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& Planetary Physics,
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Microwindow Selection for 0.0625cm^{-1} Sampling

Approach

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- Convert error/Jacobian spectra and microwindow definitions from 0.025cm^{-1} grid to 0.0625cm^{-1} grid
- Scale previously assumed NESR by √0.4, otherwise same error sources as before
- Assume same nominal scan pattern
- Assume same 3cm^{-1} maximum width (49pts *cf* 121pts)
- Select microwindows for 6-68km retrieval until no more microwindows providing >1 bit of information can be found

Status

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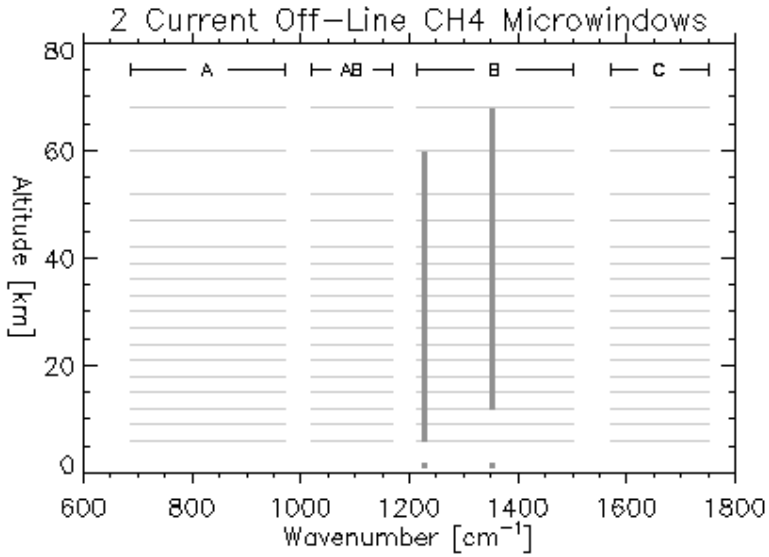
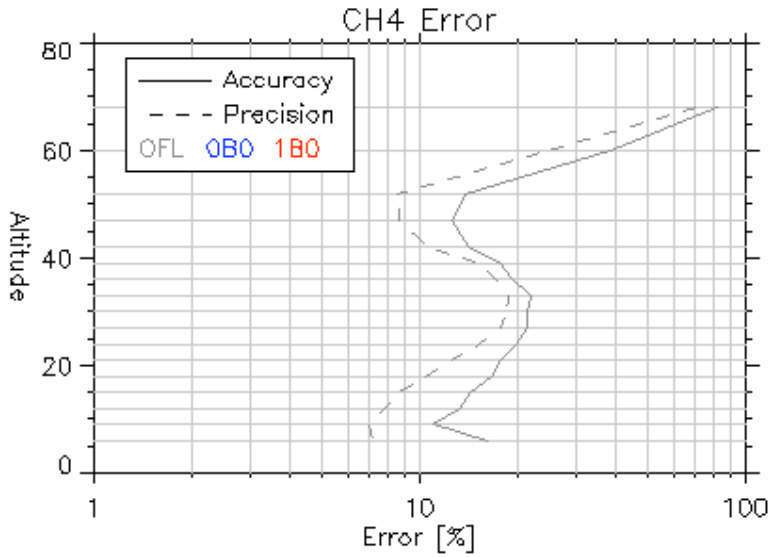
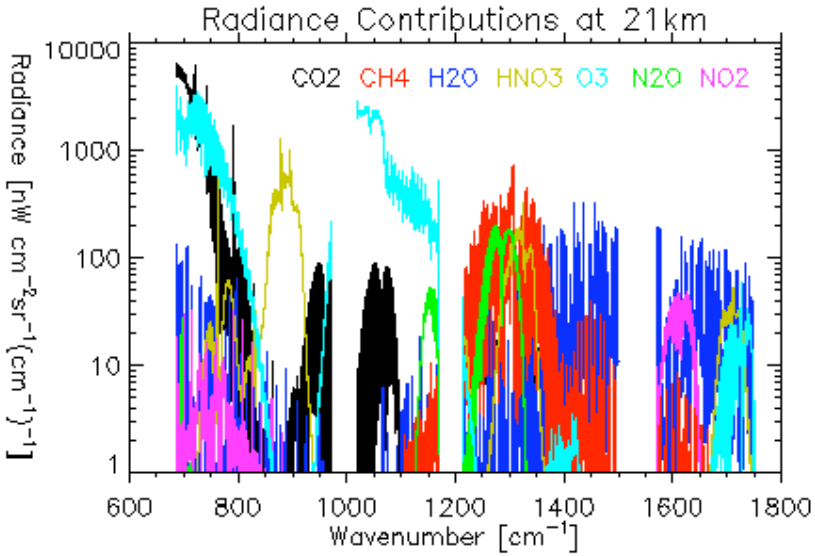
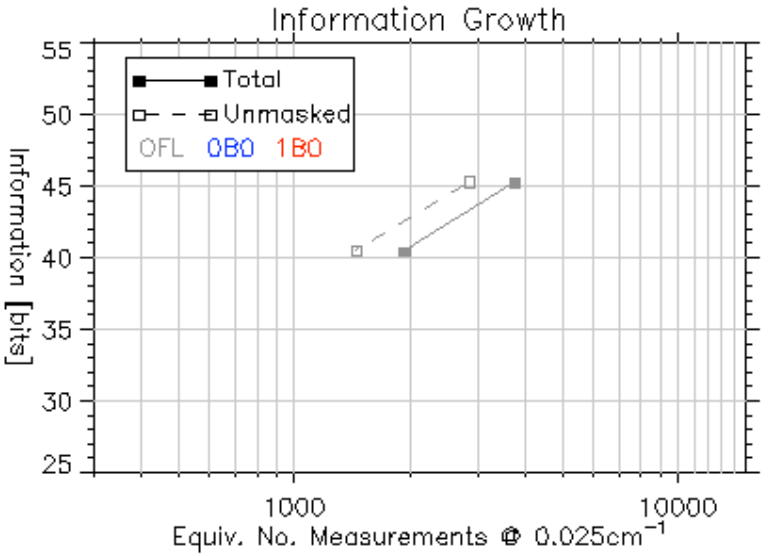
- Standard sets of 0.0625cm^{-1} microwindows selected for all key species (MW#201-209) (QWG#4)
  - Minimise $\mathbf{S}^{rnd} + \mathbf{S}^{sys}$
- Additional sets selected for reduced systematic errors (MW#211-219)
  - Minimise $\mathbf{S}^{rnd} + 3\mathbf{S}^{sys}$
- LUTs and irregular grids generated
- 2 sets of CPU-optimised occupation matrices:
  - 0B0: Min ($\mathbf{S}^{rnd} + \mathbf{S}^{sys}$ + CPU cost)
  - 1B0: Min ($\mathbf{S}^{rnd} + 3\mathbf{S}^{sys}$ + CPU cost)

