

Cross sections and gradients of CO₂
and CH₄ in HIPPO:

Comparison with Carbon Tracker,
GEOS-CHEM and MACC.

Steven C. Wofsy, the HIPPO and
Carbontracker Teams

Boulder, CO. HIPPO STM-2

13 March 2012

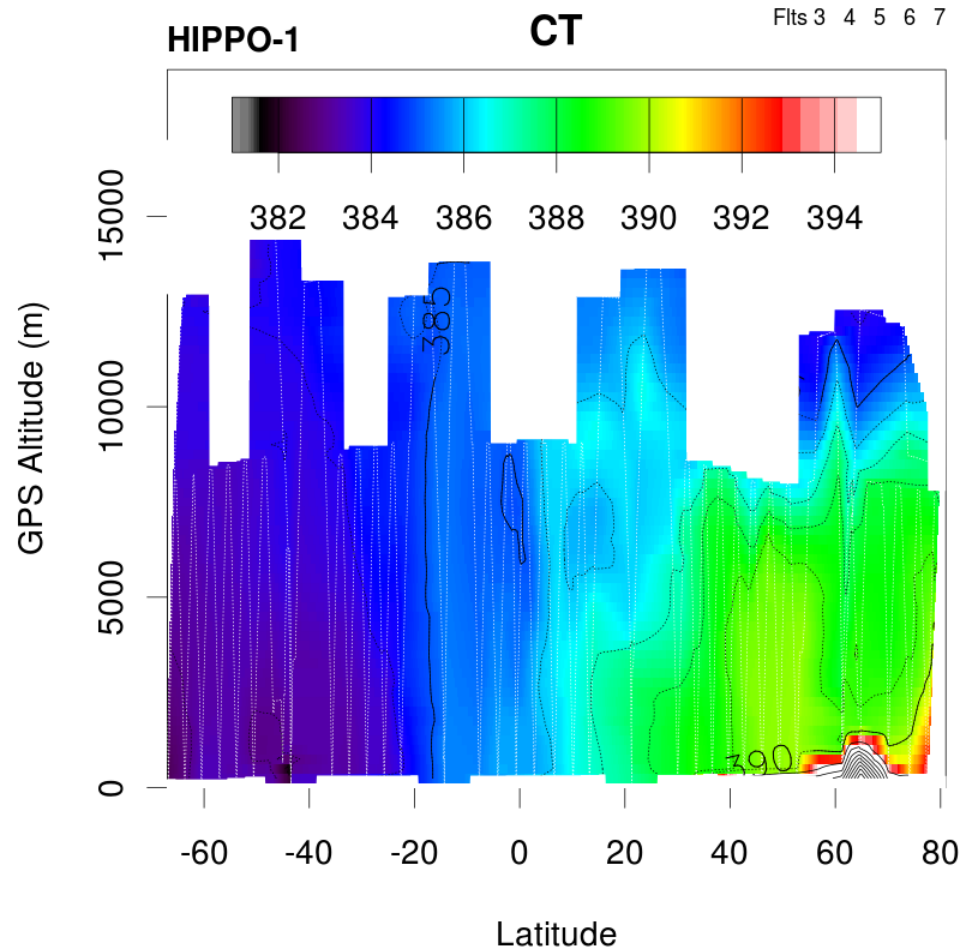
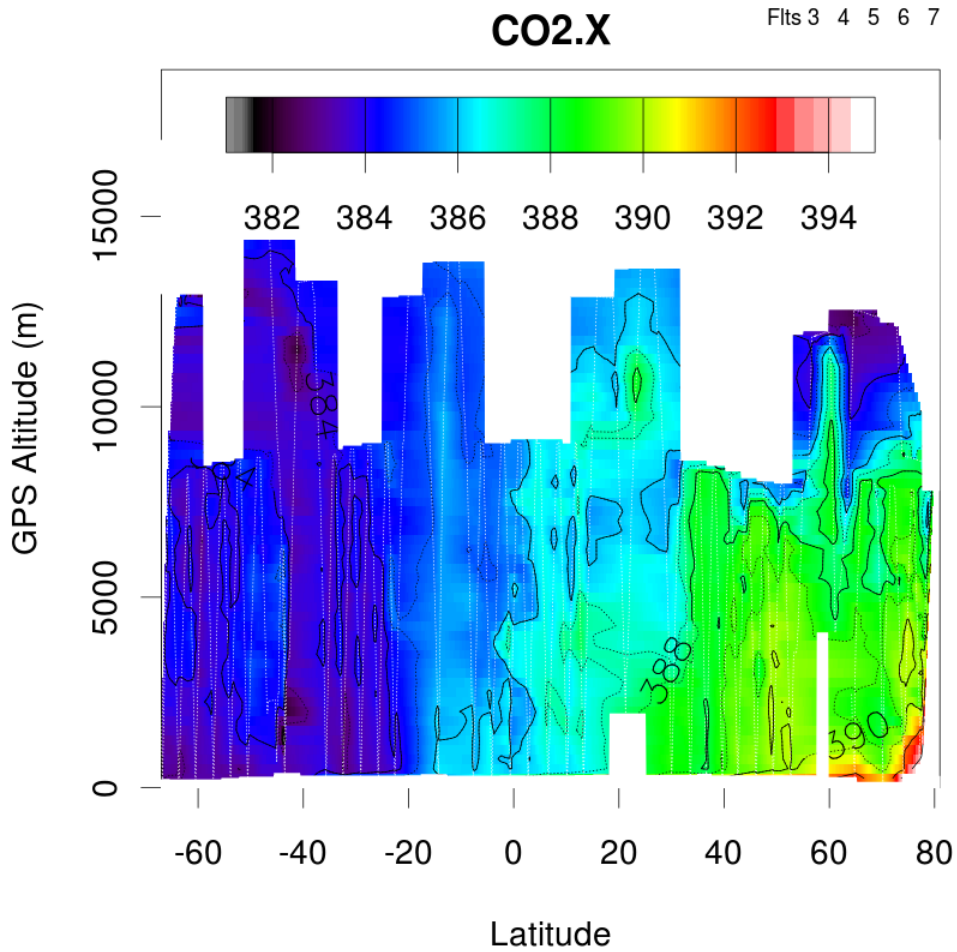
I have been waiting a
long time for this....



HIPPO and CarbonTracker CO₂

HIPPO-1 CO₂ CarbonTracker

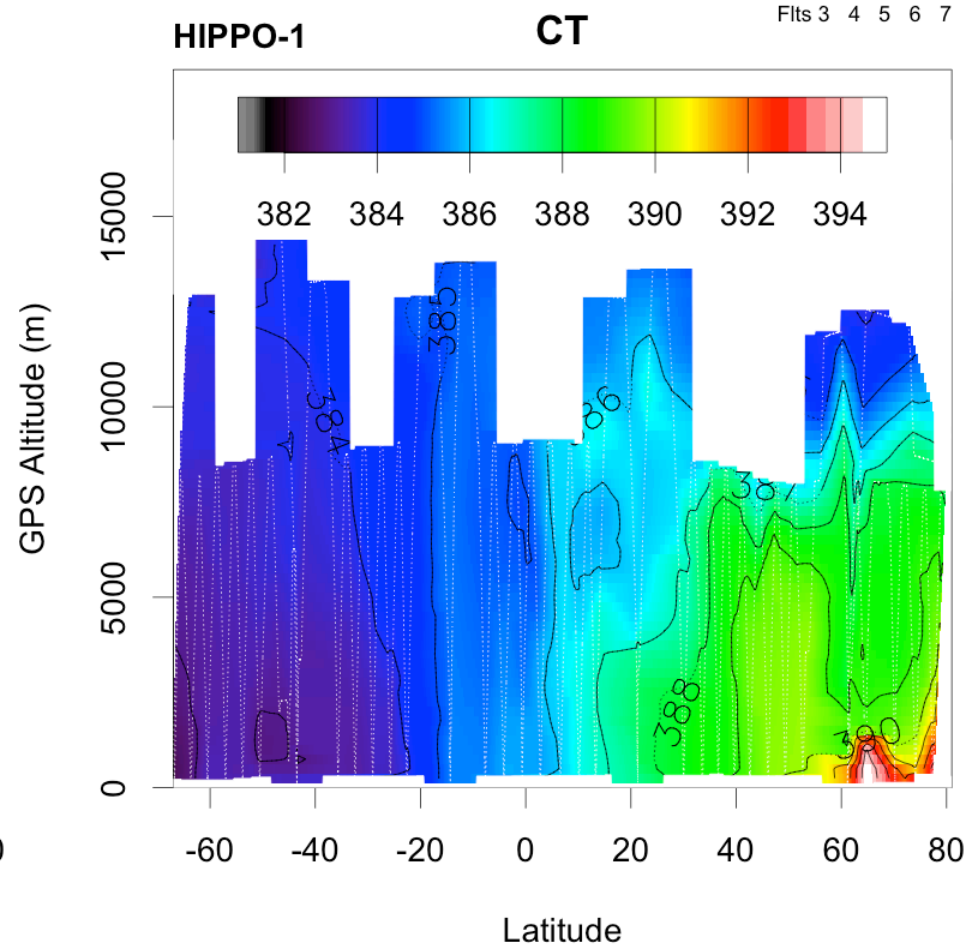
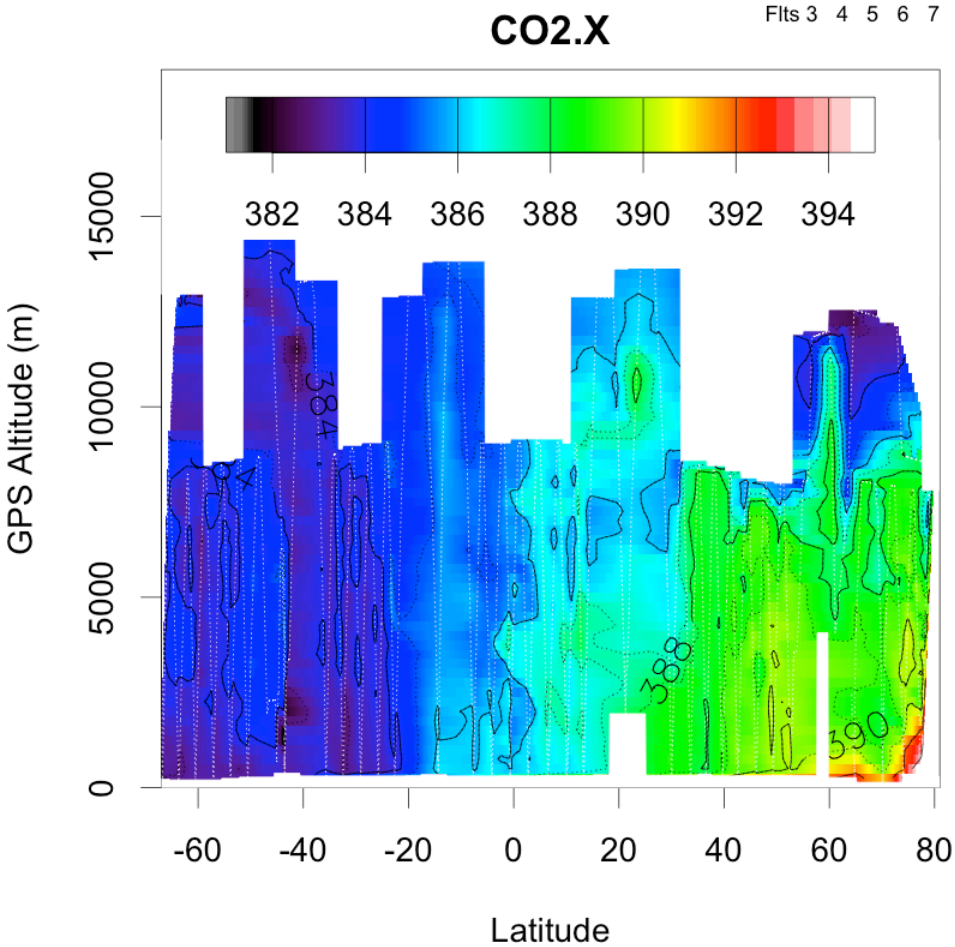
Observed CT



HIPPO-2 CO₂ CarbonTracker

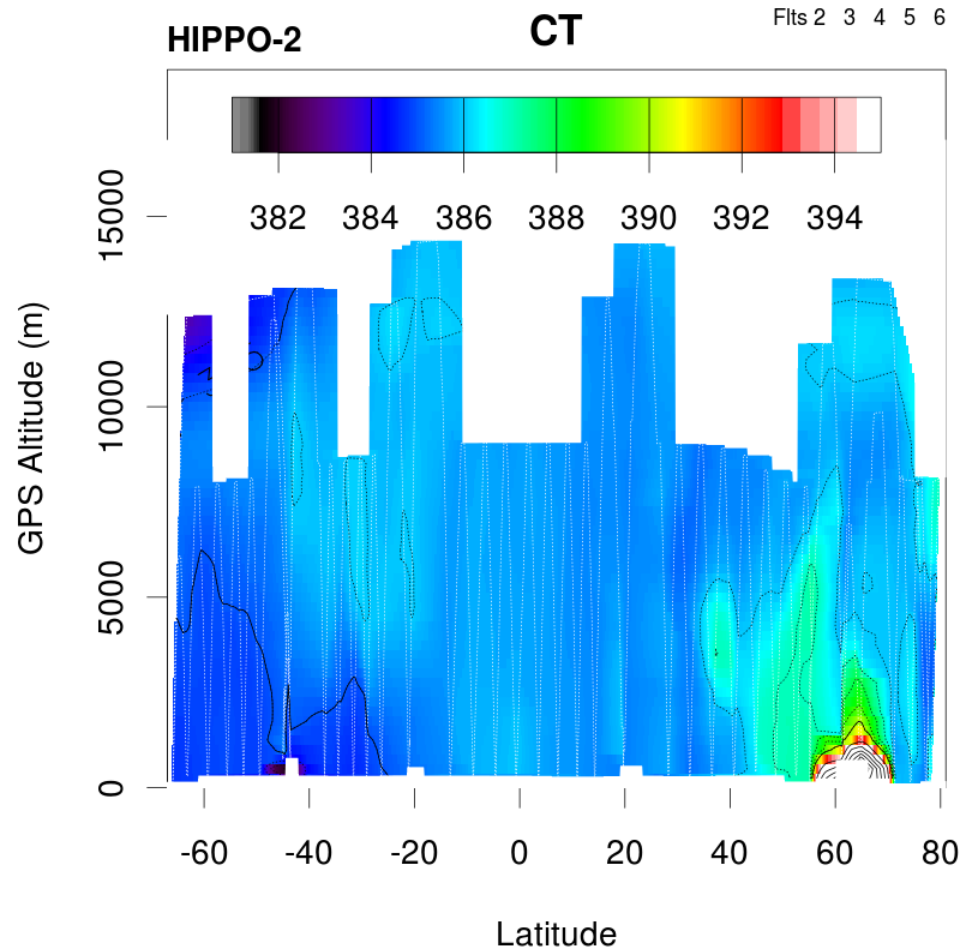
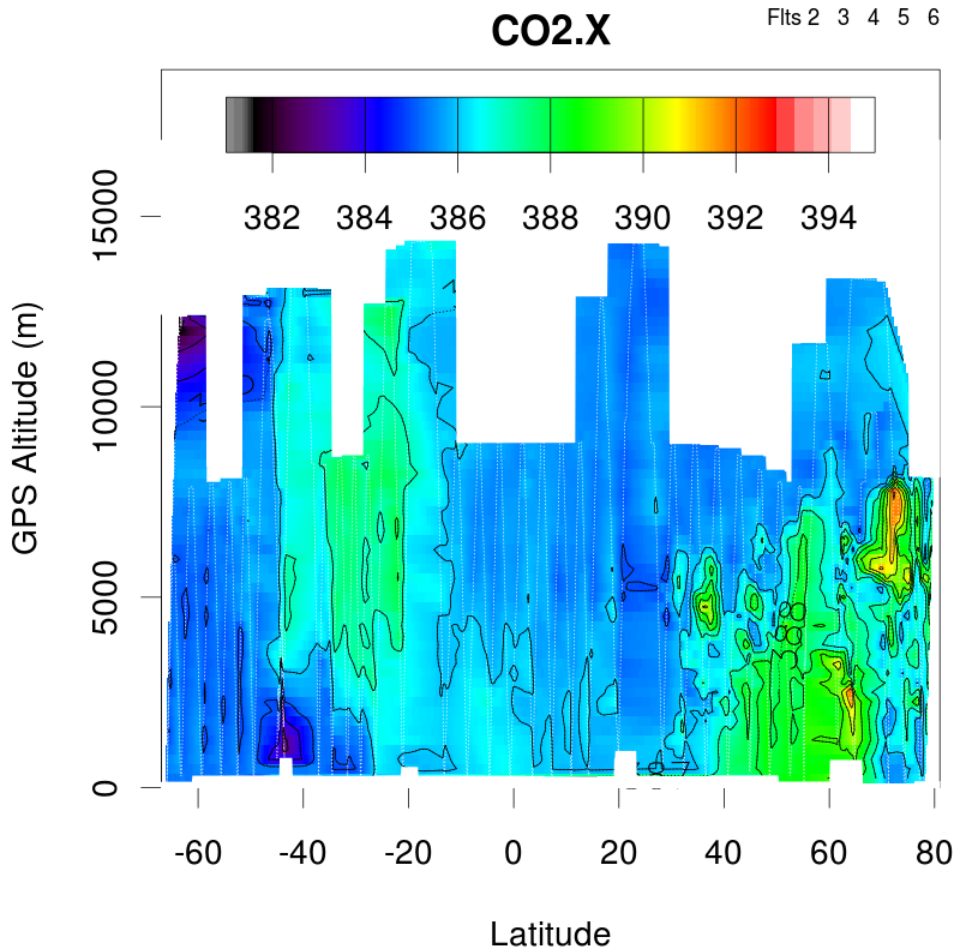
Observed CT

