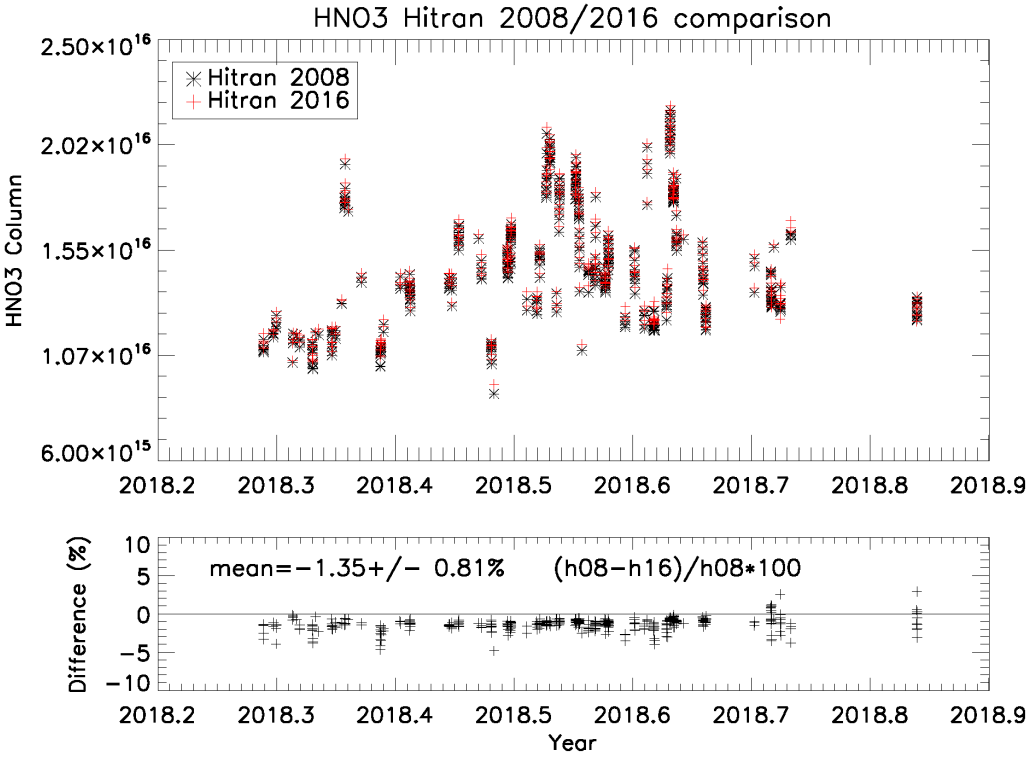
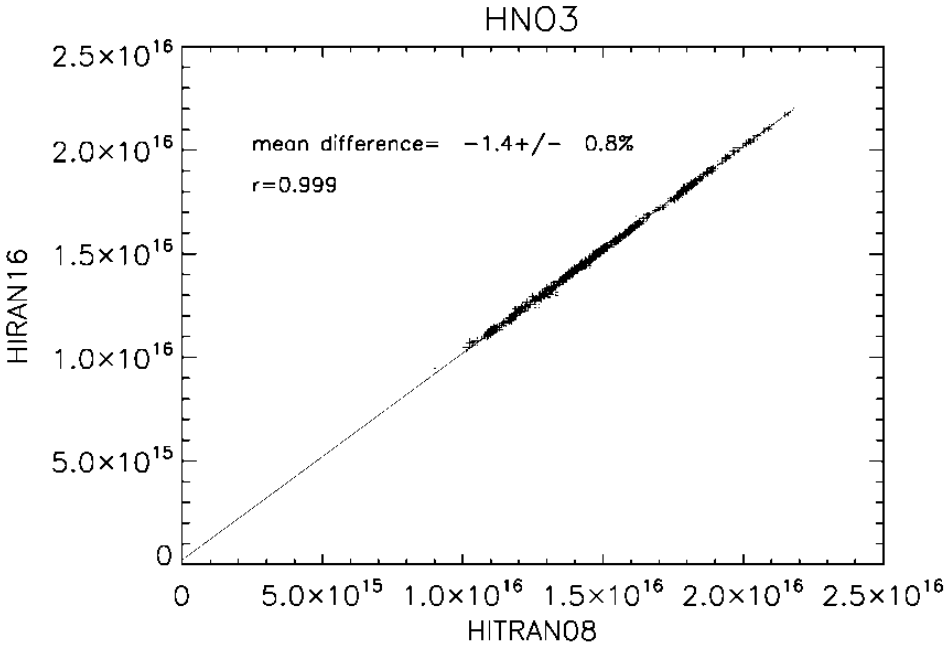
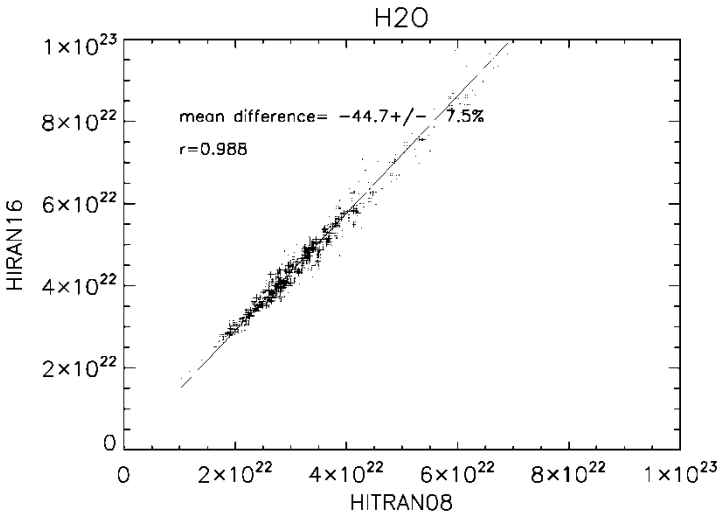