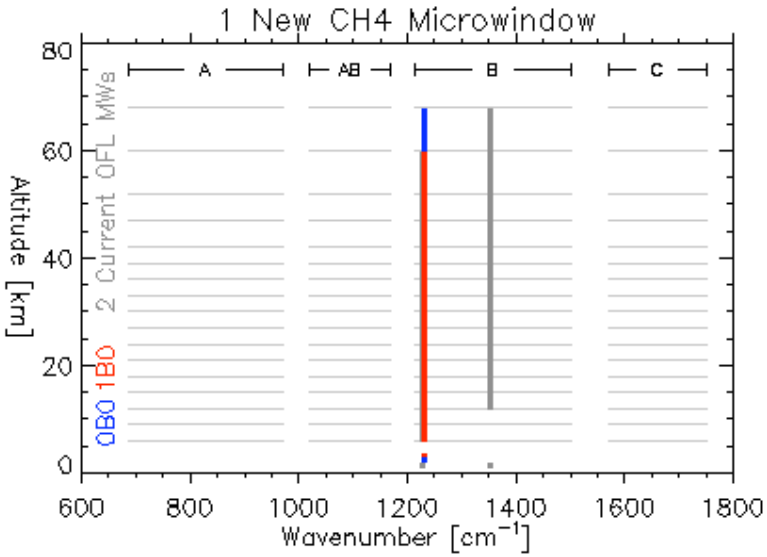
CH4

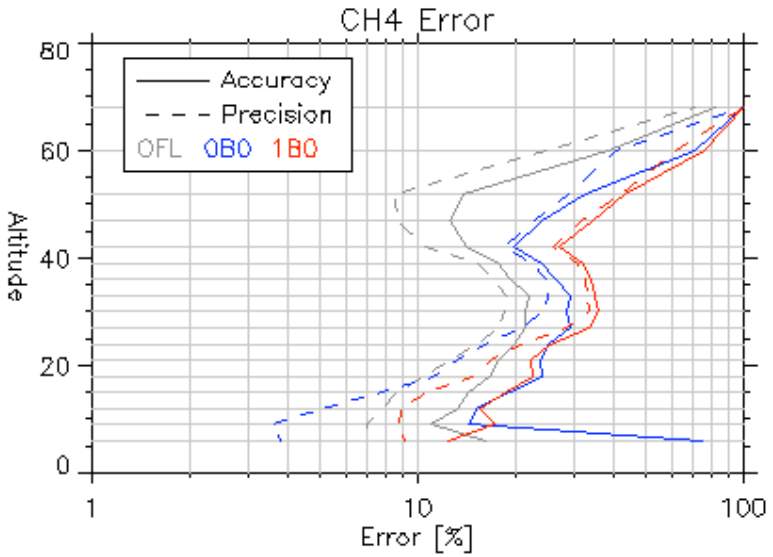

2 Current Off-Line CH4 Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]

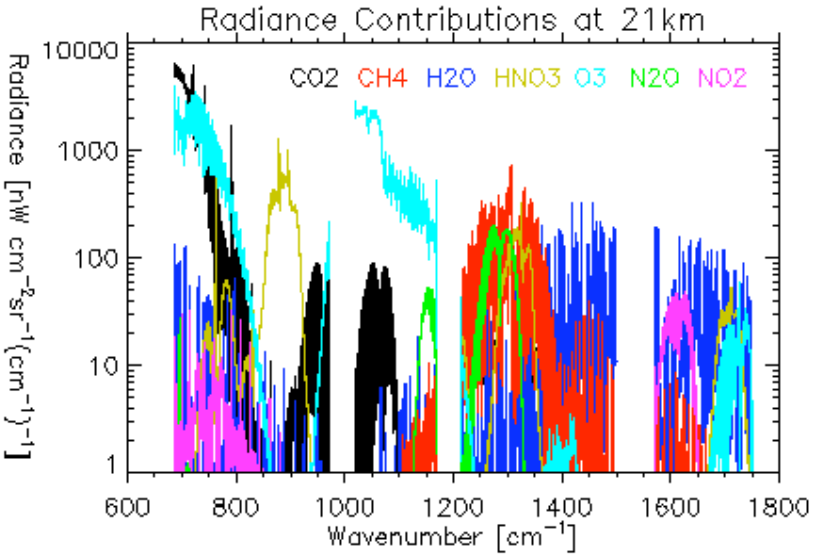

CH4 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]


Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


1 New CH4 Microwindow
A
AB
B
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]


CH4 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]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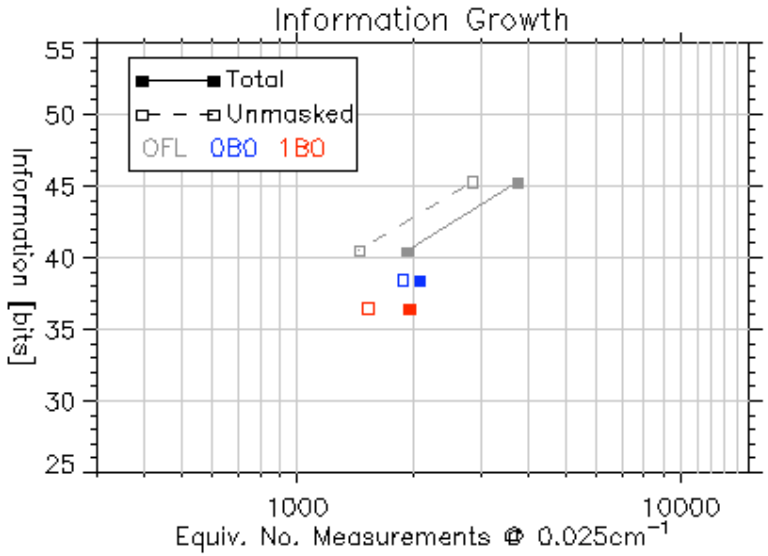
Radiance [nW cm-2sr-1(cm-1)-1]
Wavenumber [cm-1]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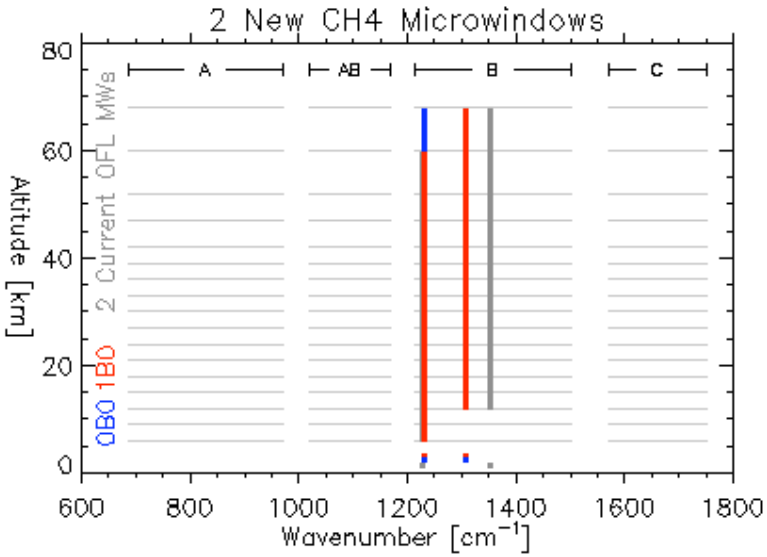
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm-1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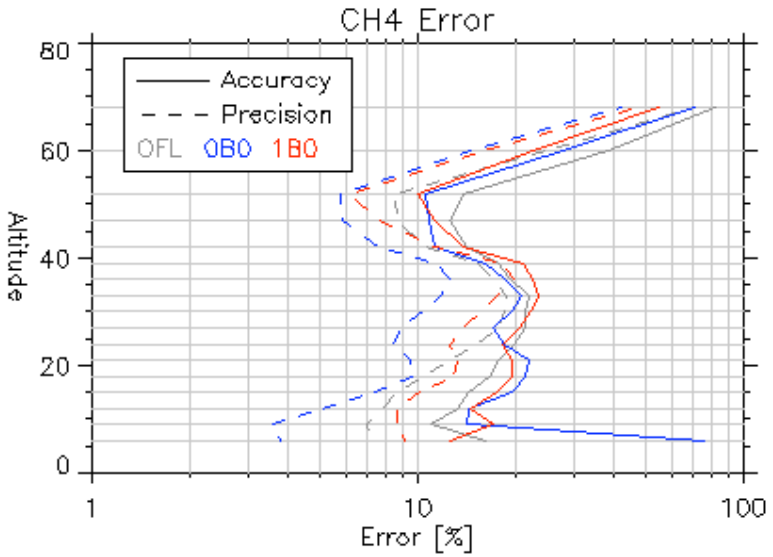
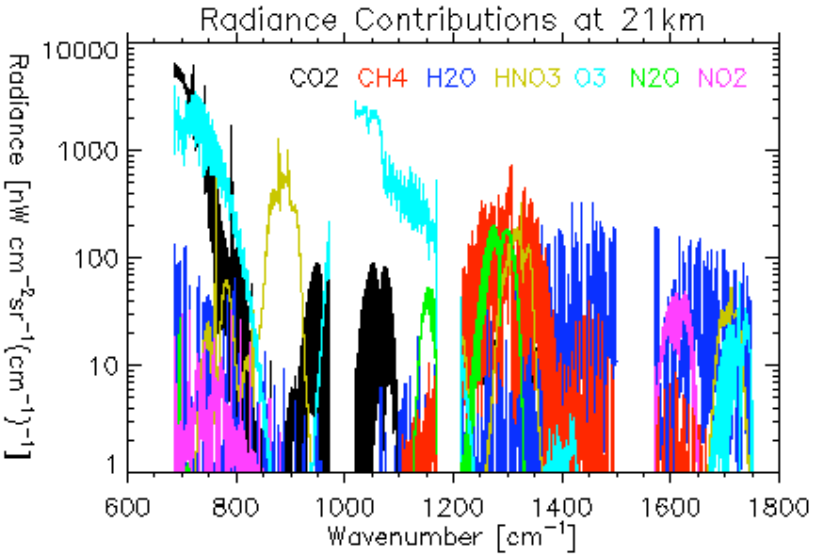
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]