Remove Level 1



HIPPO-2 CO₂ CarbonTracker

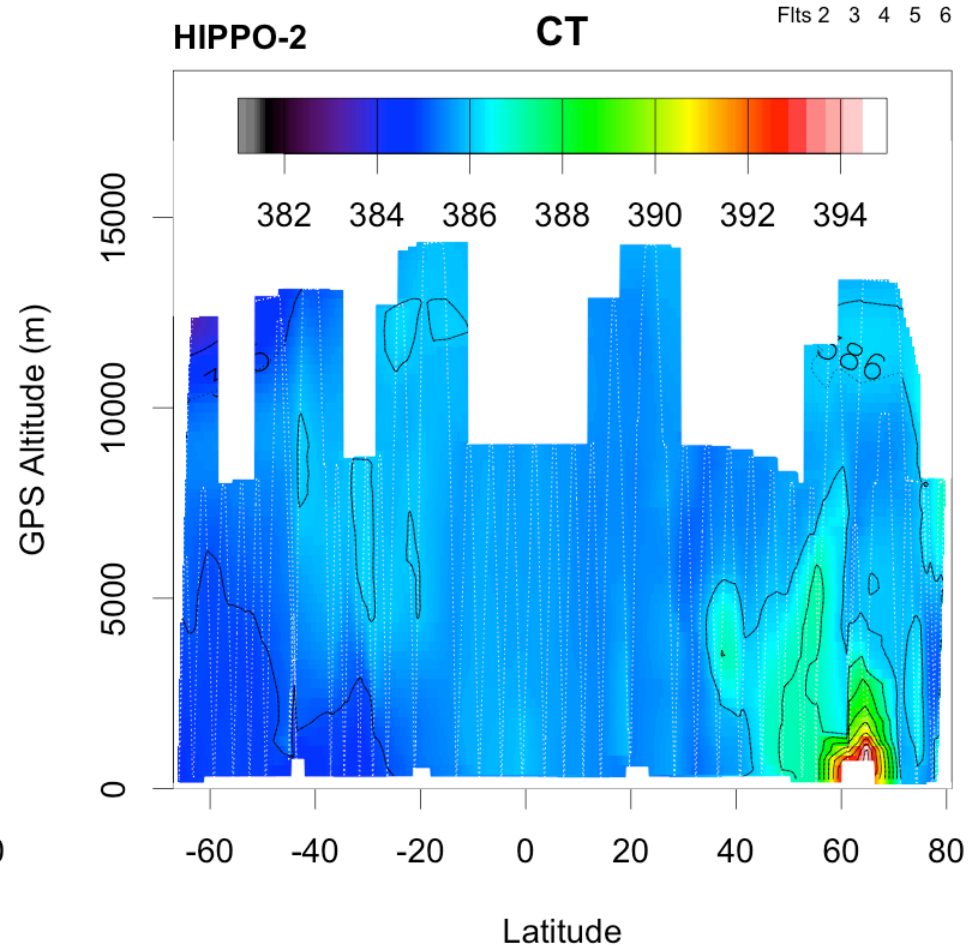
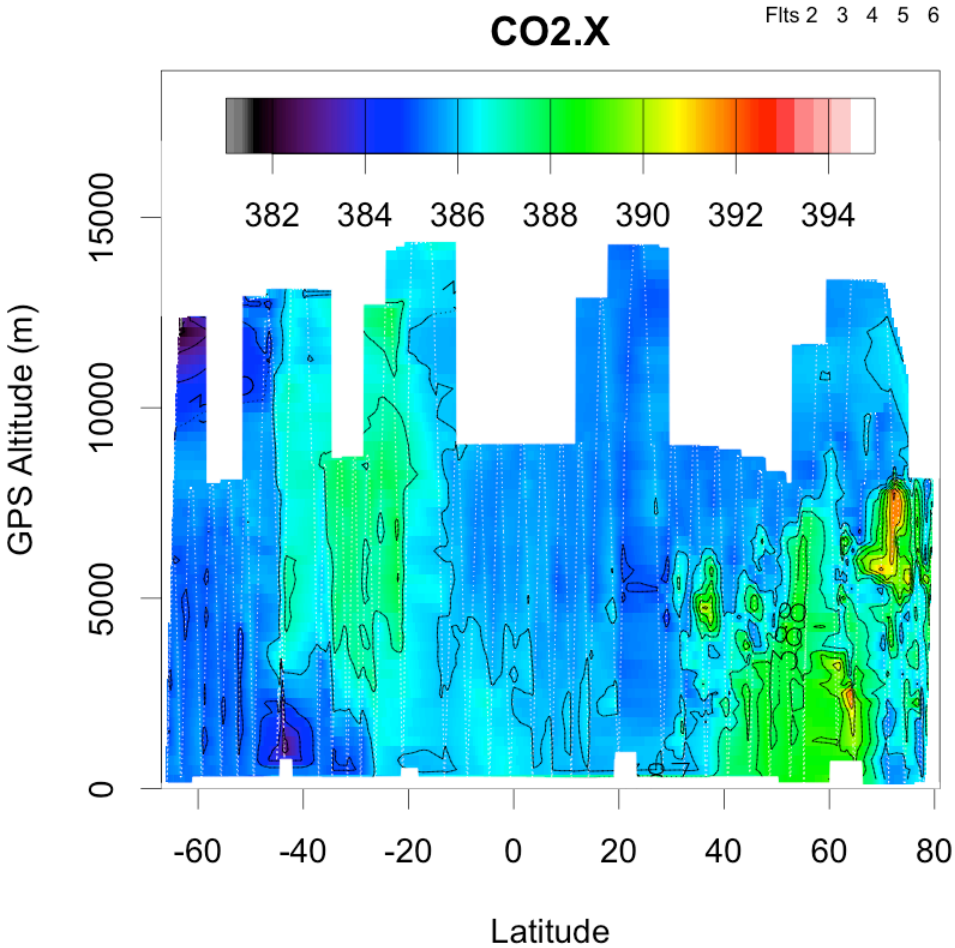
Observed CT



HIPPO-2 CO₂ CarbonTracker

Observed CT

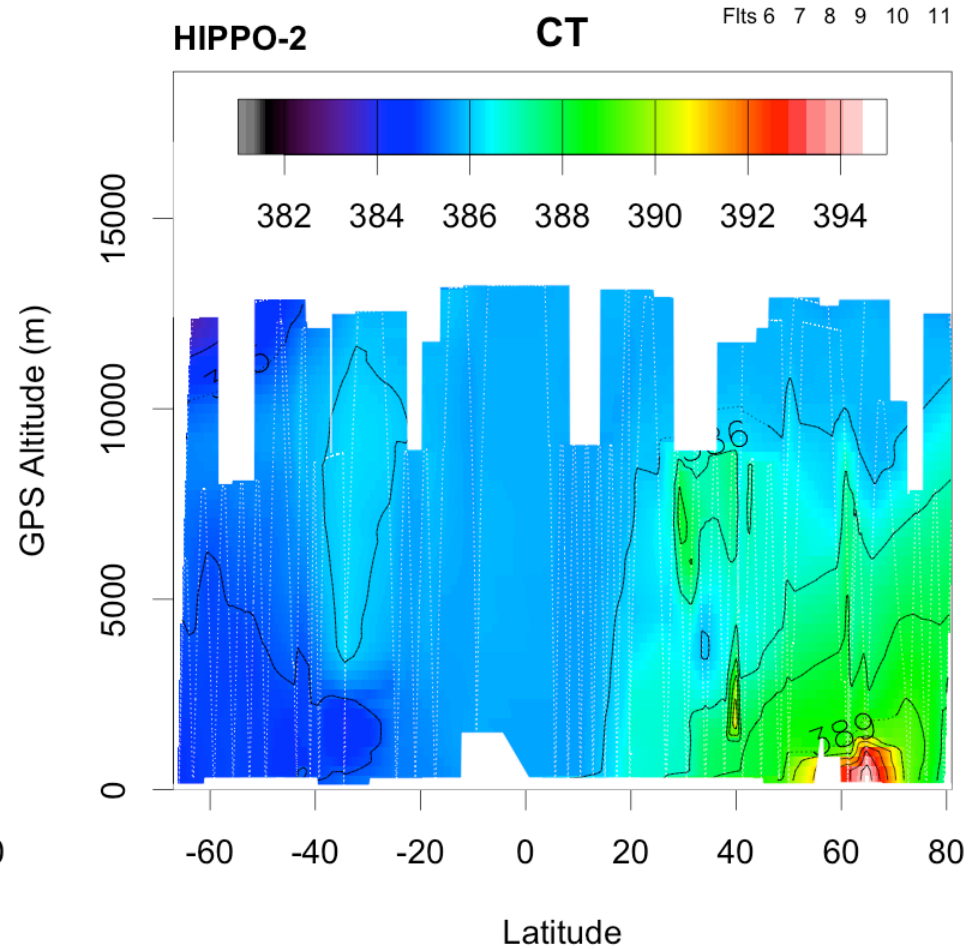
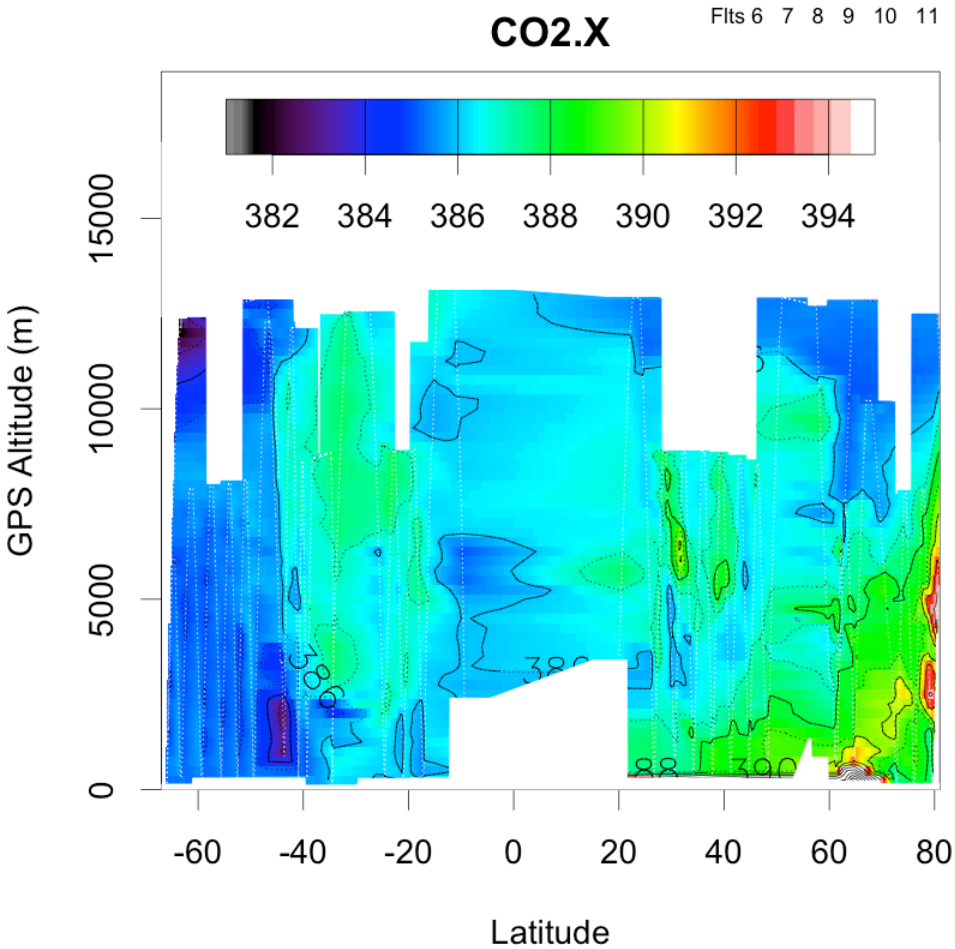
Remove Level 1

