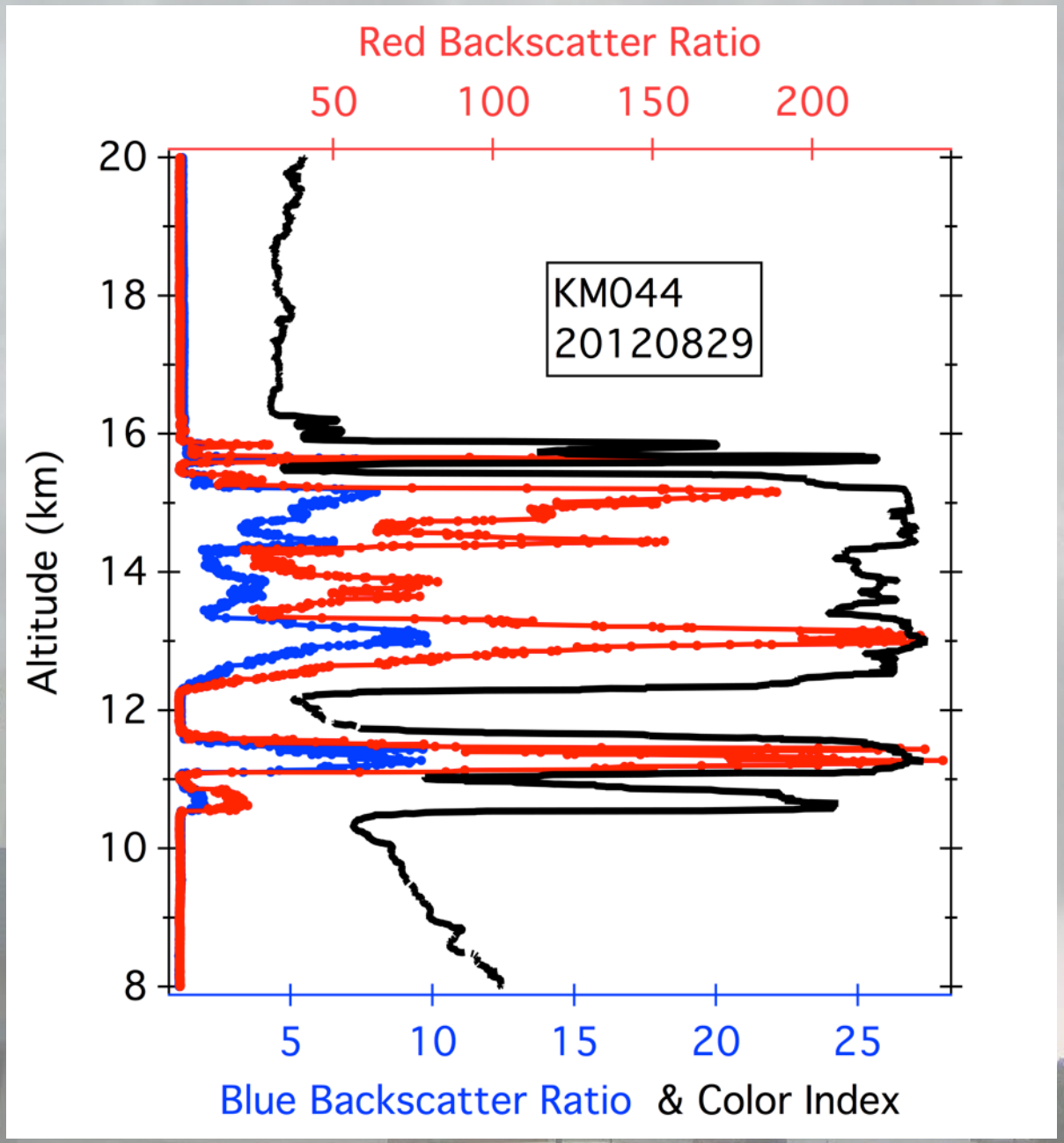
Kunming 2012: Supersaturation



Kunming 2012: Supersaturation



COBALD Data



COBALD Specifics

2-channels:

870 nm

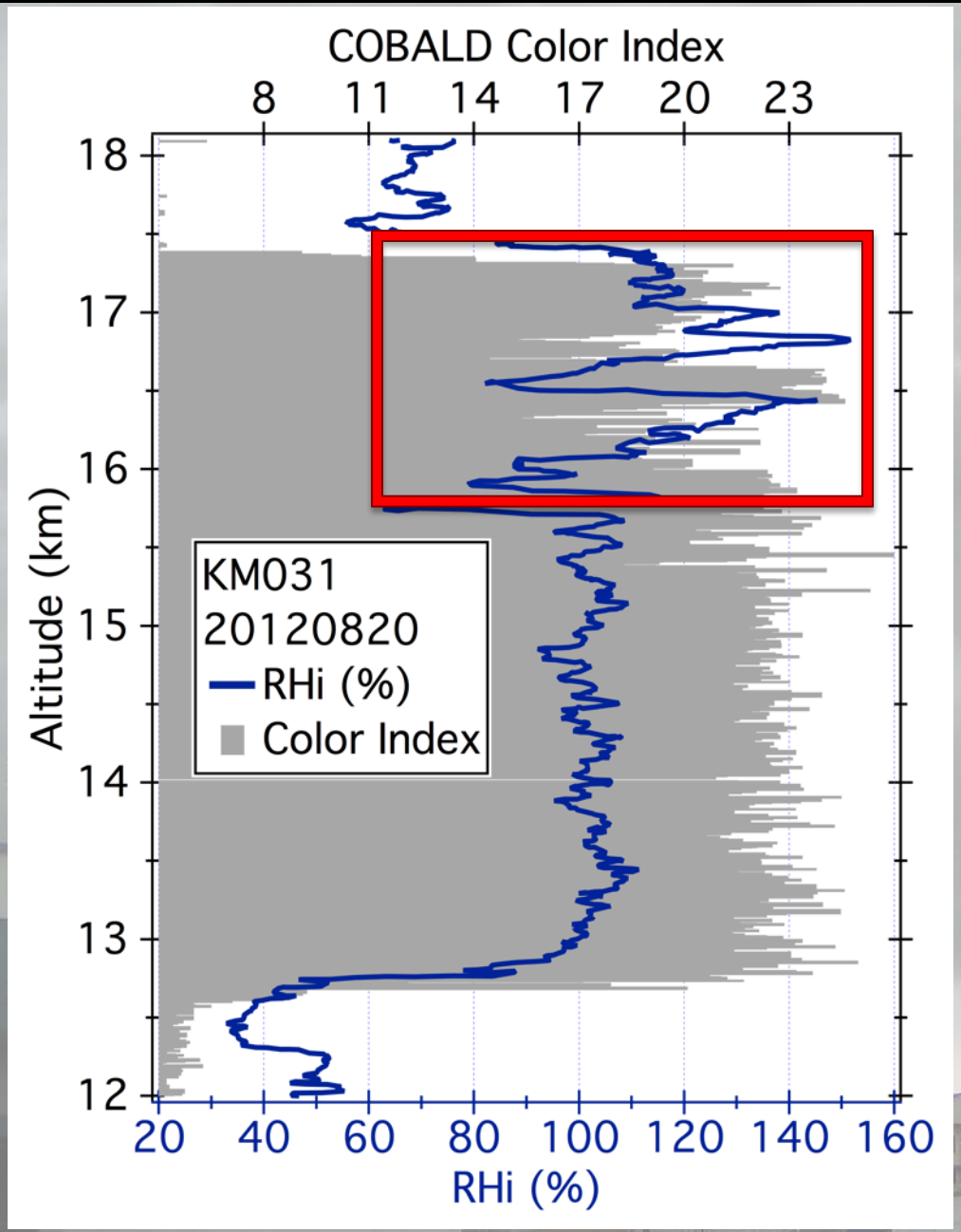
455 nm

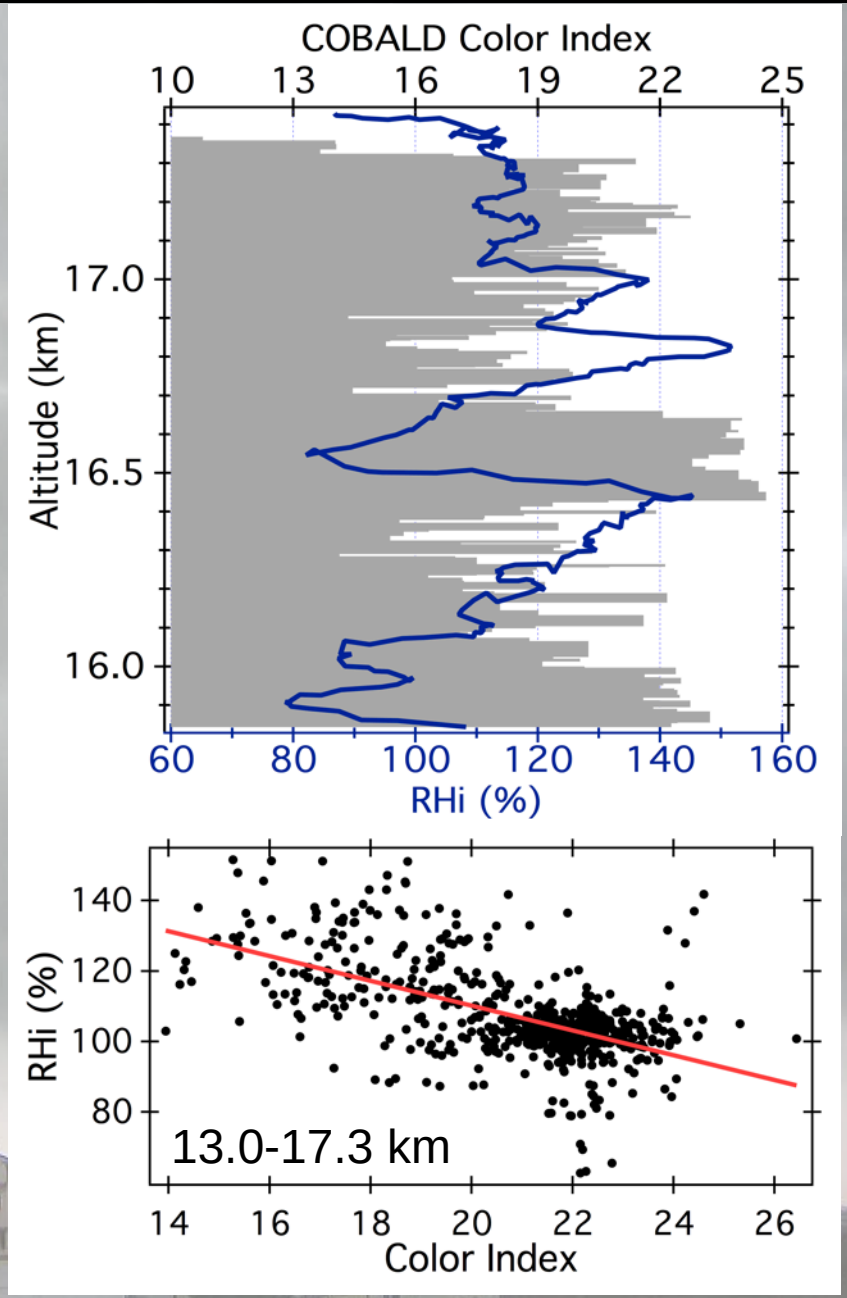