CH4 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]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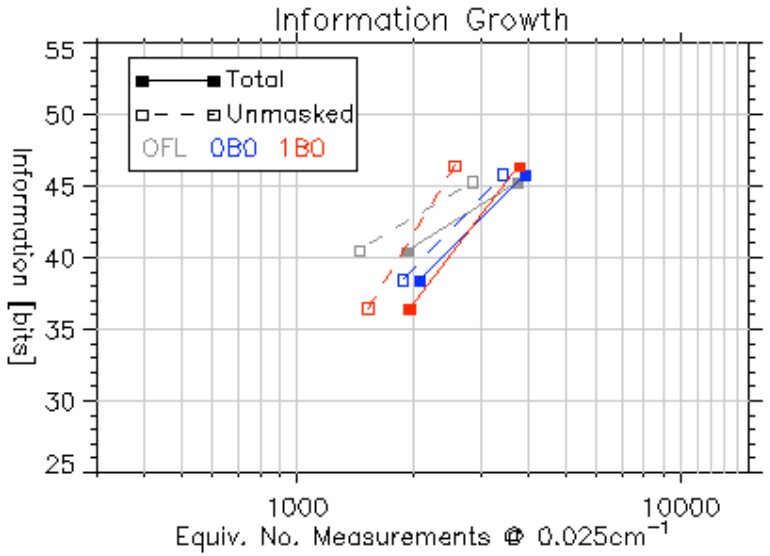
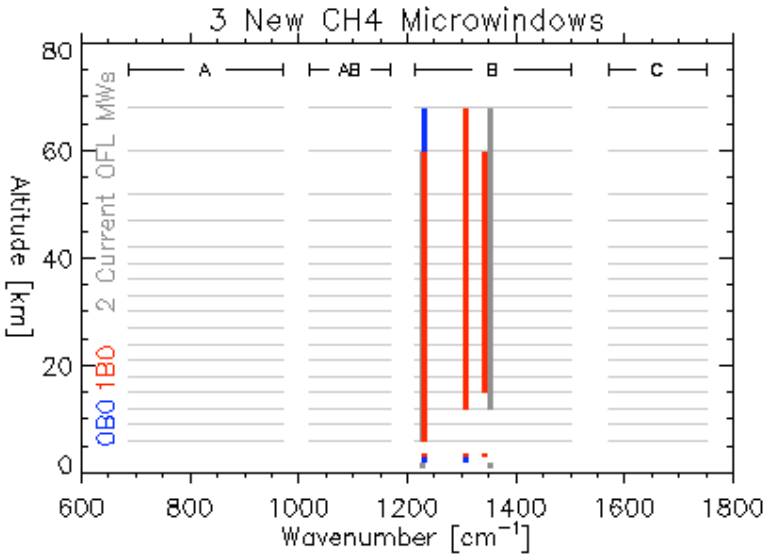
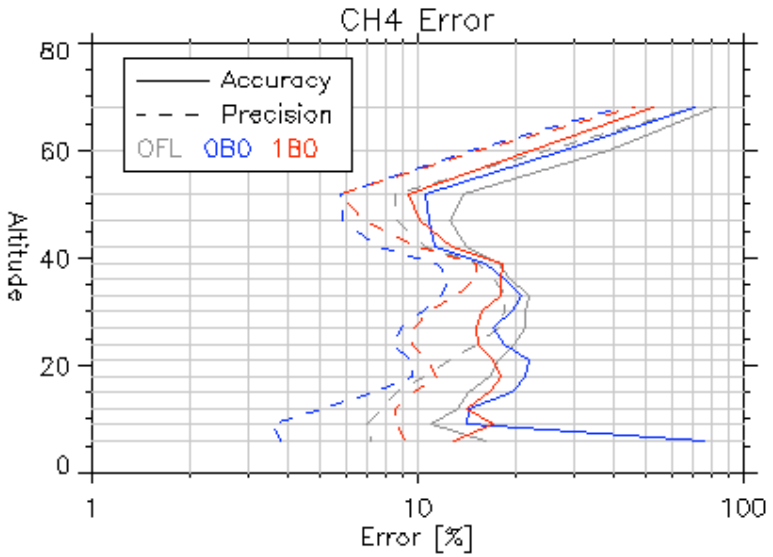
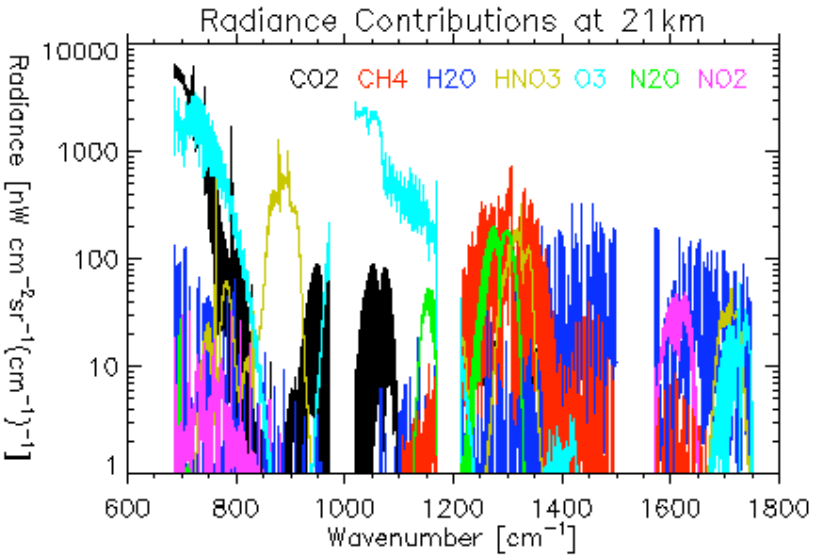
Radiance [nW cm-2sr-1(cm-1)-1]
Wavenumber [cm-1]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm-1


3 New CH4 Microwindows
A
AB
B
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]


CH4 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]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Radiance [nW cm-2sr-1(cm-1)-1]
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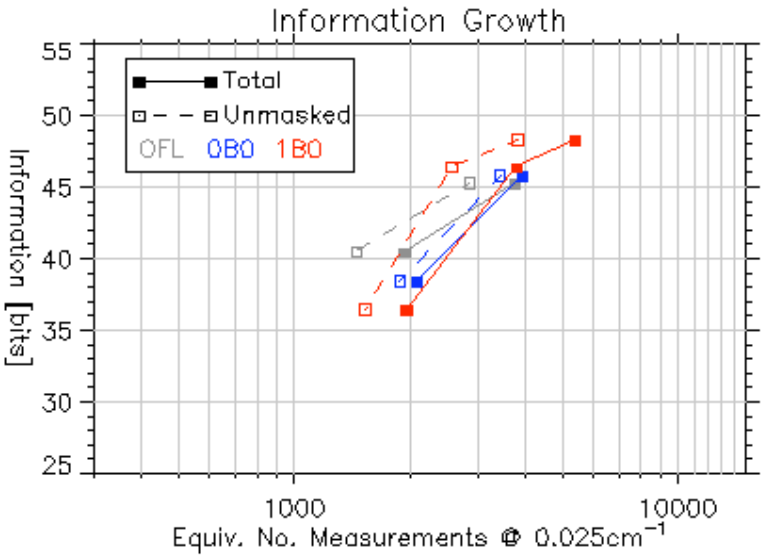
Information Growth
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Unmasked
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Equiv. No. Measurements @ 0.025cm-1