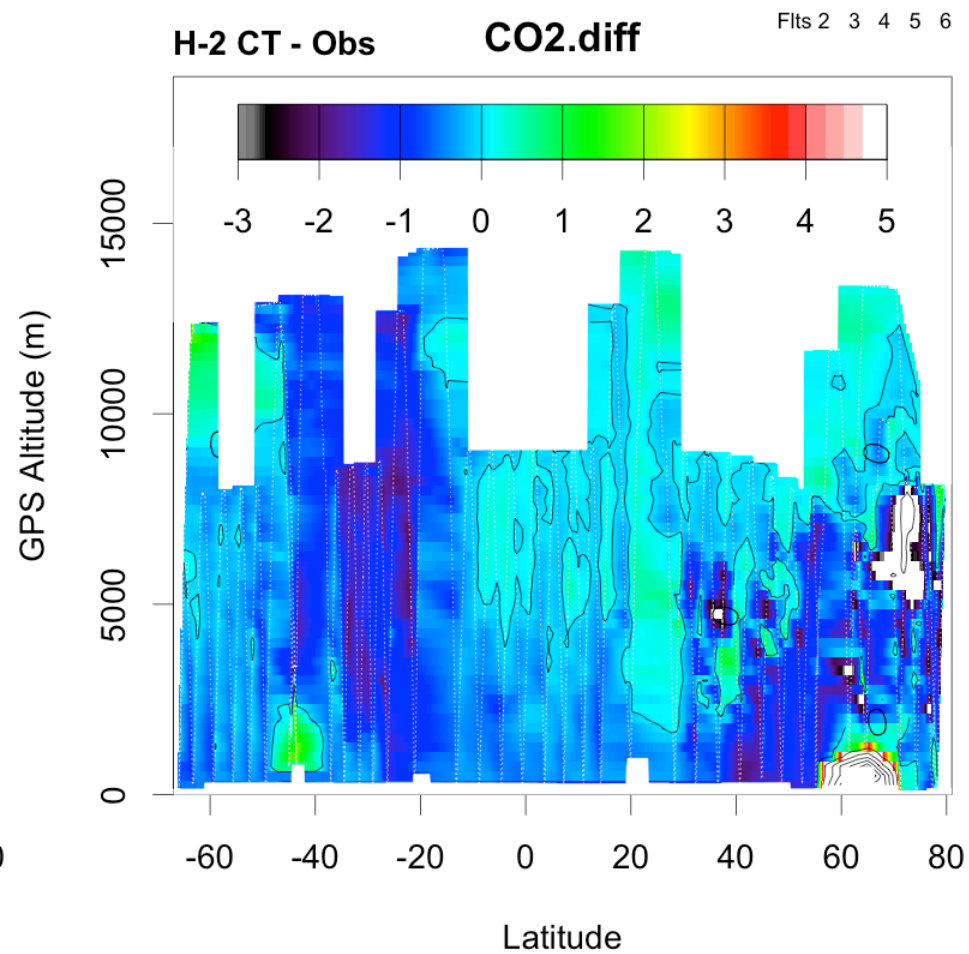
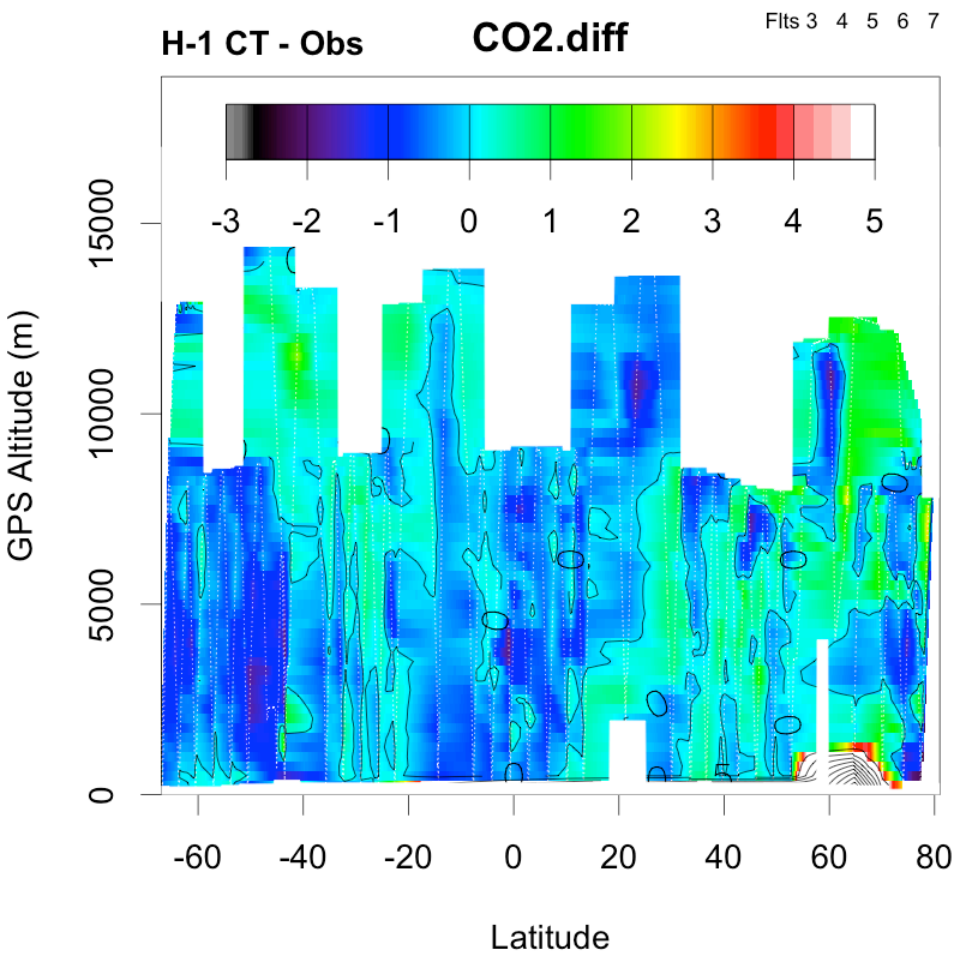