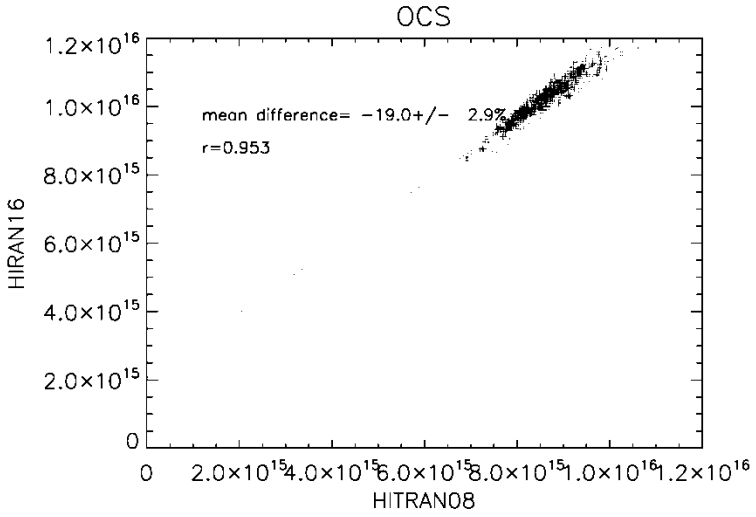
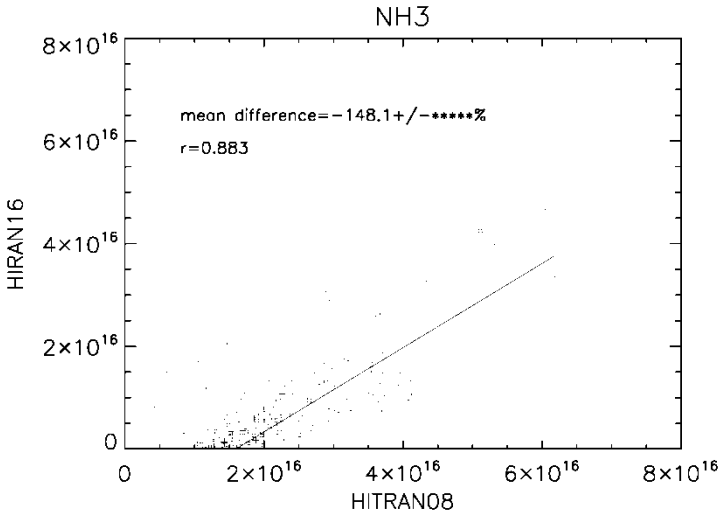
HNO3 Hit08 versus hit2016