CH4 Error Analysis

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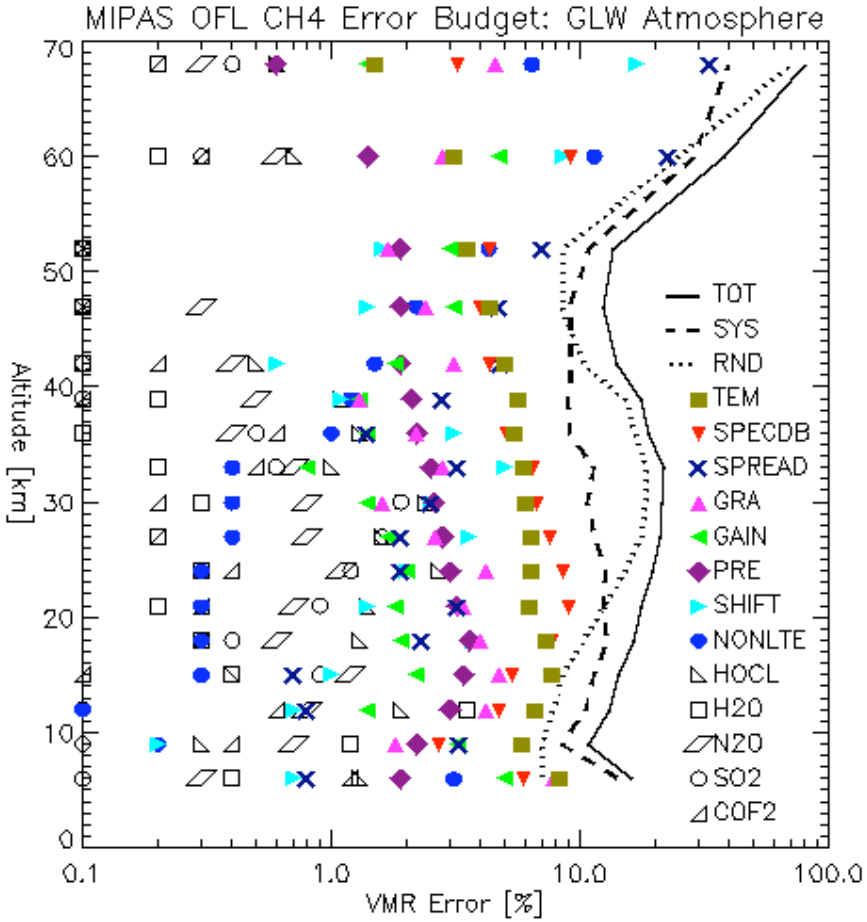