HIPPO-2 CO₂ CarbonTracker

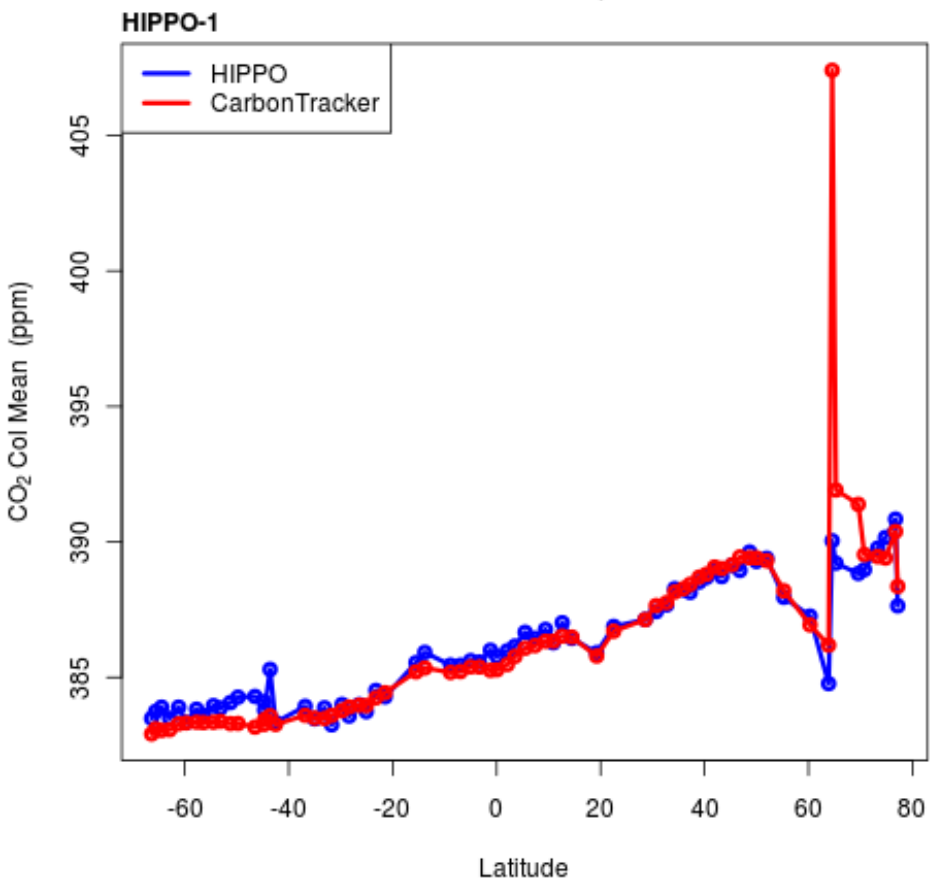
Observed CT

NBound: Remove Level 1

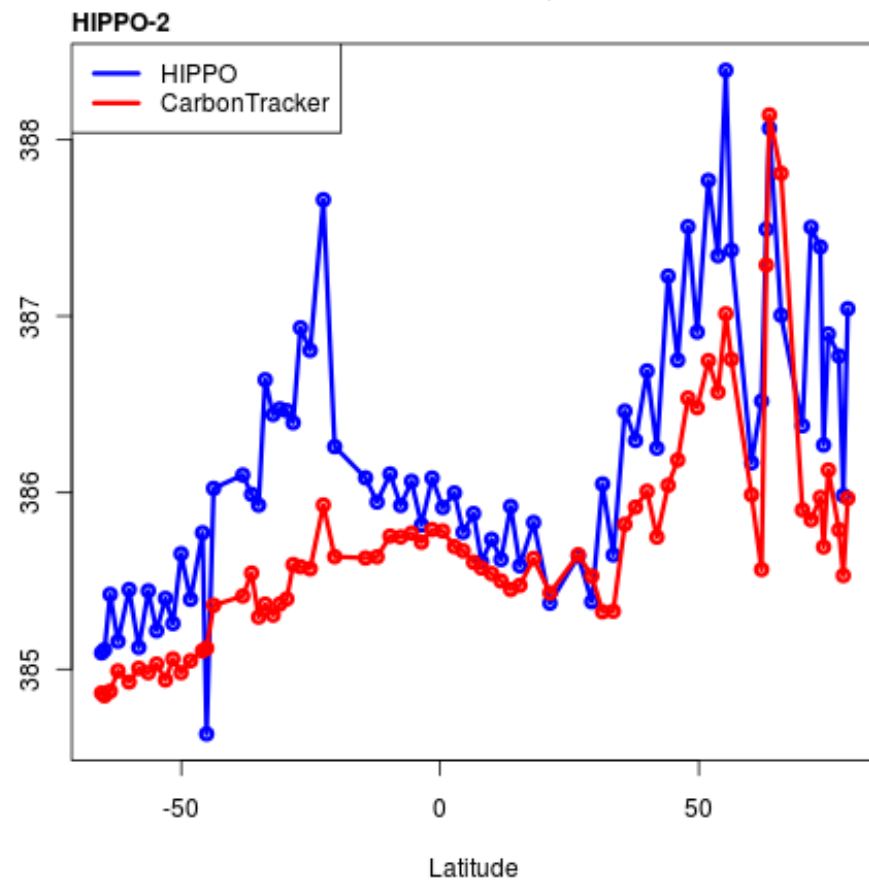




HIPPO-1 SB Jan, 2009

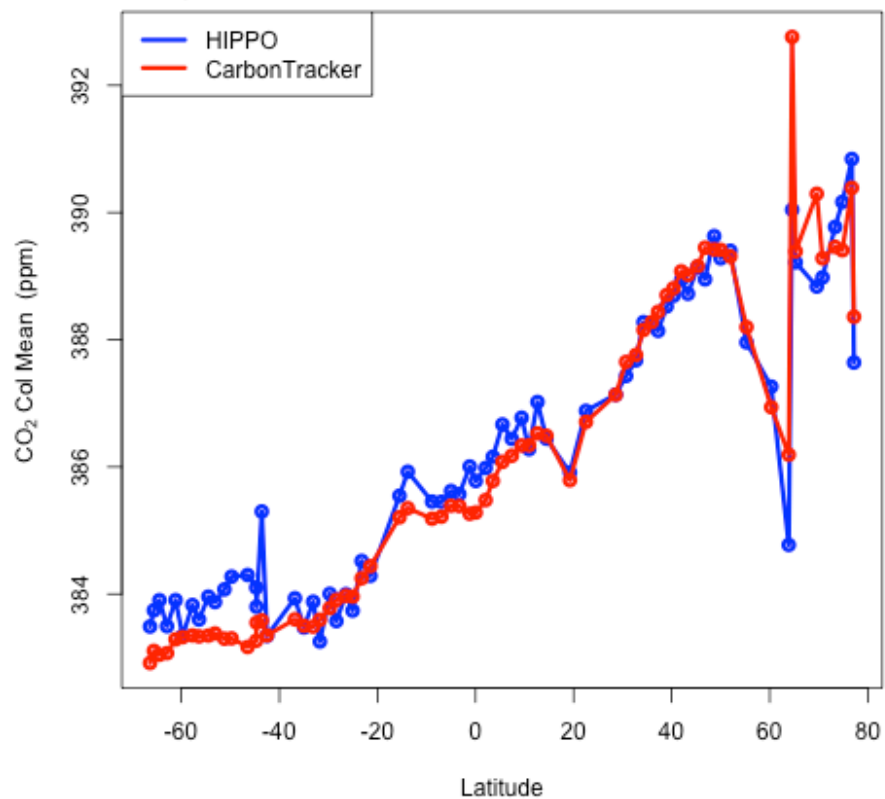


HIPPO-2 SB Oct, 2009



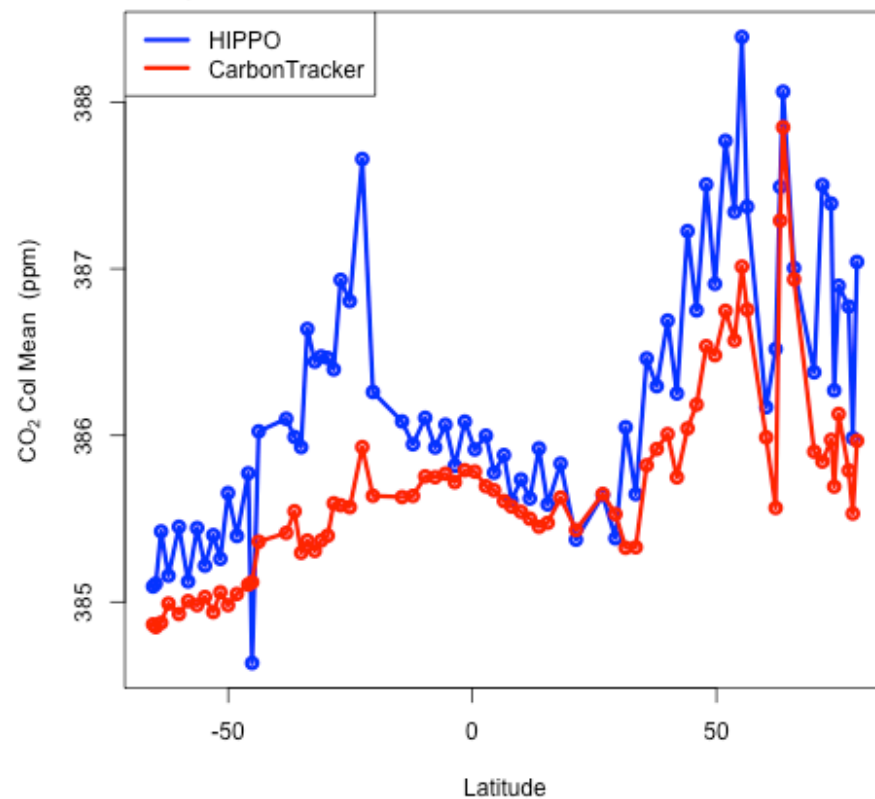
HIPPO-1 SB Jan, 2009

HIPPO-1

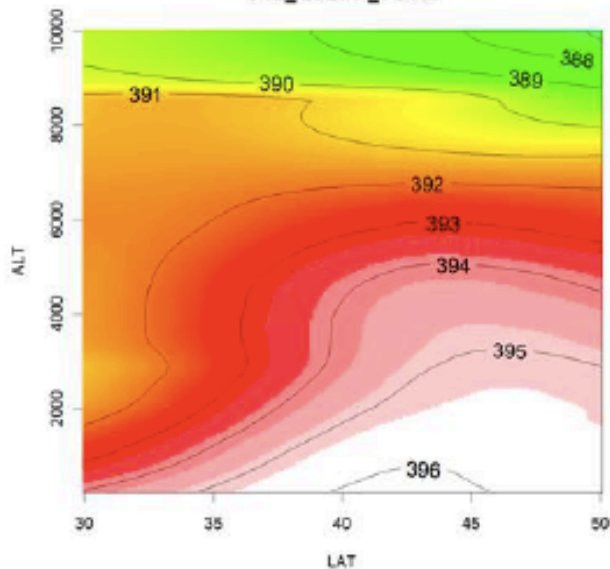


HIPPO-2 SB Oct, 2009

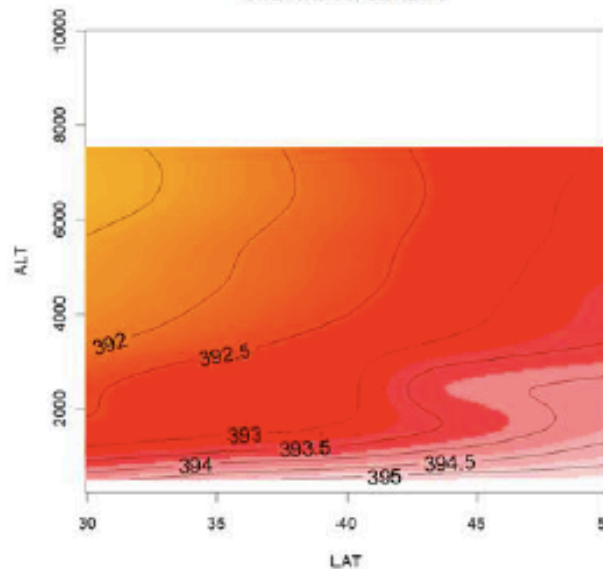
HIPPO-2



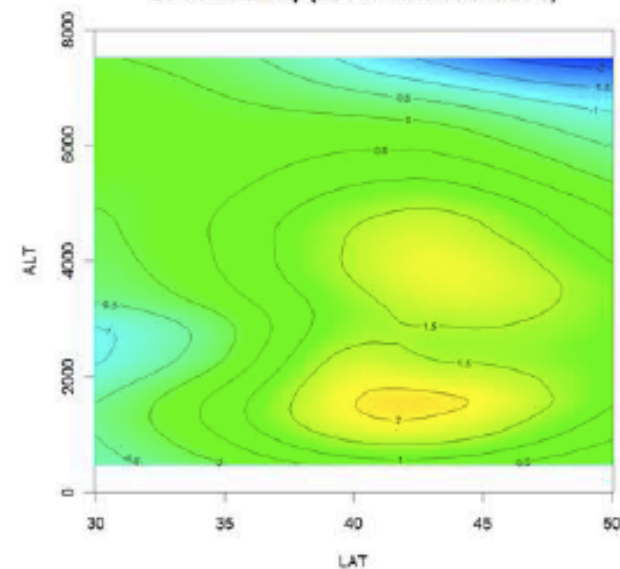
CO₂_QCLS H₃ Data



CO₂ Remote Site Data

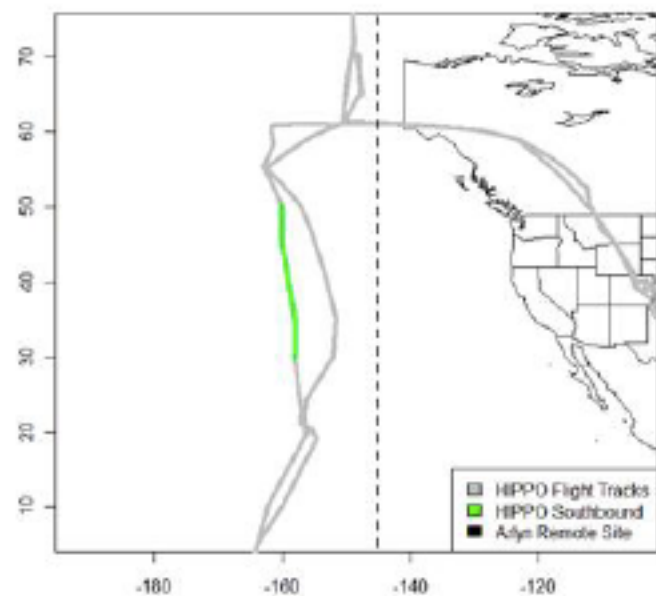
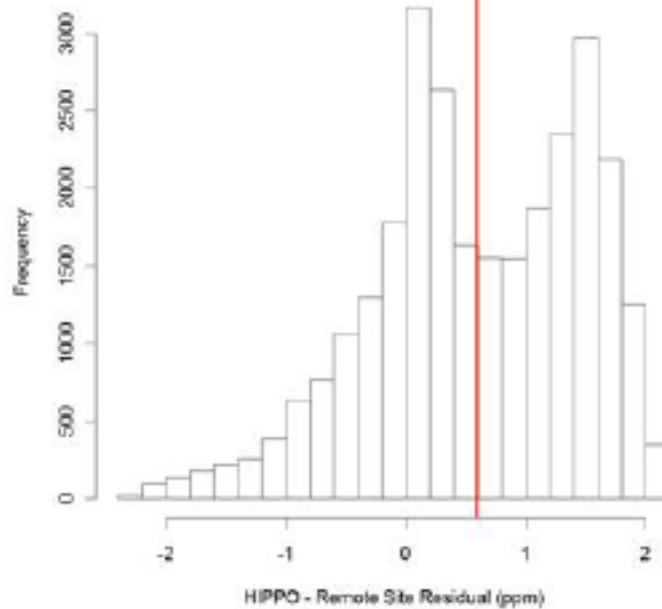


BC Residual Map (HIPPO - Remote Site Data)



BC Residual Distribution

mean = 0.6 sd = 0.7



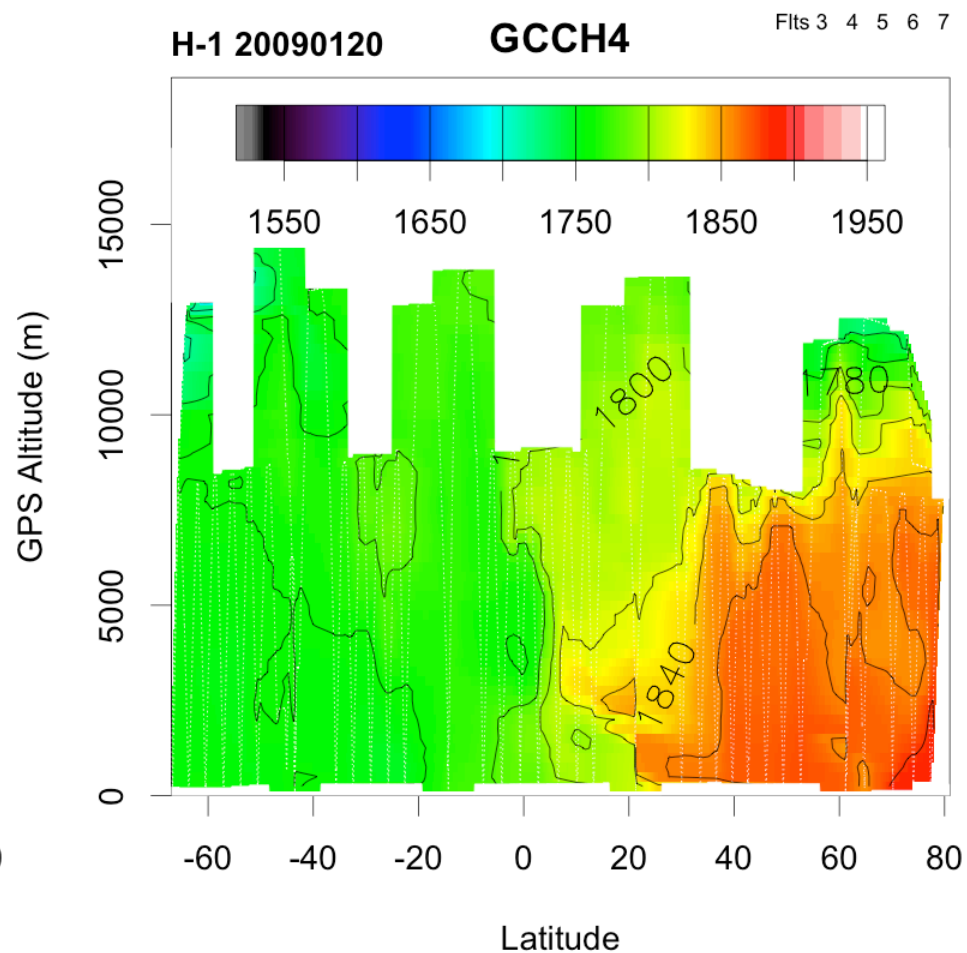
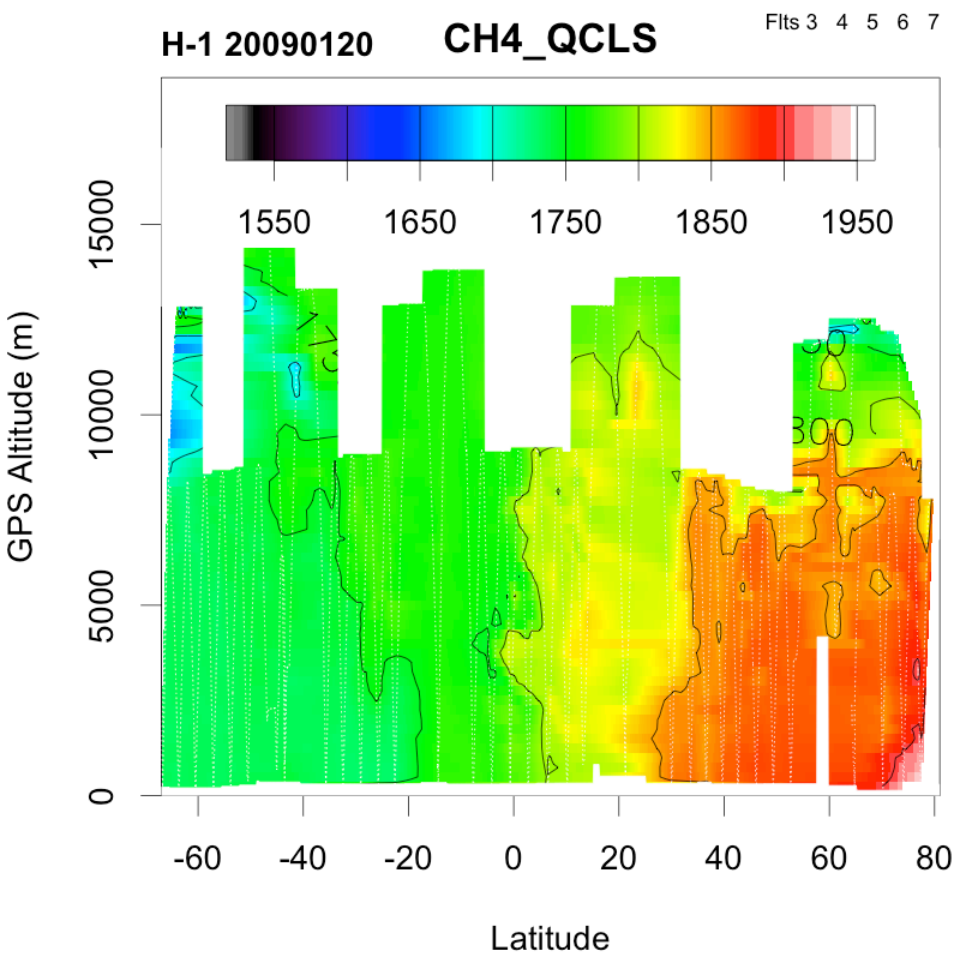
G. Santoni