Color Index =

(BSR–1)/(BSR-1)

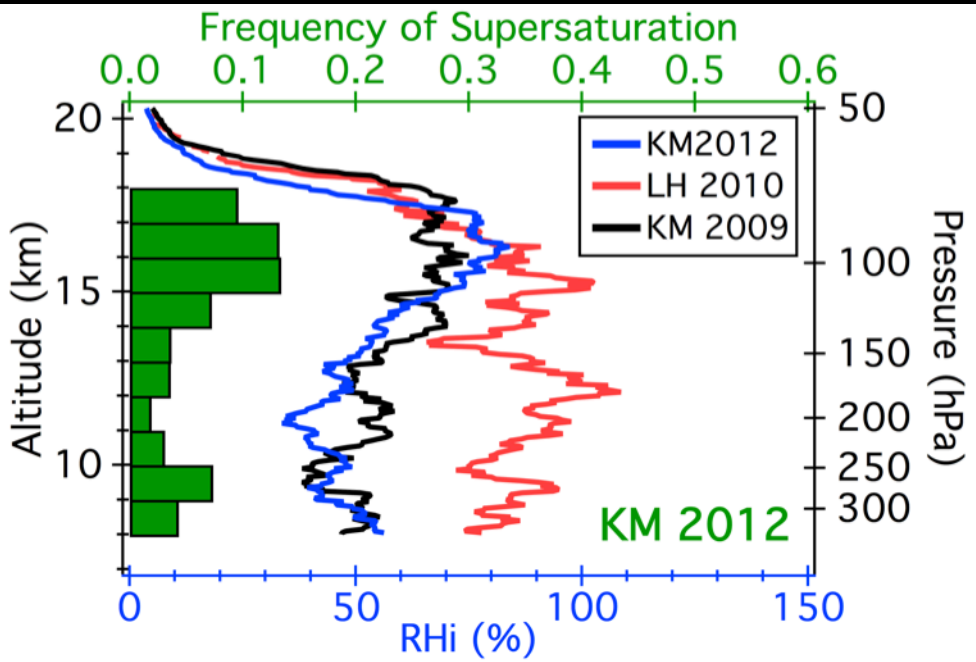
>15 indicative of cirrus (>3 μm)