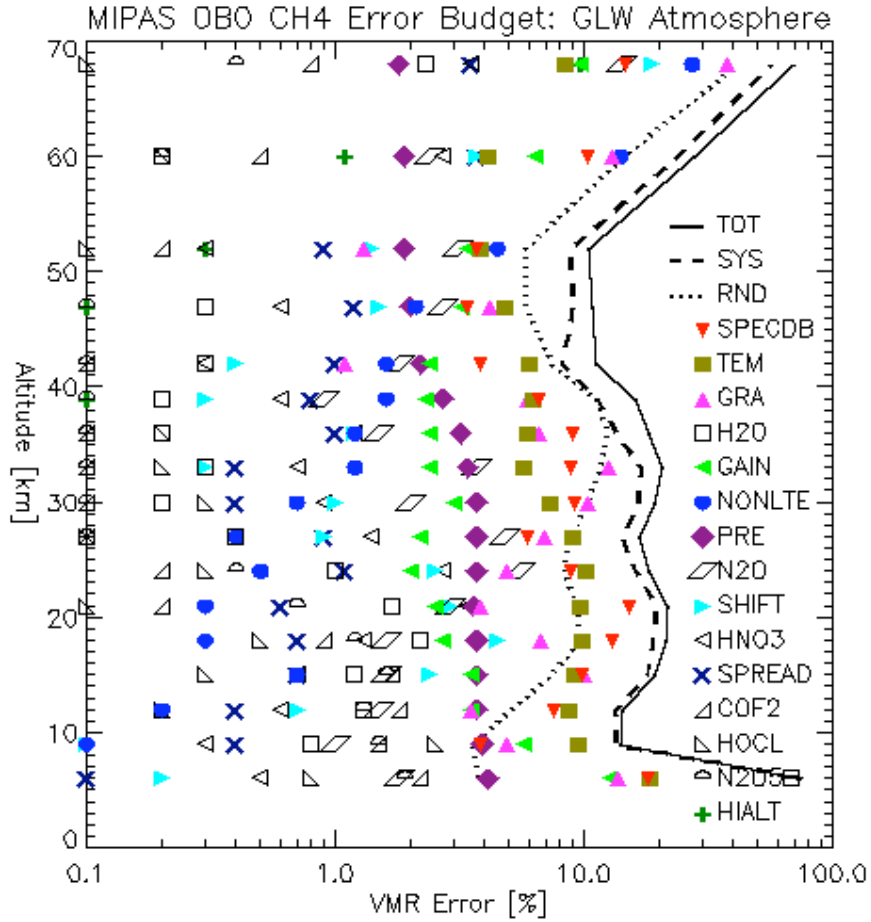

CH4 Error Analysis

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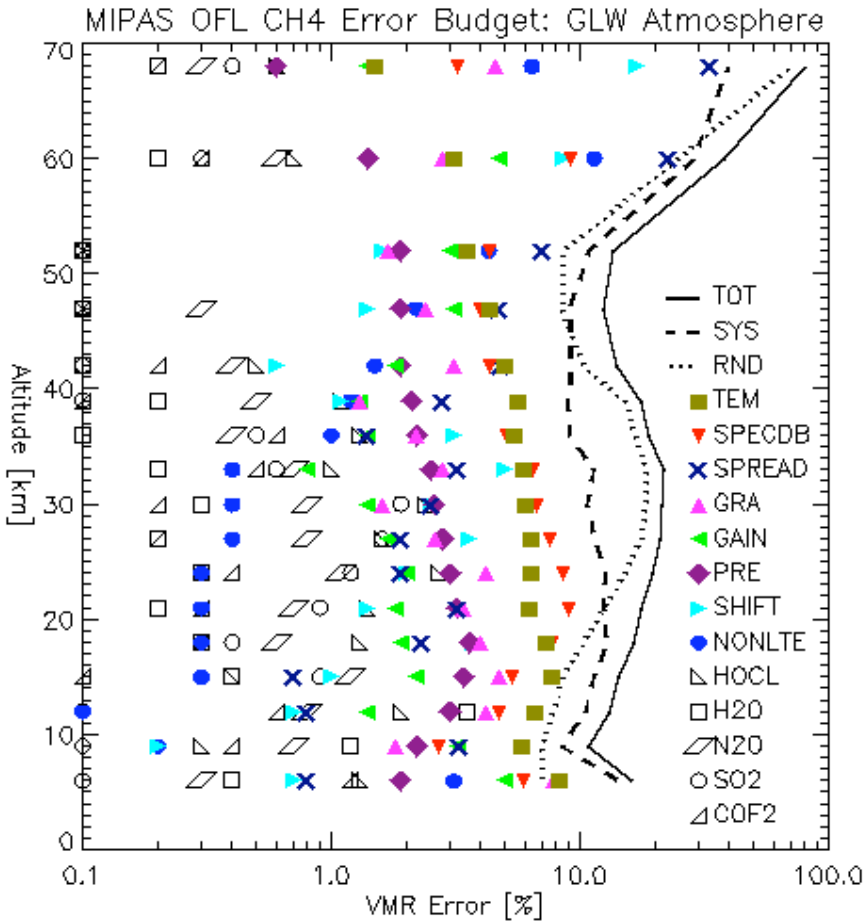
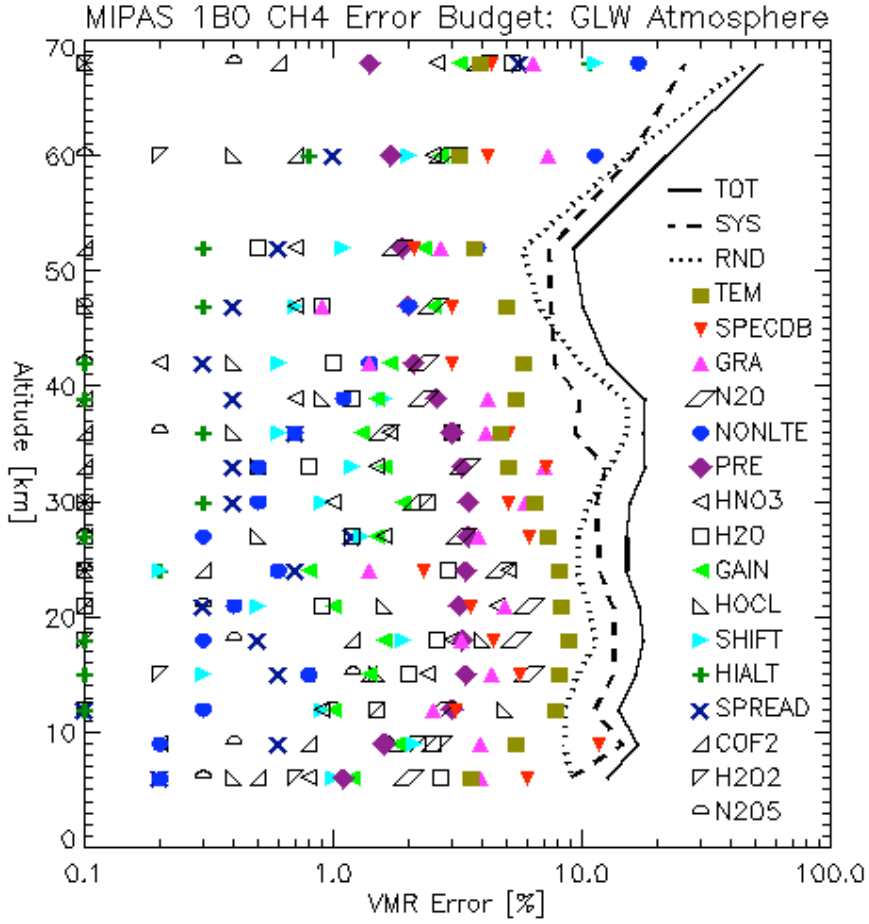
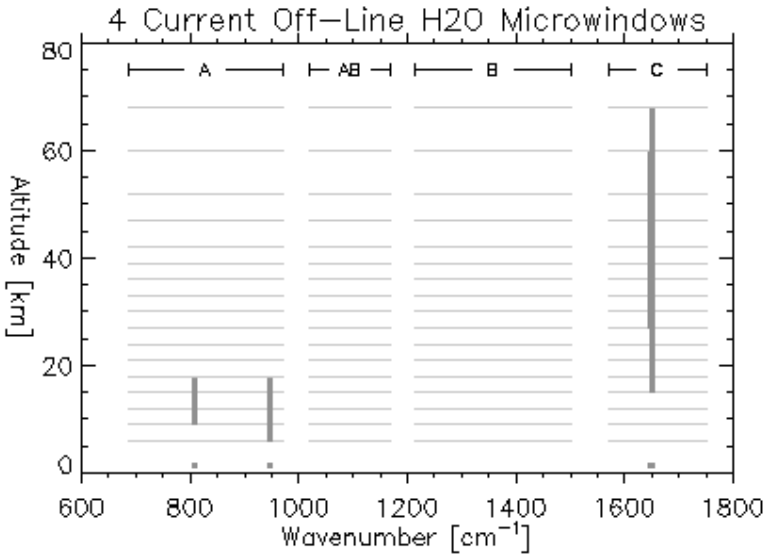
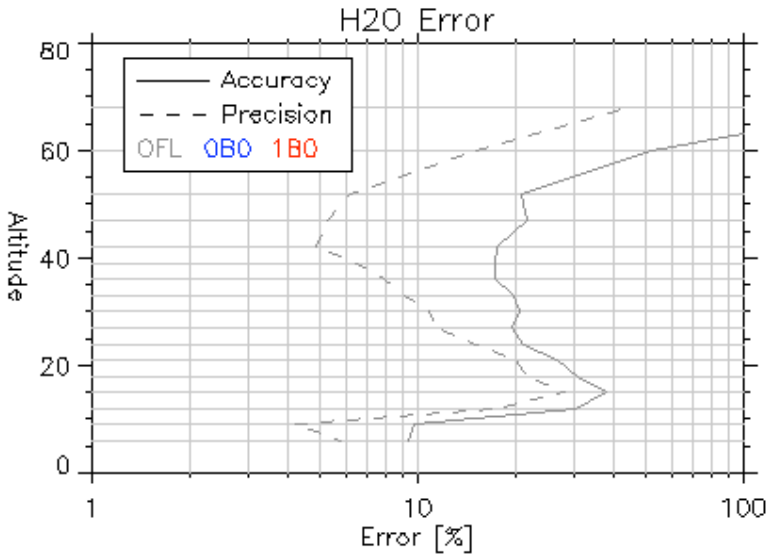
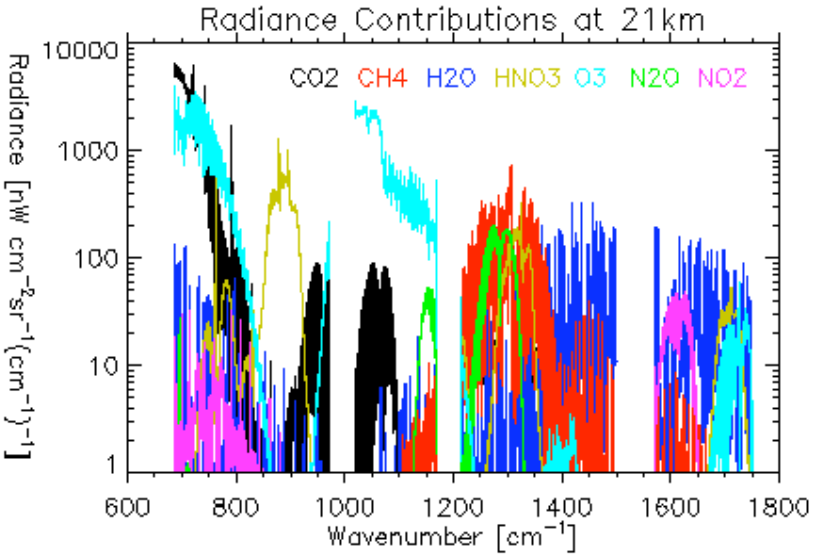