HIPPO and MACC and GEOS-CHEM CH₄

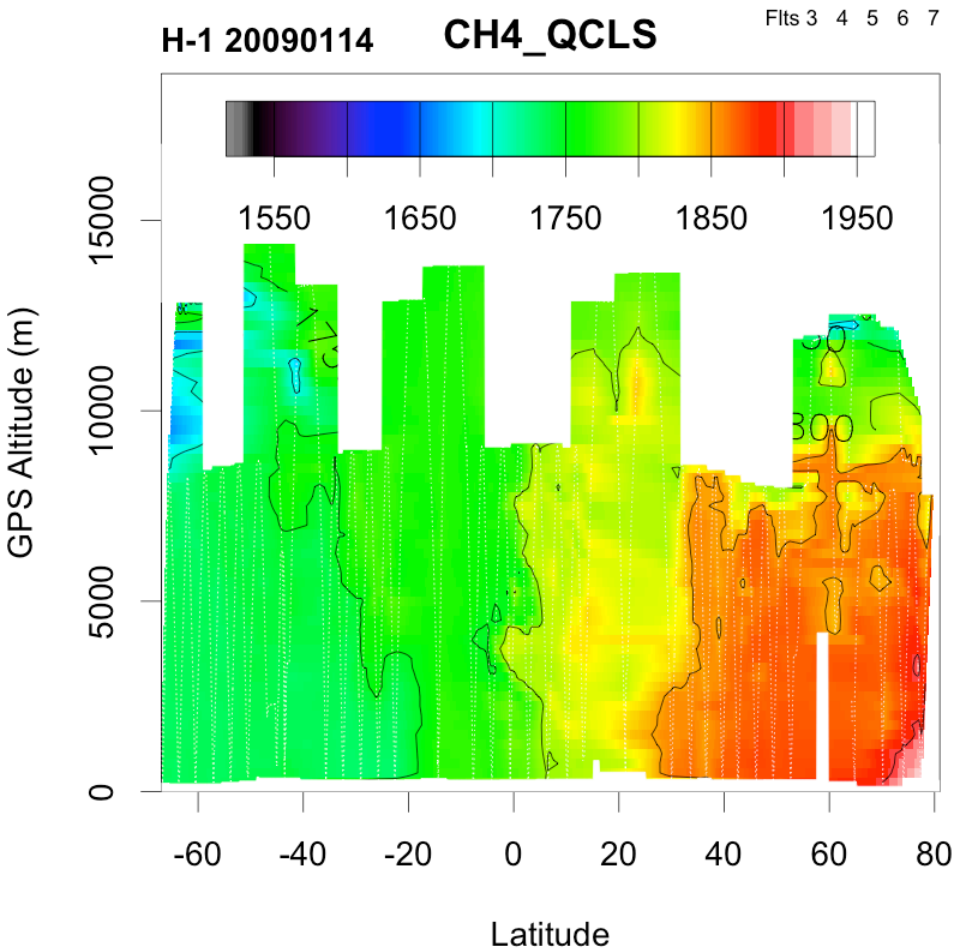
HIPPO-1

SB

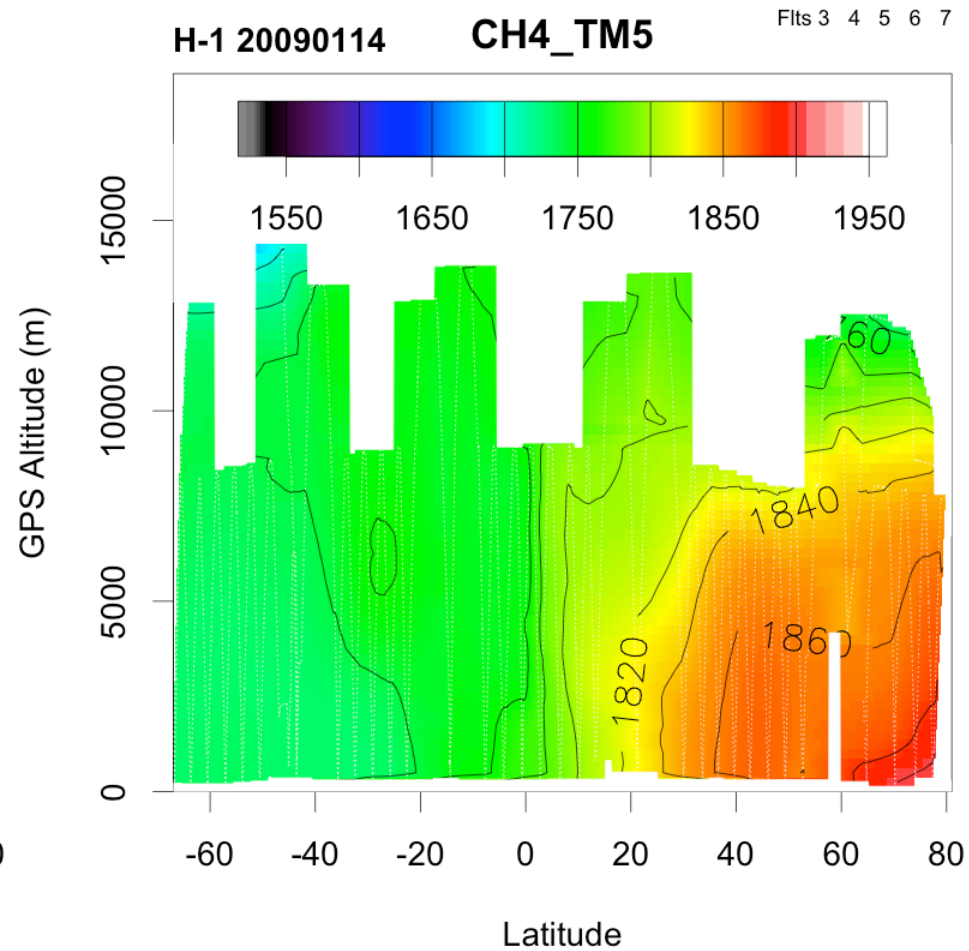
GEOS-CHEM



HIPPO-1



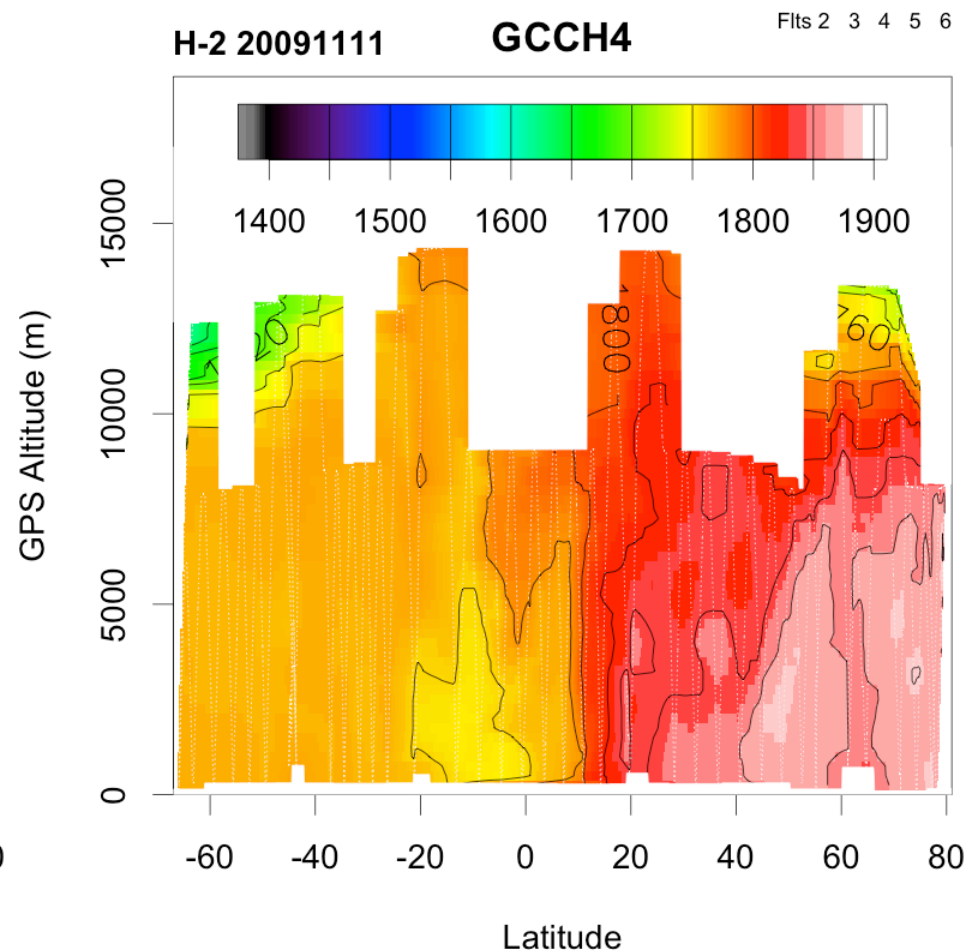
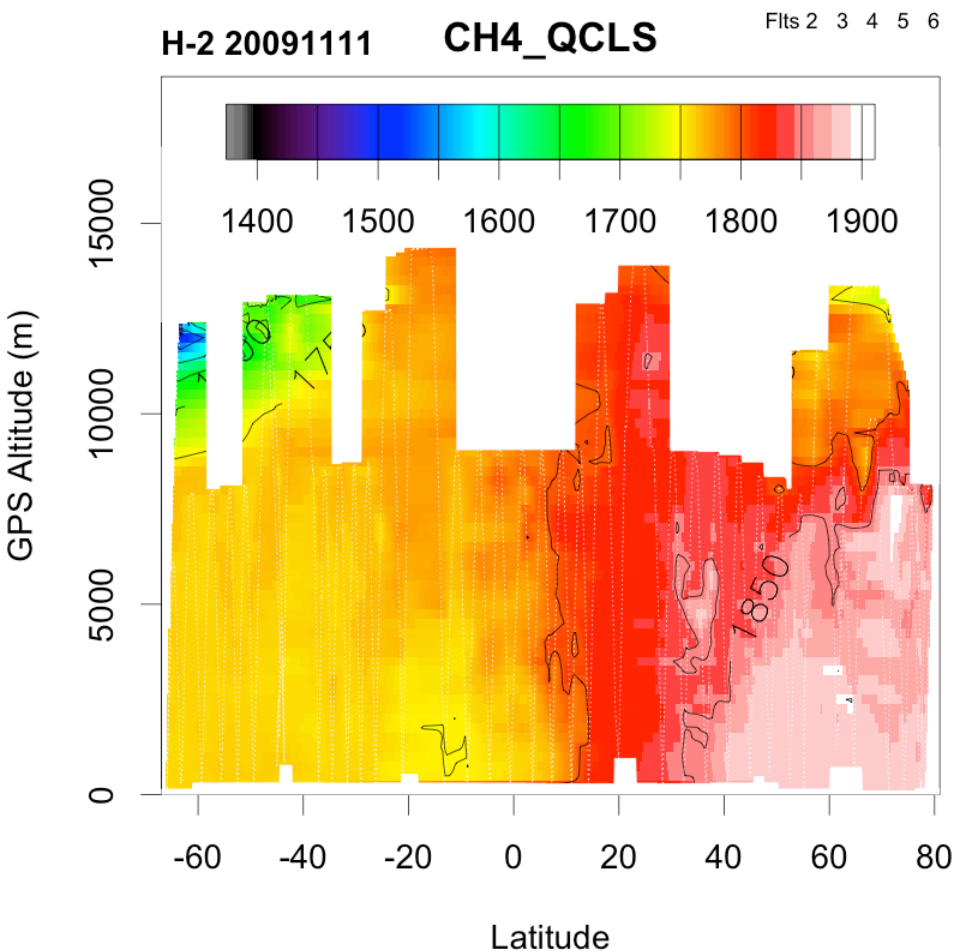
MACC TM-5



HIPPO-2

SB

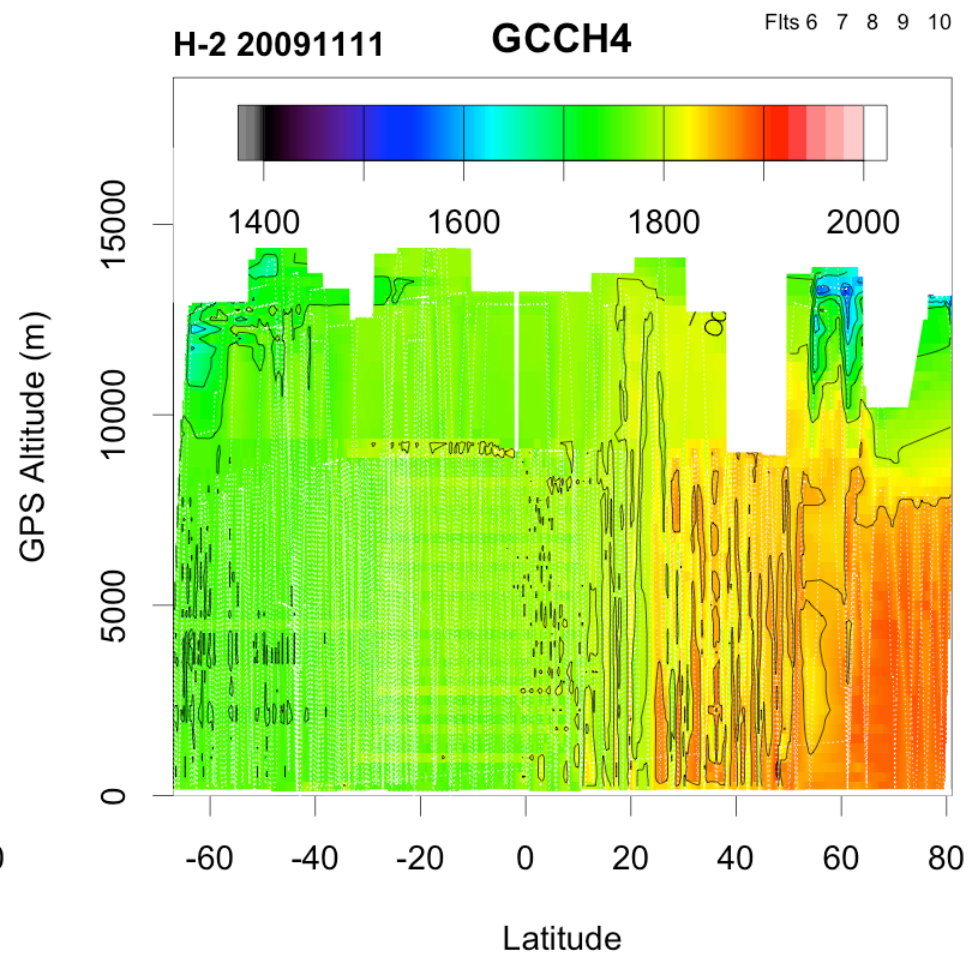
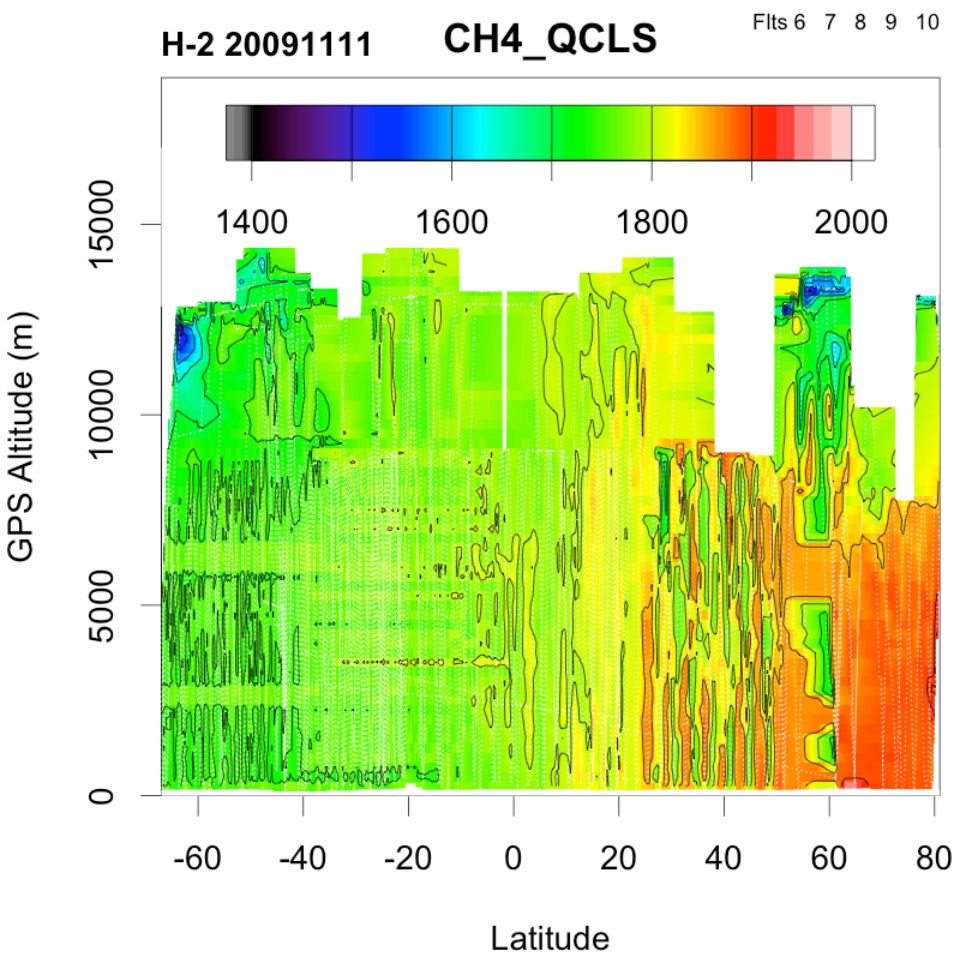
GEOS-CHEM



HIPPO -2

NB

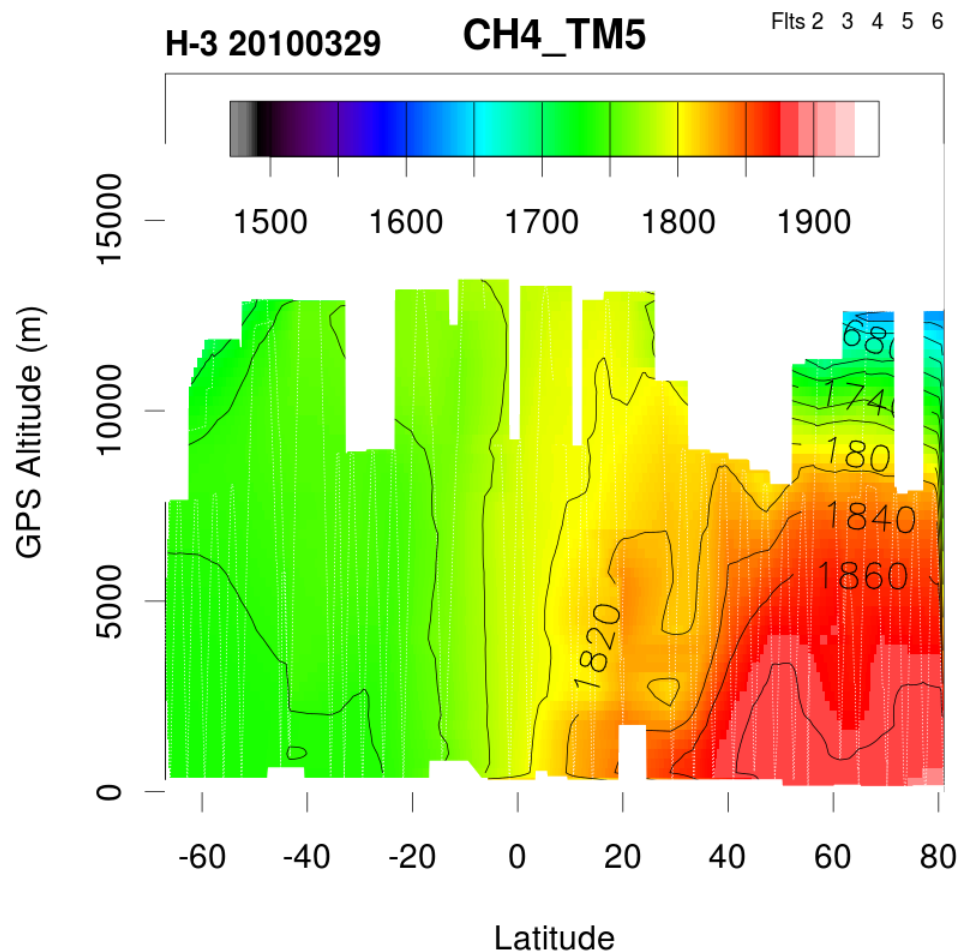
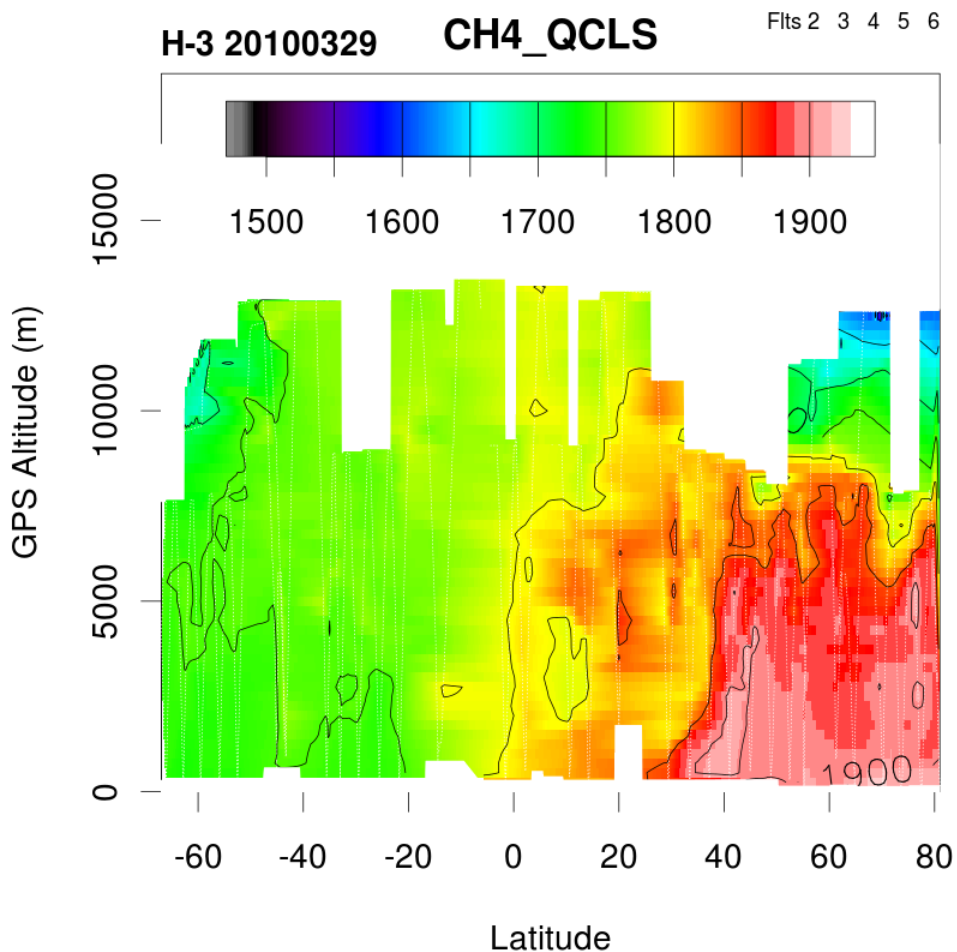
GEOS-CHEM