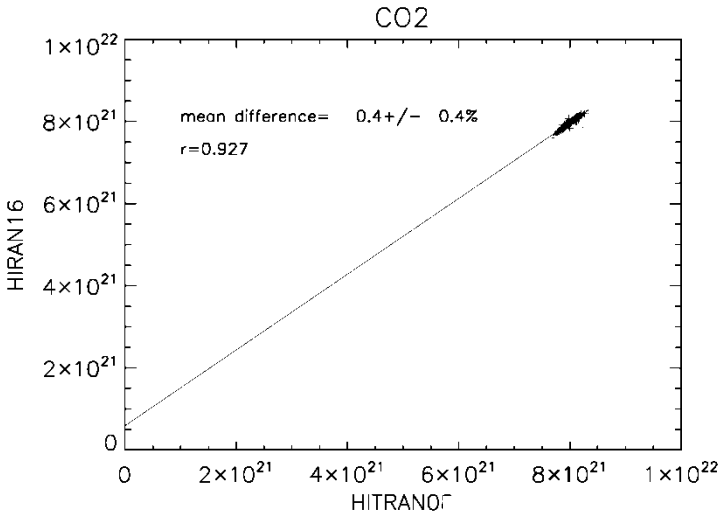


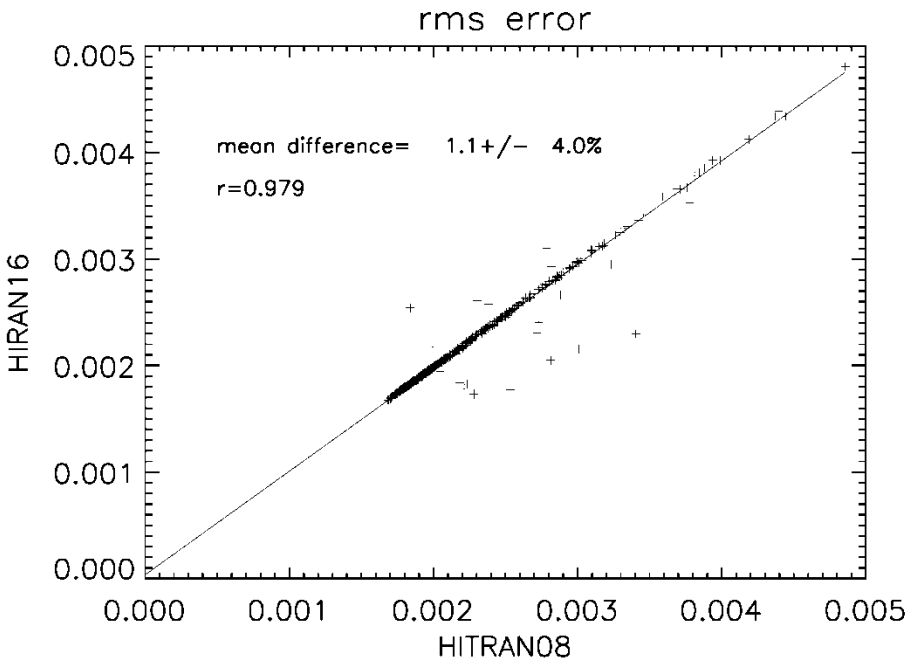

HNO3
mean difference= −1.4+/− 0.8%
r=0.999
HIRAN16
HITRAN08
0
5.0×10^15
1.0×10^16
1.5×10^16
2.0×10^16
2.5×10^16