H2O


4 Current Off-Line H2O Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]


H2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]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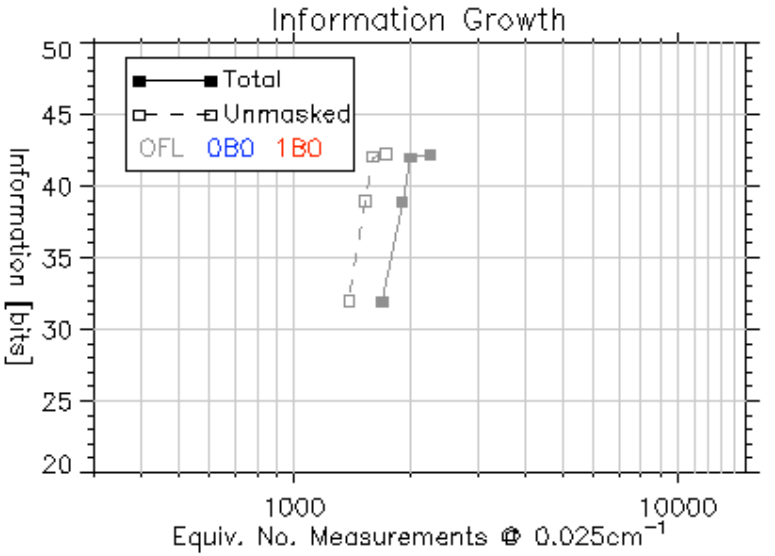
Information Growth
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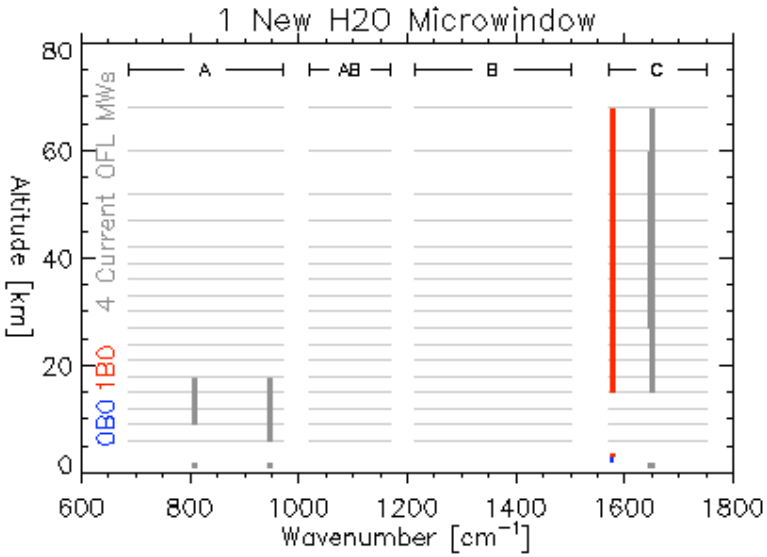
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}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C
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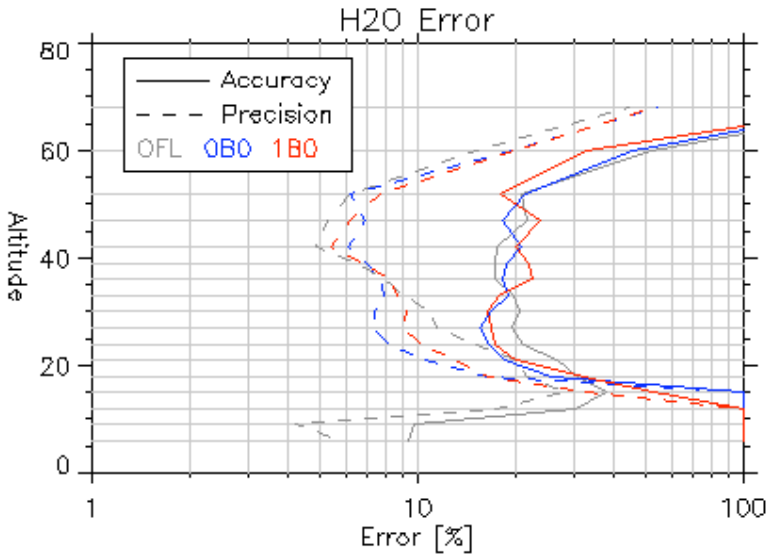
0B0 1B0
Altitude [km]
Wavenumber [cm-1]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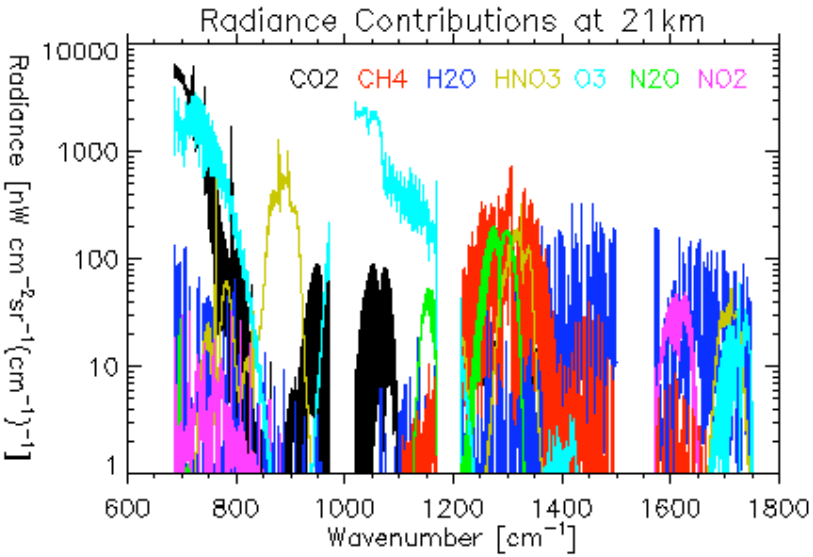
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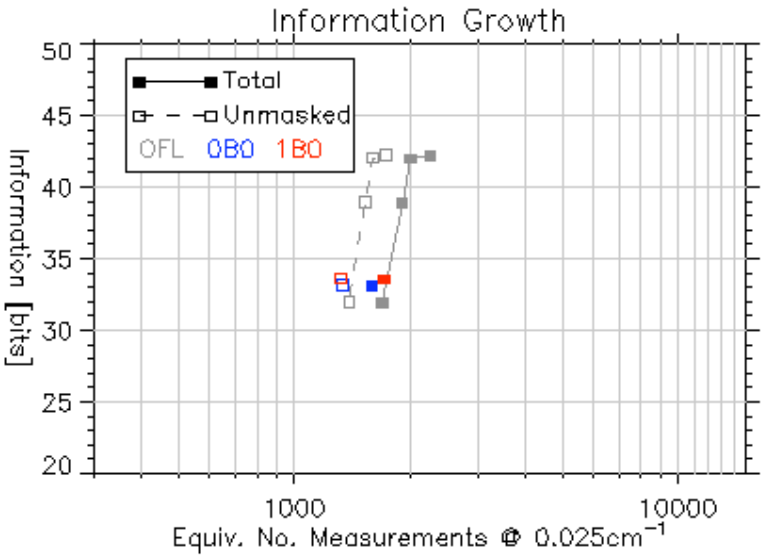
Information Growth
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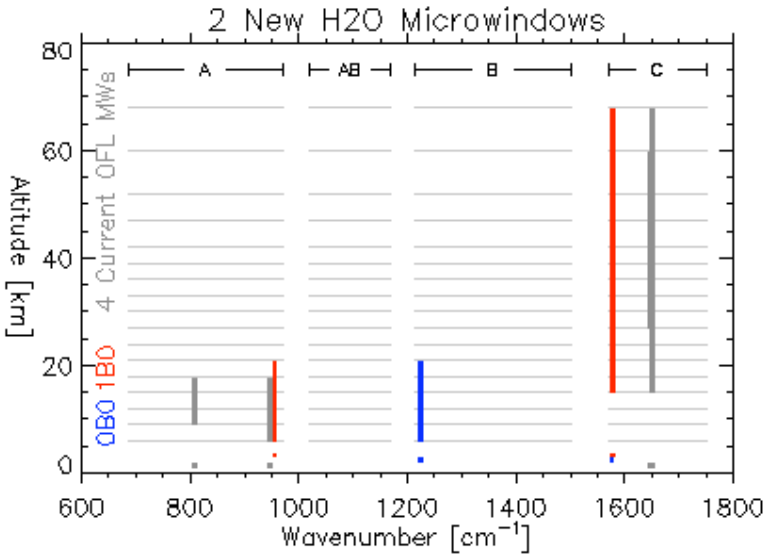
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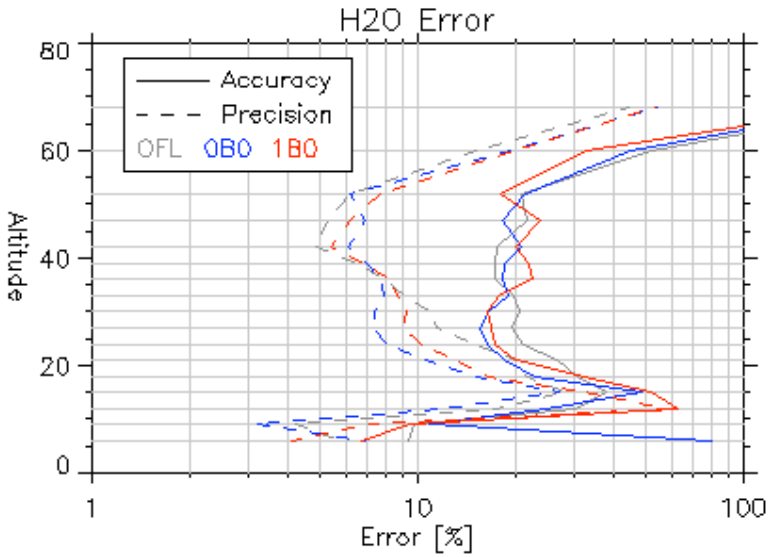
H2O Error
Accuracy
Precision
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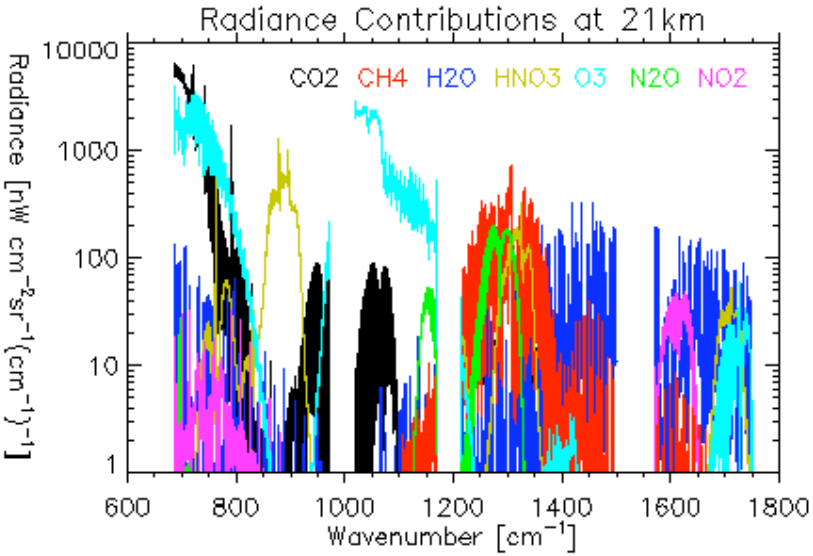
Altitude
Error [%]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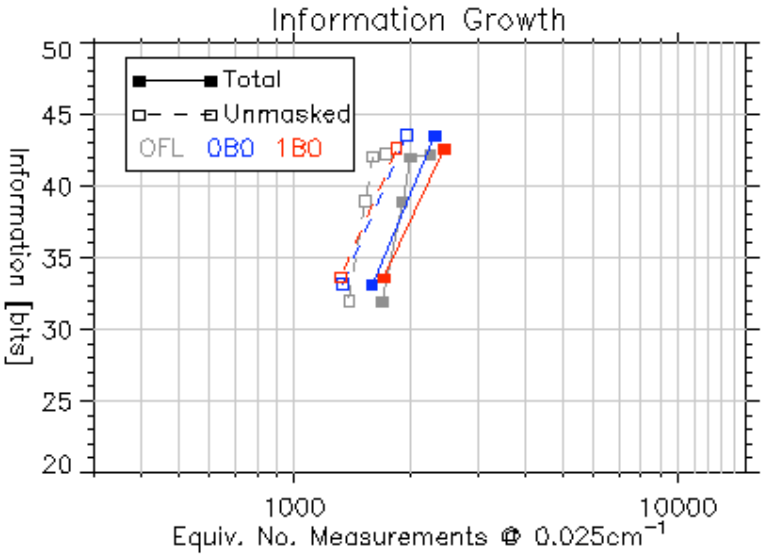
Information Growth
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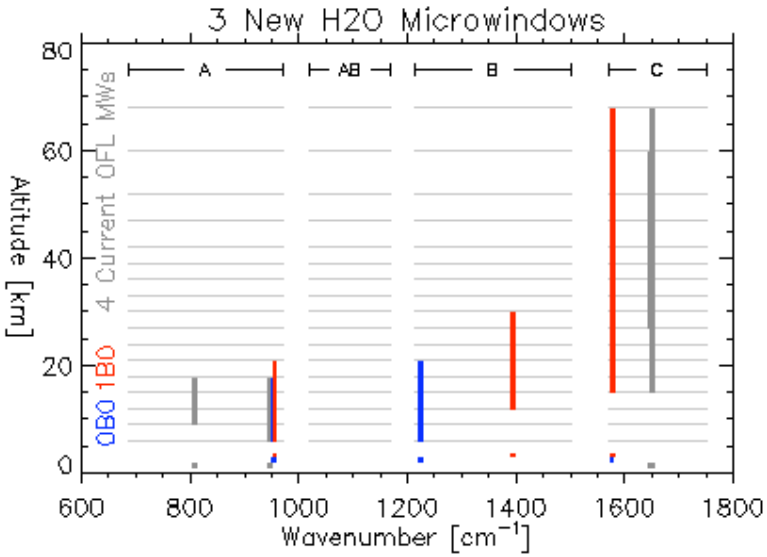
3 New H2O Microwindows
A
AB
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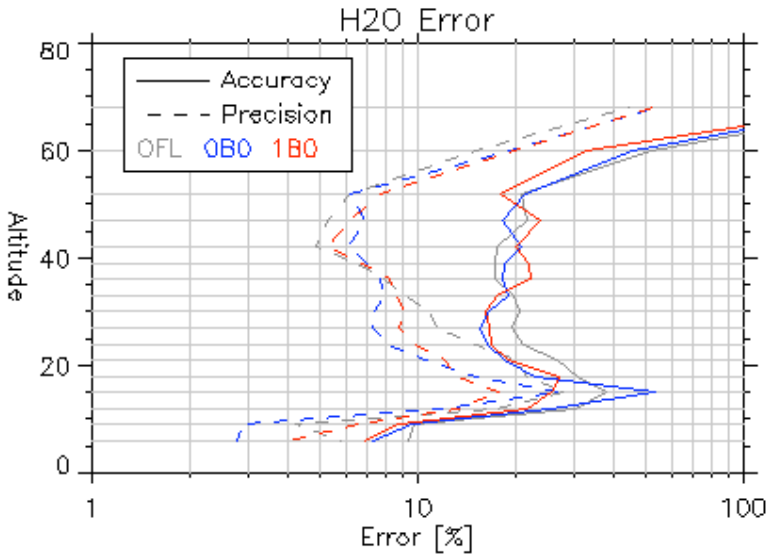
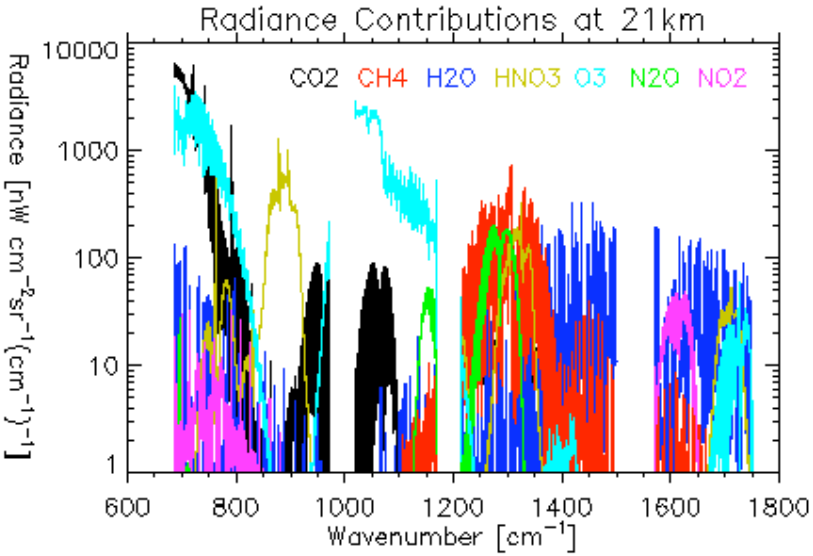
4 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]