HIPPO

HIPPO-3 Southbound

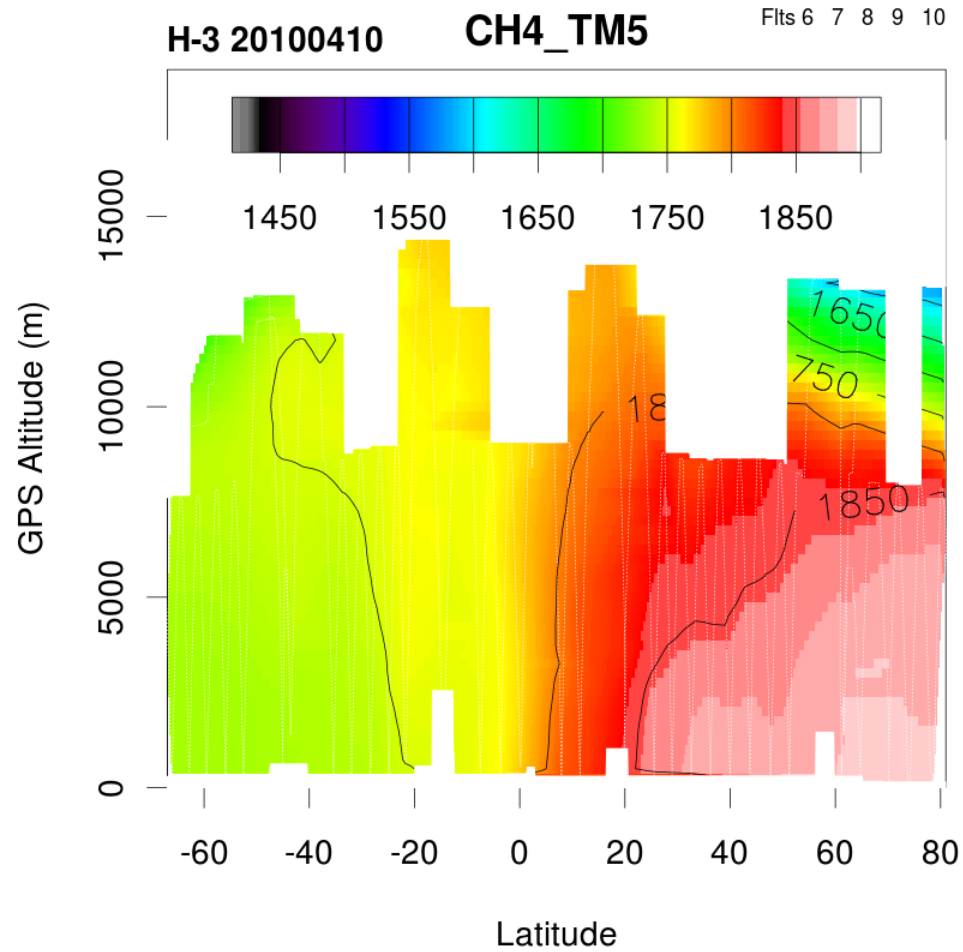
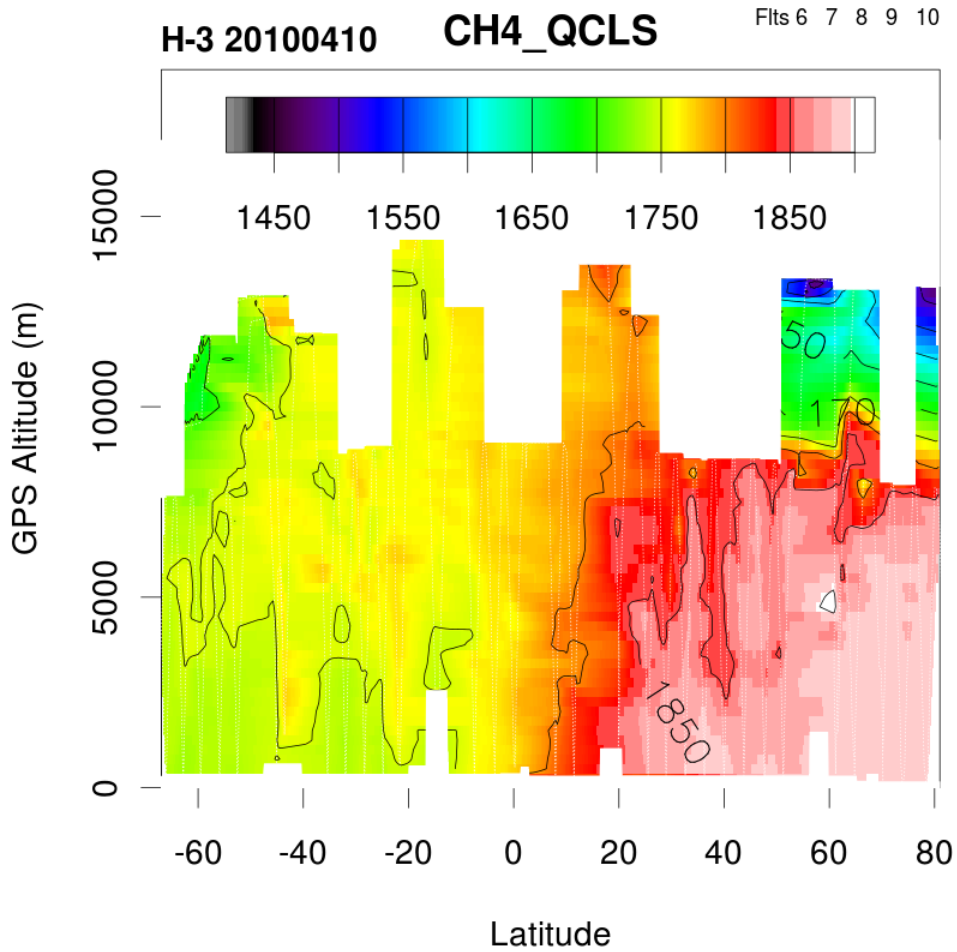
MACC TM-5



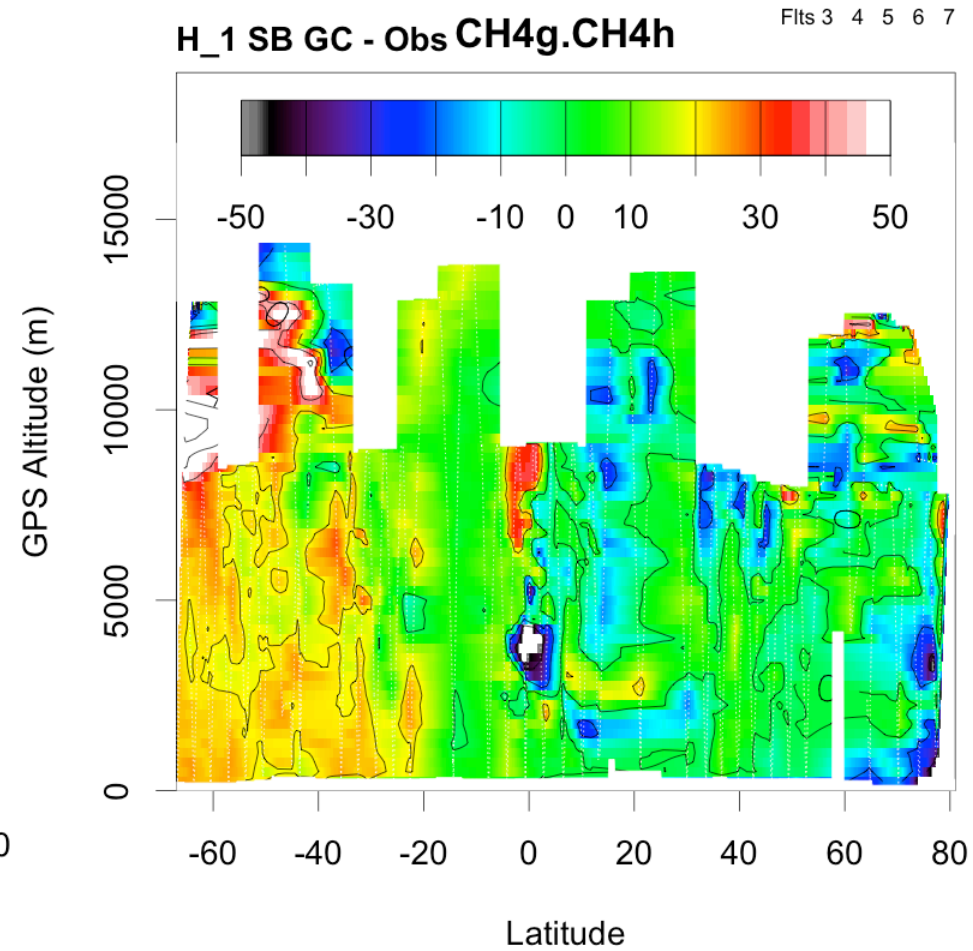
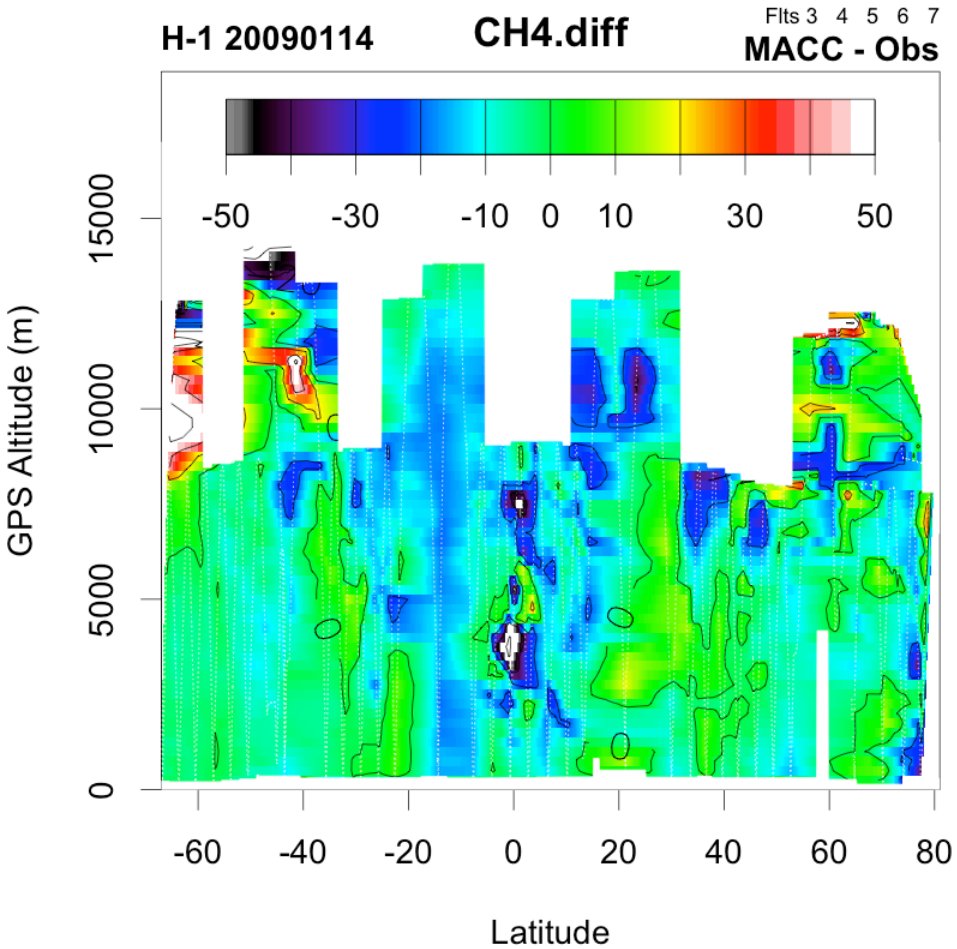
HIPPO