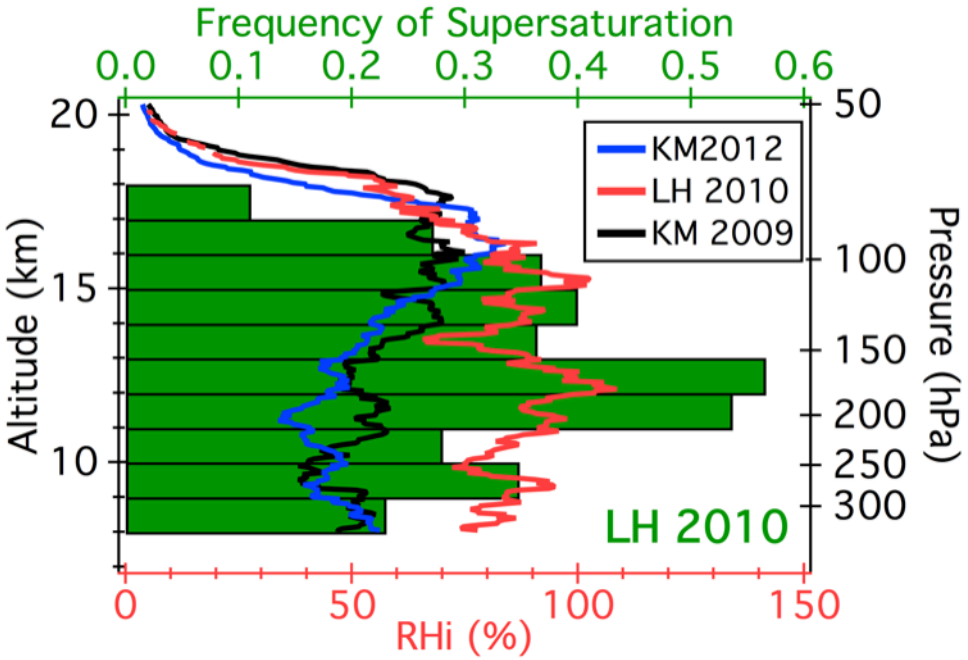
Flight KM031 – a case study

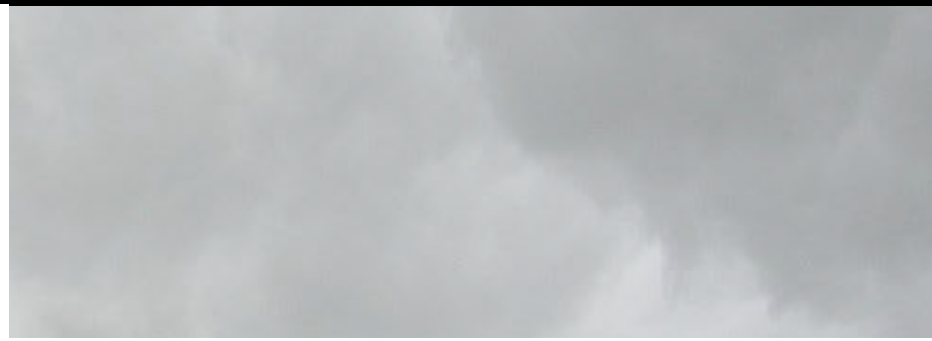




Supersaturation: Frequency of Occurrence







Ssat Freq 16-18 km

KM2012: 10 – 13%

KM2009: 13 – 18%

LH2010: 11 – 27%

Summary

- KM2012 (August) Balloon-borne measurements of:
  P, T, O_3 (N=38), FP H_2O (N=21), COBALD Cirrus (N=12)
- Influences of convective uplift to CPT, but not above
  i.e. no evidence of ice lofting into LS
- COBALD detection of cirrus layers (Color Index)
  RHi up to 160% in clear air
  relaxation of supersaturation within cirrus
  anticorrelation between RHi and Color Index
- KM2012: 10-13% of UT air masses were supersaturated
  similar frequency as KM2009 but smaller than LH2010
  KM2012 freq increases by 3% if UT cirrus are included
- August 2013: Lhasa campaign planned but access to non-Chinese nationals is very difficult at this time