H2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]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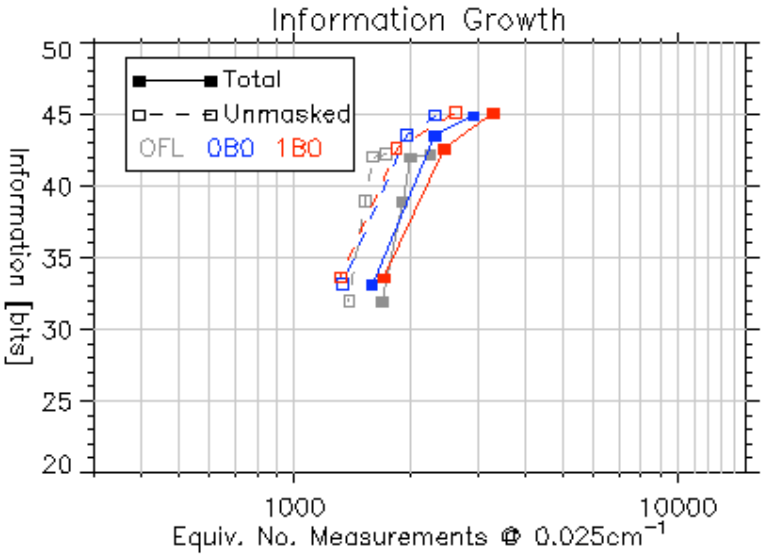
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H2O Error Analysis