HIPPO-3 Northbound

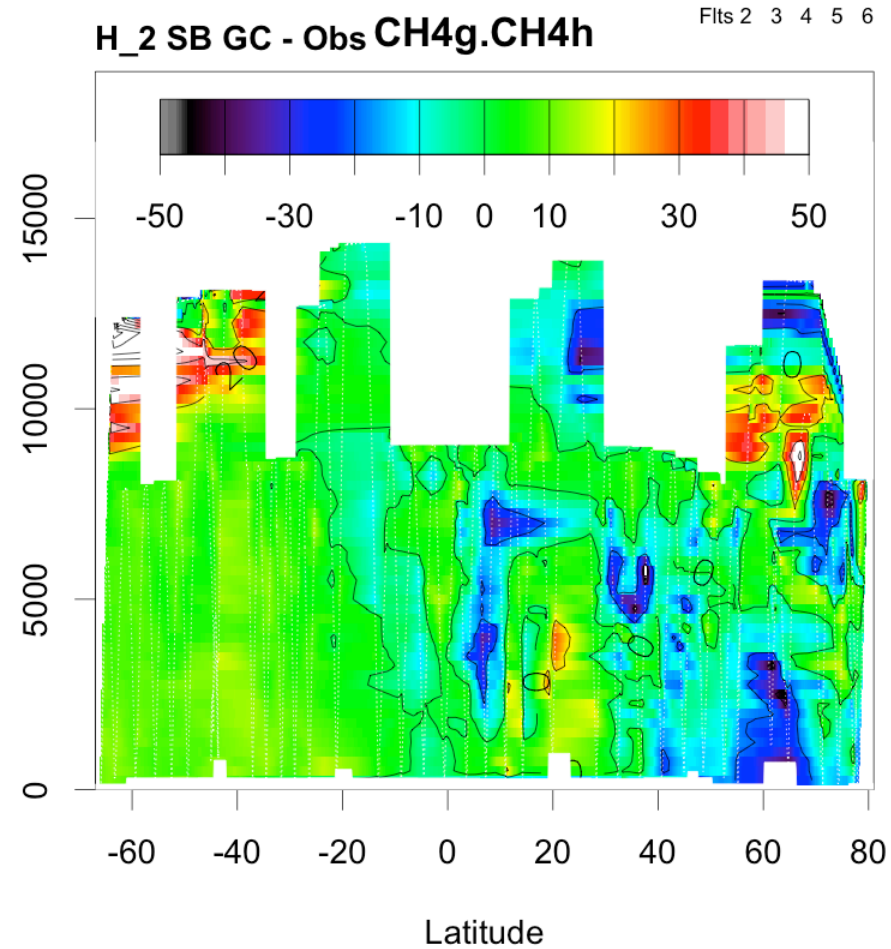
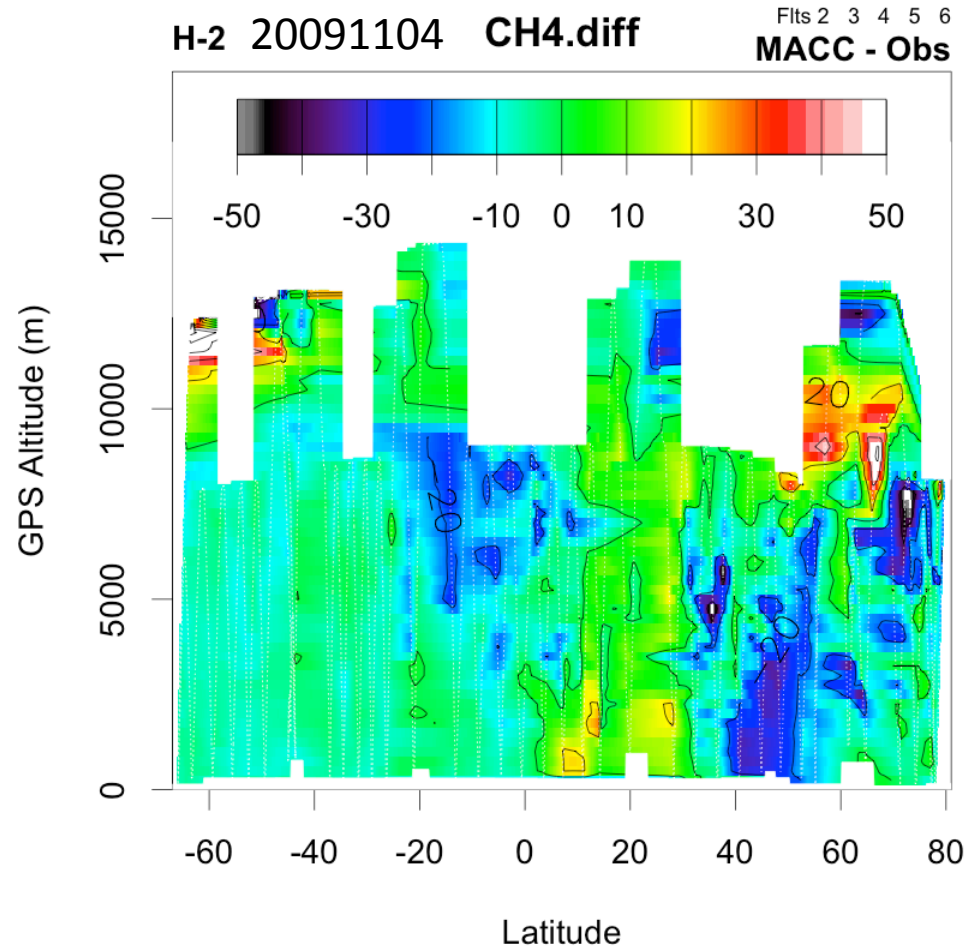
MACC TM-5



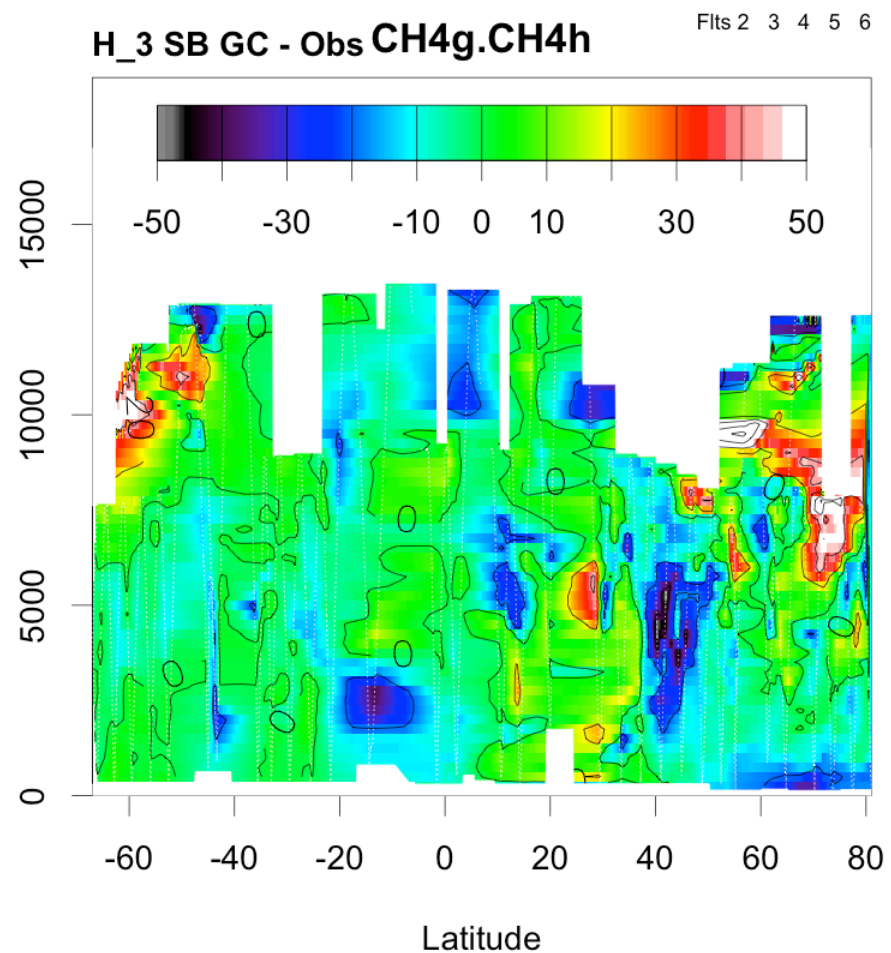
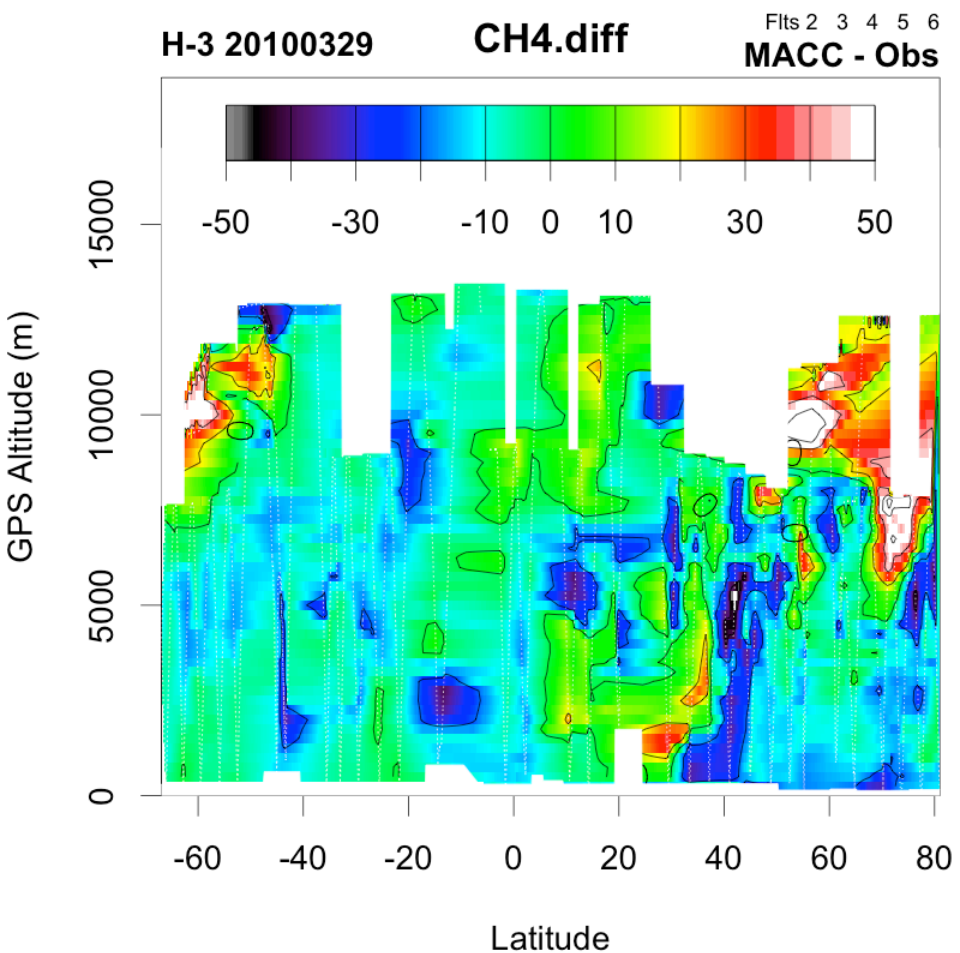
MACC ← → GEOS
HIPPO—1