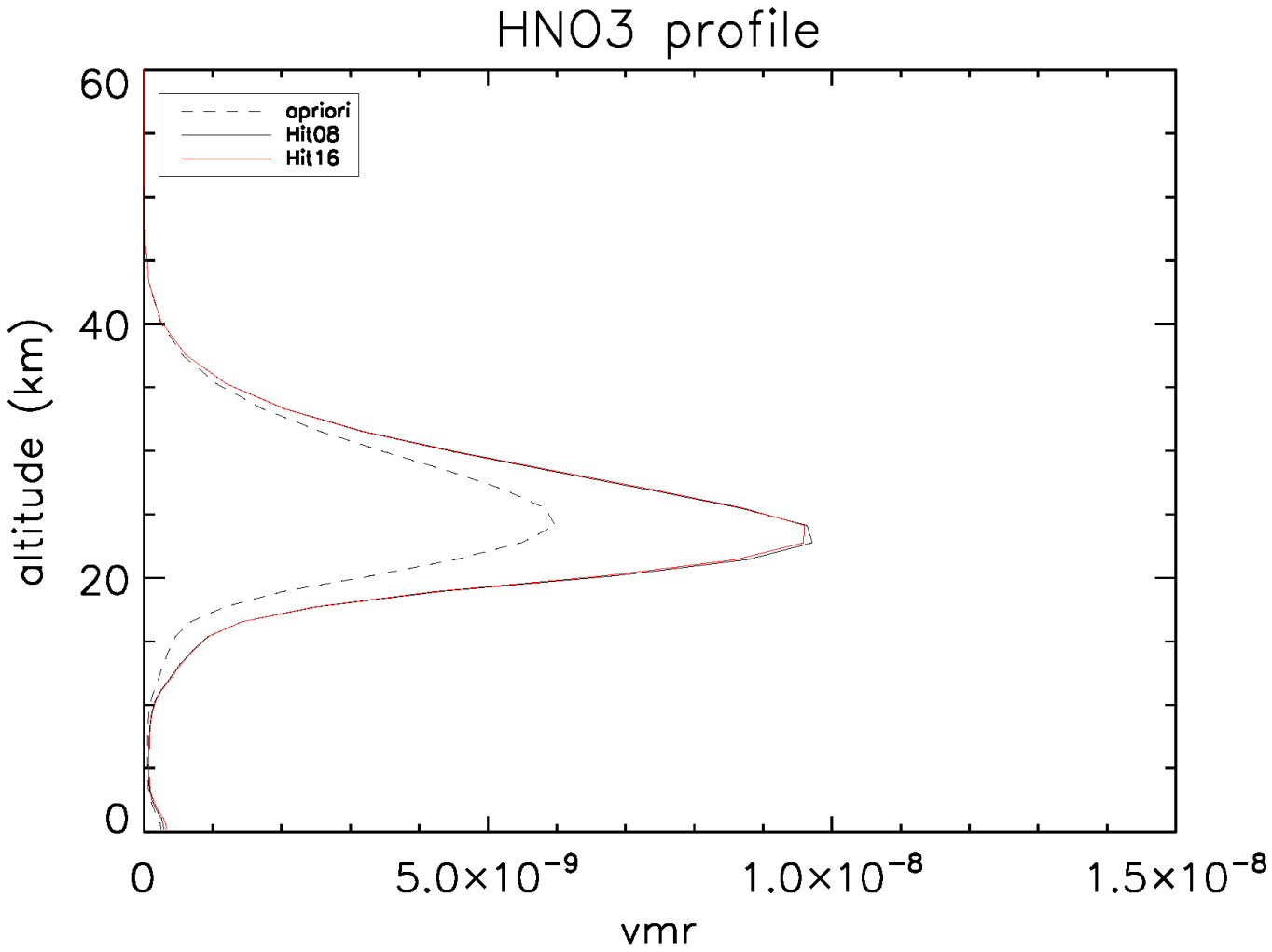

H2O
mean difference= −44.7+/− 7.5%
r=0.988
HIRAN16
HITRAN08
0
2×10^22
4×10^22
6×10^22
8×10^22
1×10^23