MACC ← → GEOS
HIPPO—2



MACC ← → GEOS
HIPPO--3

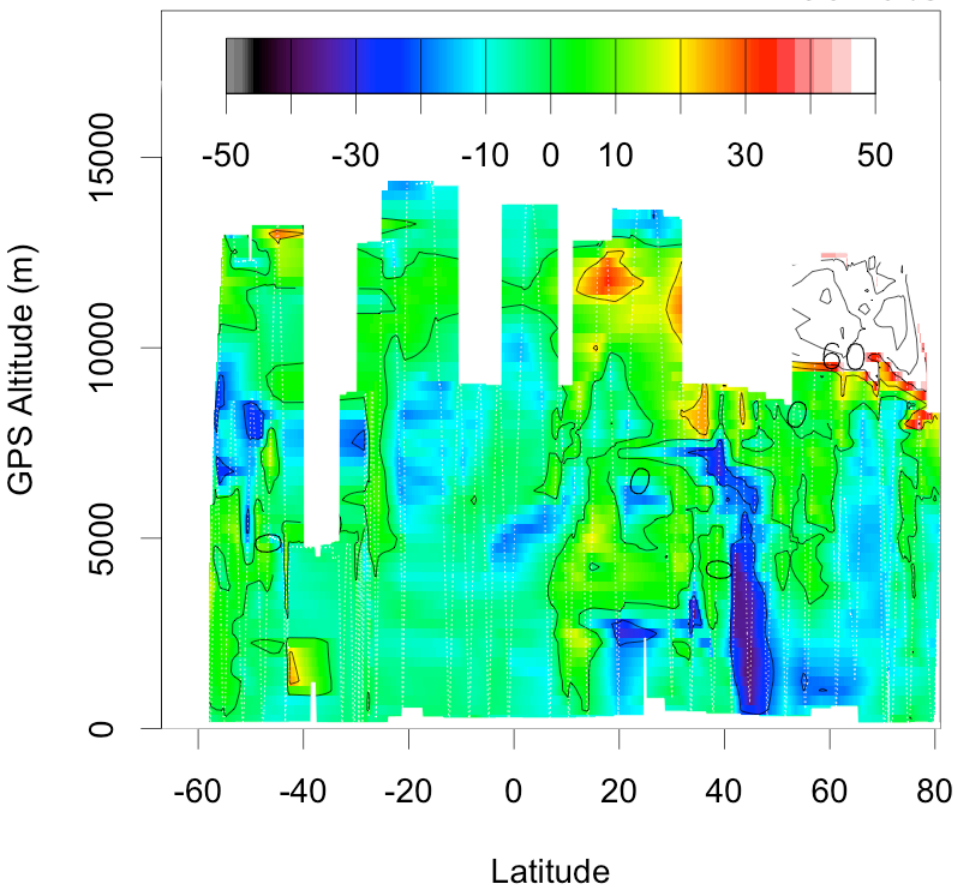


MACC ← → GEOS
HIPPO--4

H-4 20110618

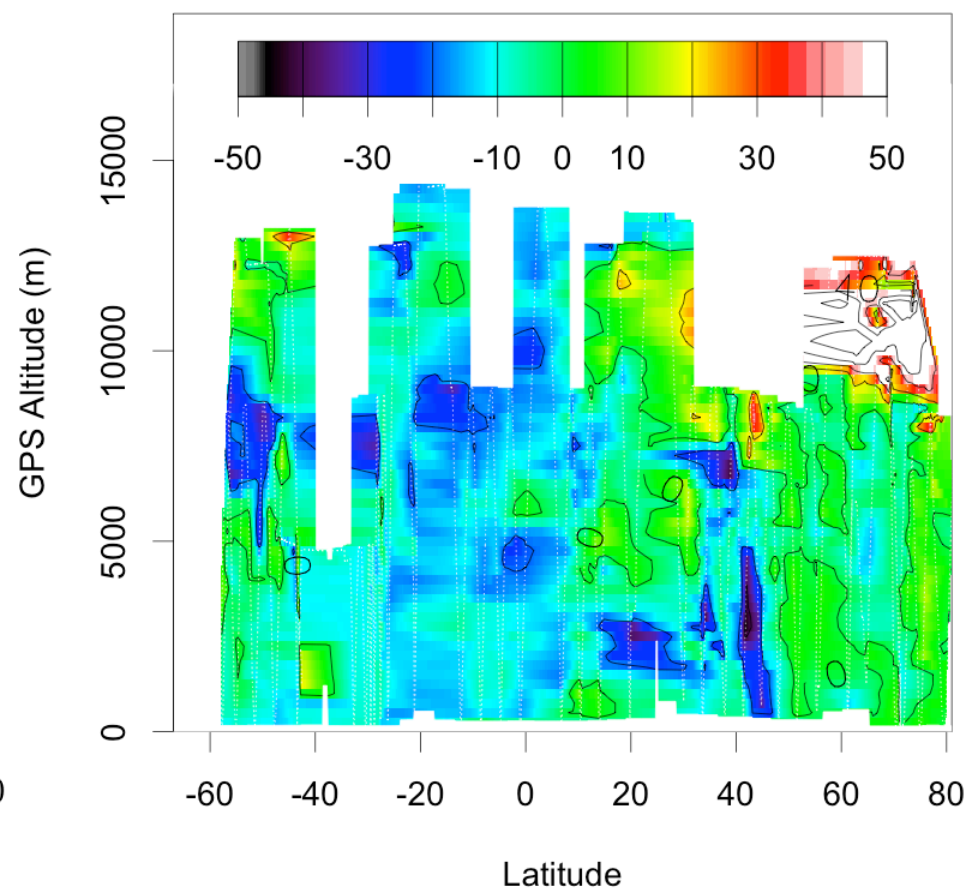
CH4.diff

Flts 2 3 4 5 6
MACC - Obs



H_4 SB GC - Obs CH4g.CH4h

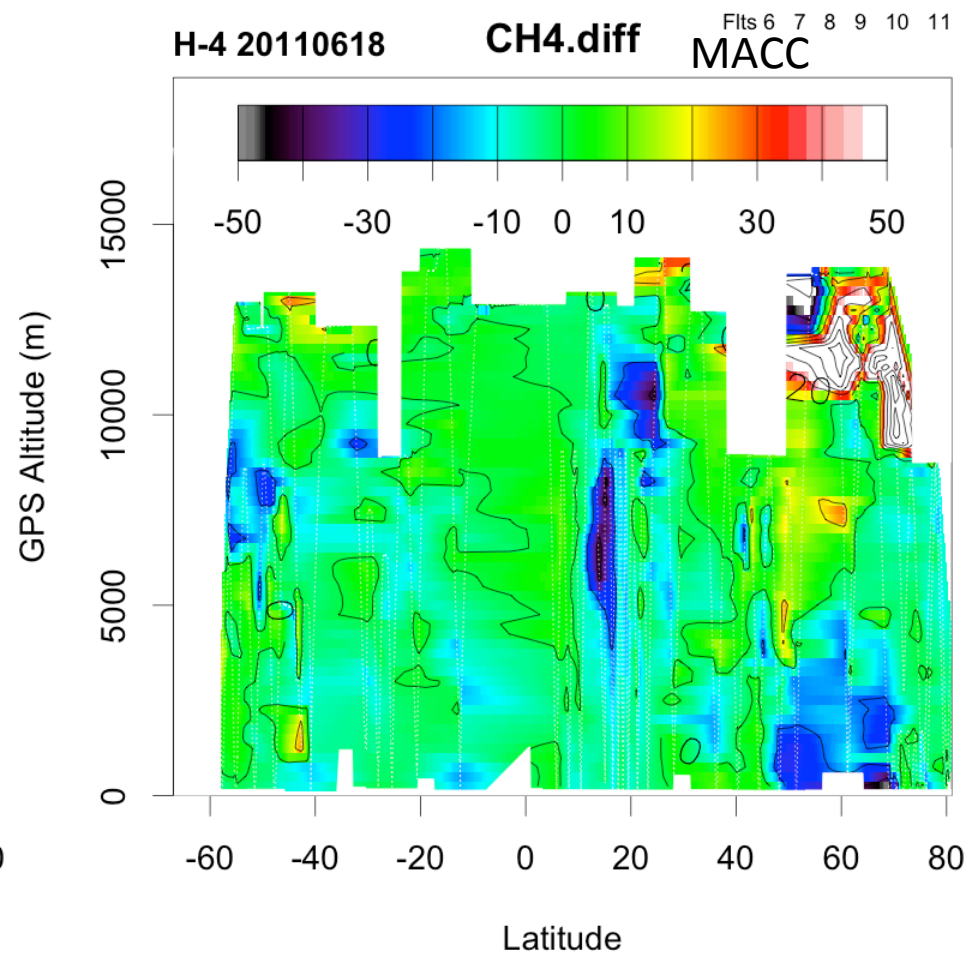
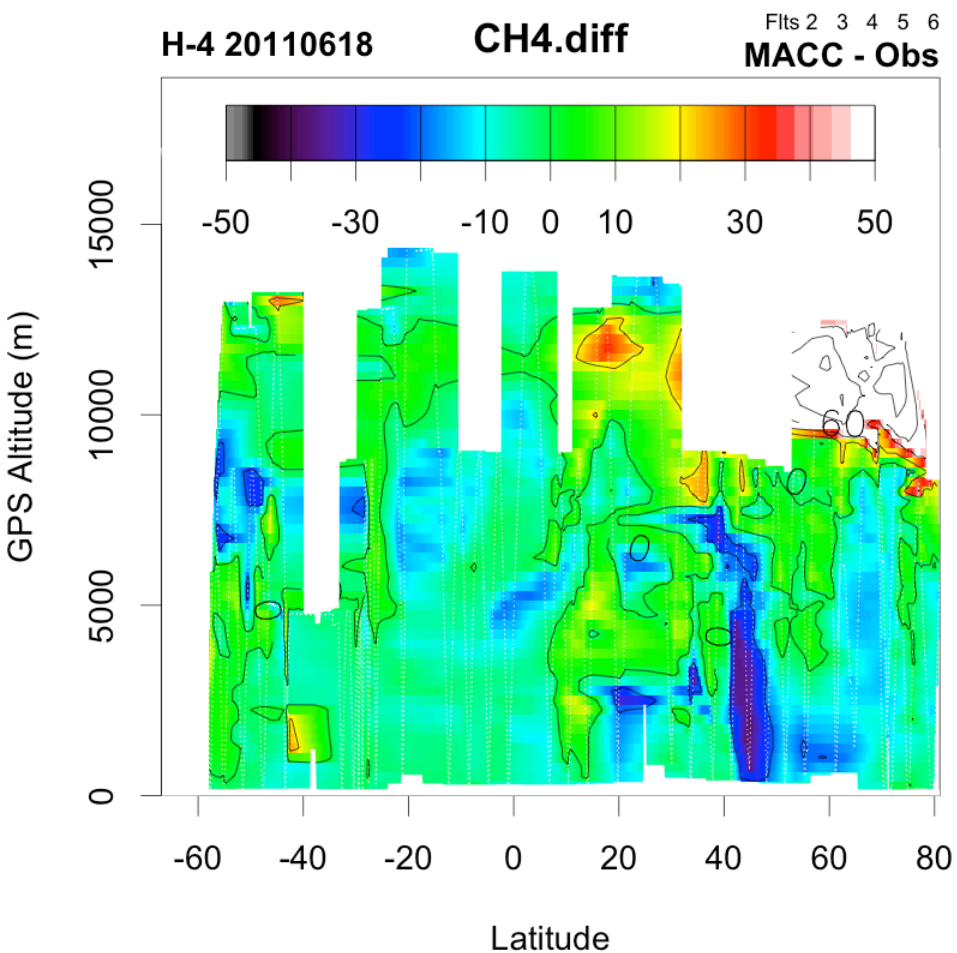
Flts 2 3 4 5 6



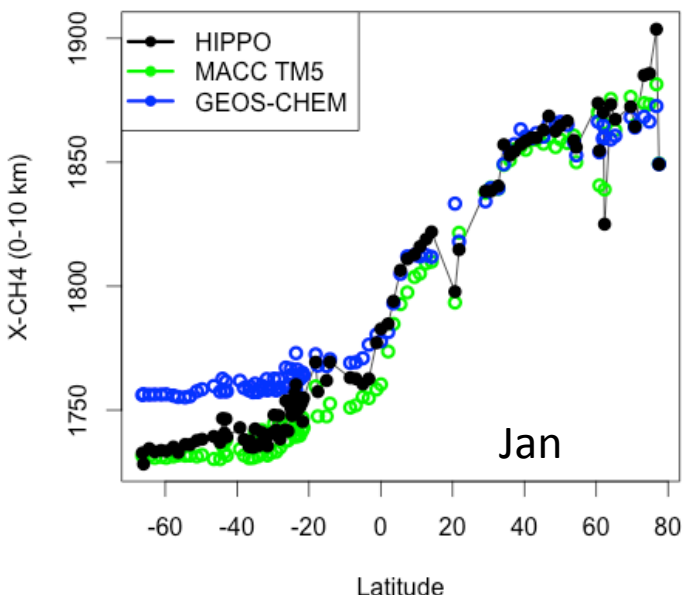
Southbound

Northbound

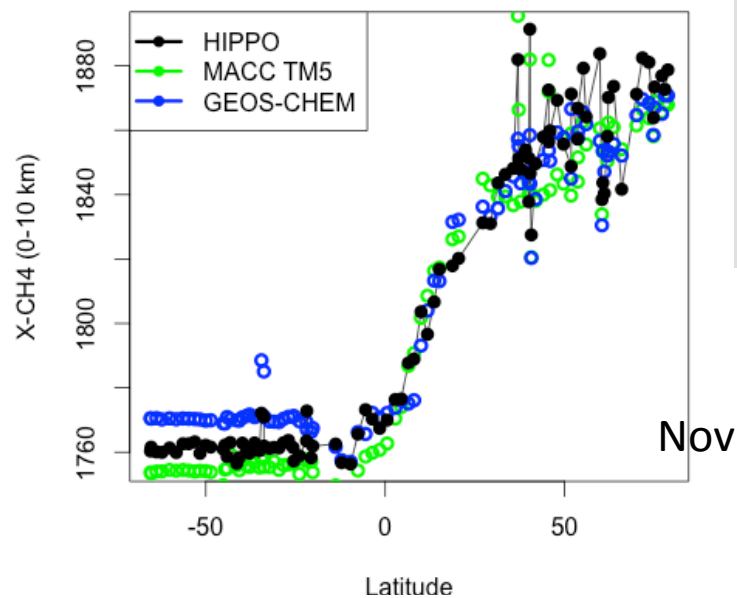
HIPPO 4 MACC



HIPPO 1 Southbound

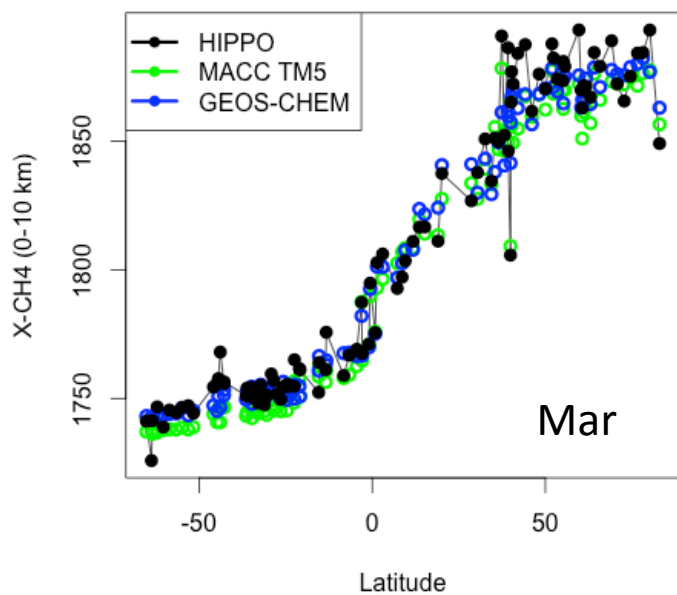


HIPPO 2 Southbound

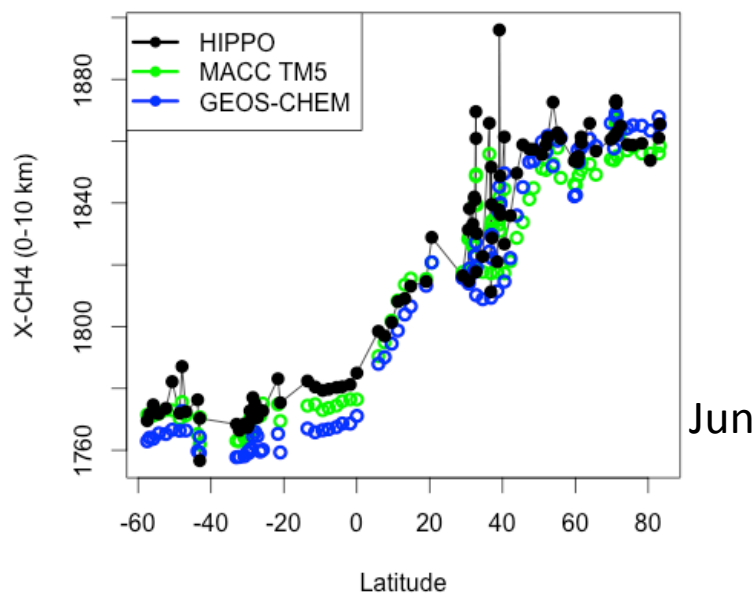


X-CH₄
0-10 km

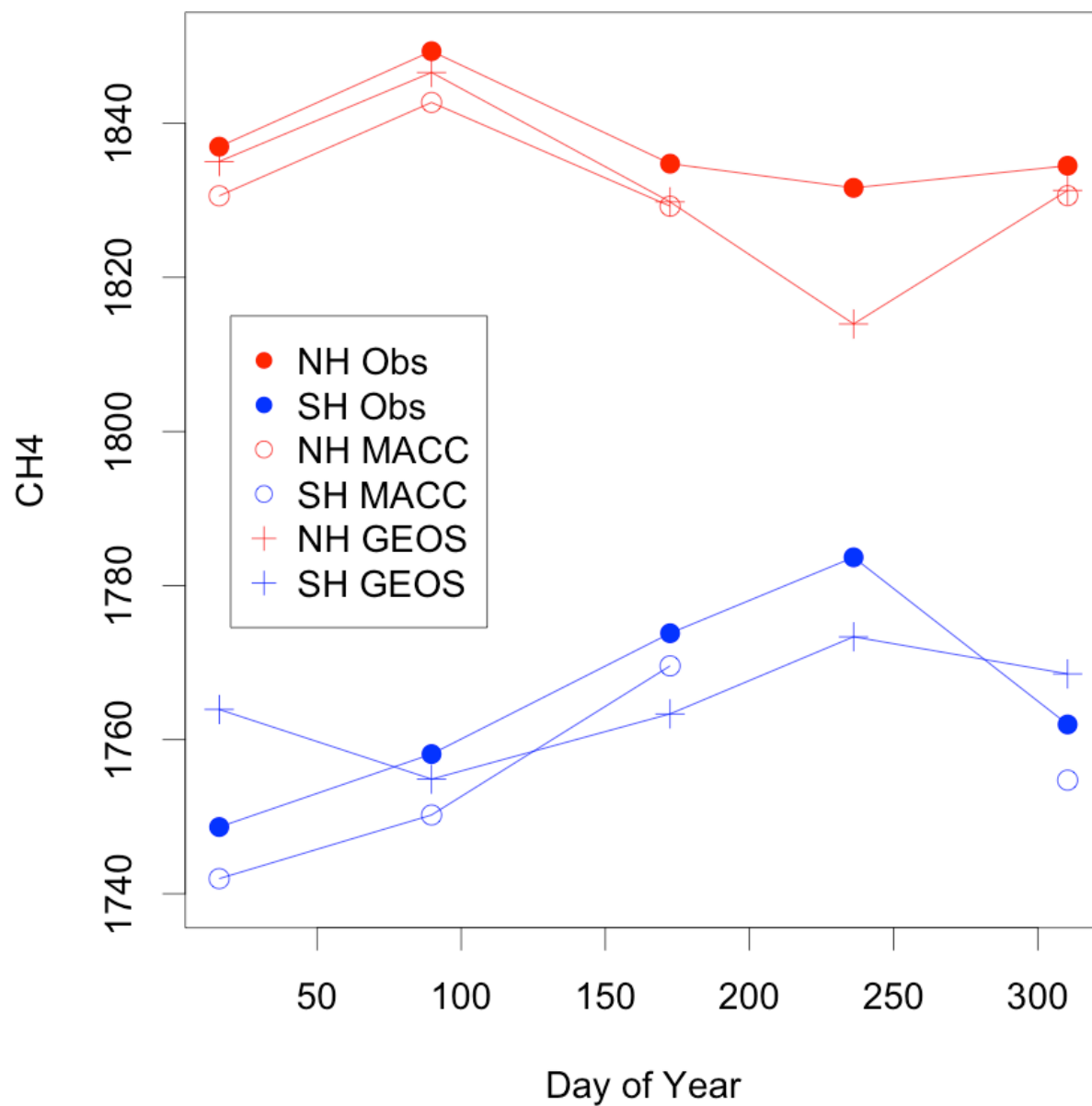
HIPPO 3 Southbound



HIPPO 4 Southbound



Hemispheric Mean CH4 in HIPPO



Carbon Tracker, MACC and GEOS-CHEM simulate many broad and some detailed features of CO₂ and CH₄ global distributions. The models better than expected in reproducing the vertical gradients globally.

Notable issues that appear in a first look:

CH₄ latitude and global seasonal variation, Southern Hemisphere (especially GEOS).

Major jet stream and high—altitude/Arctic transport events, plus Alaska anomaly, for CO₂ in Carbon Tracker.



...a long way to go yet...