OCS
mean difference= −19.0+/− 2.9%
r=0.953
HIRAN16
HITRAN08
0
2.0×10^15
4.0×10^15
6.0×10^15
8.0×10^15
1.0×10^16
1.2×10^16


NH3
mean difference=−148.1+/−*****%
r=0.883
HIRAN16
HITRAN08
0
2×10^16
4×10^16
6×10^16
8×10^16


CO2
mean difference= 0.4+/- 0.4%
r=0.927
HIRAN16
HITRAN0
0
2×10^21
4×10^21
6×10^21
8×10^21
1×10^22


rms error
mean difference= 1.1+/- 4.0%
r=0.979
HIRAN16
HITRAN08
0.000
0.001
0.002
0.003
0.004
0.005


HNO3 profile
apriori
Hit08
Hit16
altitude (km)
60
40
20
0
0
5.0×10⁻⁹
1.0×10⁻⁸
1.5×10⁻⁸
vmr

HNO_3 Spectroscopy Evaluation

Geoff Toon, Jet Propulsion Laboratory, 2017–04–18

Compiled a HNO_3 linelist consis4ng of:

- HITRAN 2012 from 0 to 1800 cm^{-1}
- MIPAS--1220--1396pre from 1220 to 1396 cm^{-1}
- Pseudo--line--lists from 1800 to 4100 cm^{-1}

I believe that the first 2 of these are intended for HITRAN 2016.

The MIPAS linelist was the one described by Perrin et al., 2015.

The pseudo--linelists have been discussed elsewhere (not a topic here)

A series of 10 broad windows were defined, each containing a complete HNO_3 absorption band. These windows were fitted in lab spectra (Kit Peak & PNNL) and atmospheric spectra (MkIV balloon).

VMR Scale factors & RMS Fits

Geoff Toon, Jet Propulsion Laboratory, 2017–04–18

Window (cm–1)	VMR Scale Balloon	VMR Scale Laboratory	% RMS Balloon	% RMS Lab
766 ± 25	0.94±0.03	0.92±0.03	0.80	0.37
885 ± 44	0.99±0.03	0.98±0.02	0.37	0.49
1208 ± 27	1.21±0.03	1.21±0.03	0.26	0.20
1314 ± 45	0.81±0.03	0.81±0.03	0.56	1.84
1314 ± 45	0.89±0.02	0.91±0.03	0.30	1.10
1707 ± 48	0.96±0.04	0.95±0.03	1.46	1.19
2645 ± 32	1.10±0.05	0.92±0.18	0.21	0.15
2999 ± 47	0.86±0.08	1.14±0.28	0.51	0.12
3402 ± 22	0.89±0.07	0.80±0.50	0.22	0.03
3550 ± 35	0.81±0.06	1.17±0.15	0.92	0.58
4000 ± 35	1.01±0.09	1.02±0.10	0.45	0.08

VMR Scaling is the factor that needs to be applied to the line intensities to make bands consistent. Black represents windows fitted with HITRAN 2012 HNO_3 linelist.

Blue represents window fitted with MIPAS--1220--1396pre.par linelist.

Green represent windows fitted with HNO_3 pseudo--linelists.

Summary for HNO3

- No change to the 11 micron band linelists for the main isotope between 2008 and 2016 (from Rothman et al JQSRT, 2008, 2016)
- $H^{15}NO3$ added (not sure of their strength?)
- HNO3 profiles very similar but small change at the peak reflected in a -1.3% change in the columns
- Rms fits are similar (mean hit08=0.002228, cf hit16=0.002201)
- Wet site is impacted by water.
- No obvious improvement in fits so care must be taken if new linelists are used when comparing HNO3 products.