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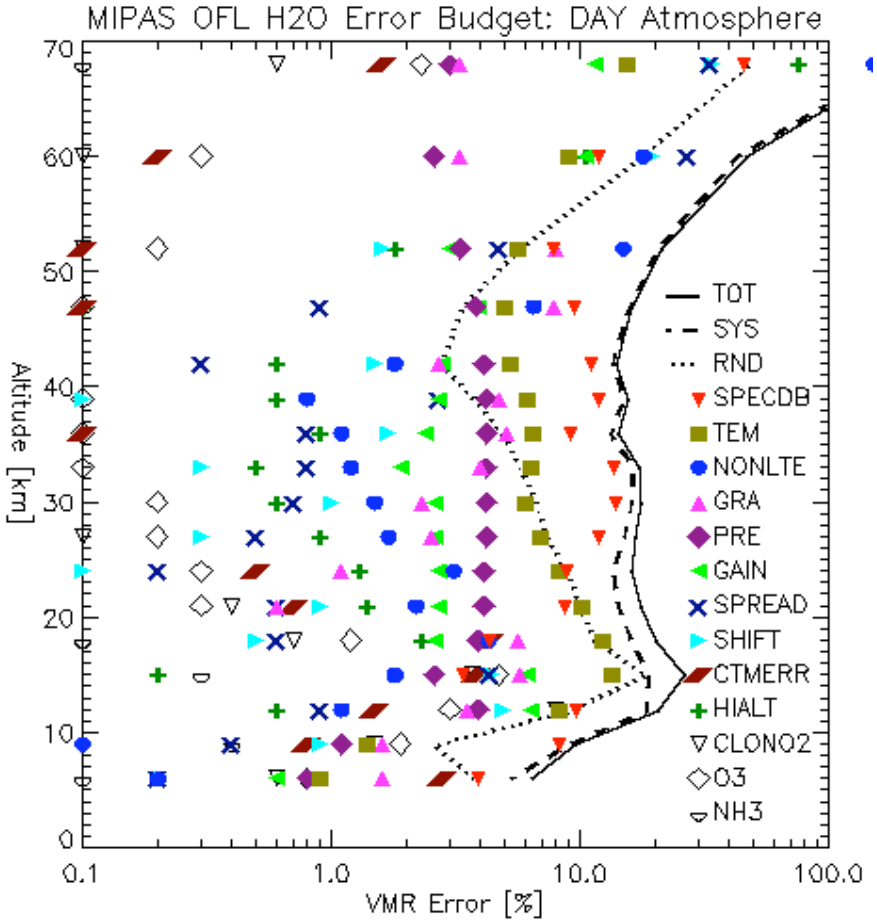

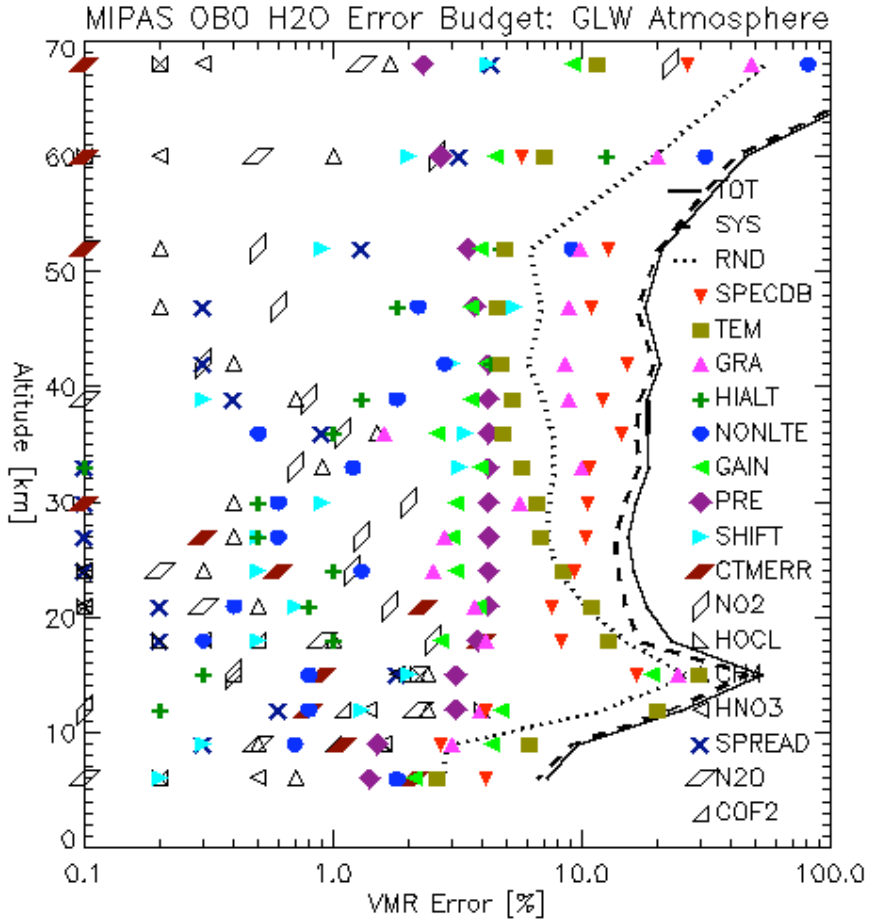

H2O Error Analysis

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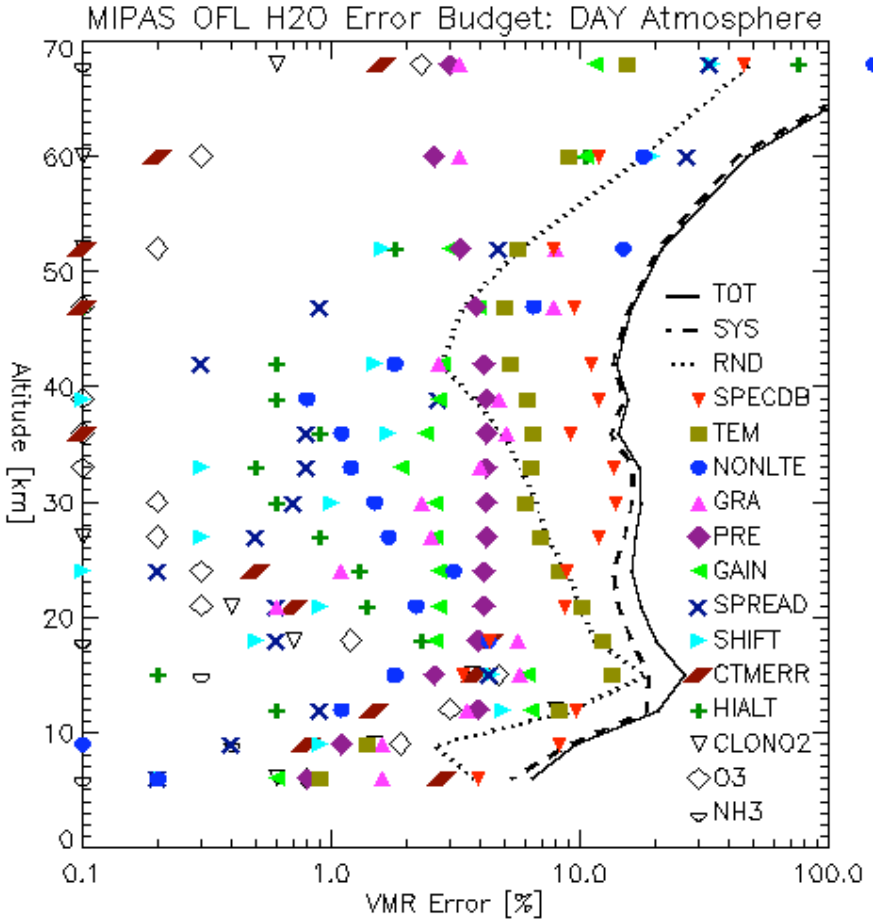
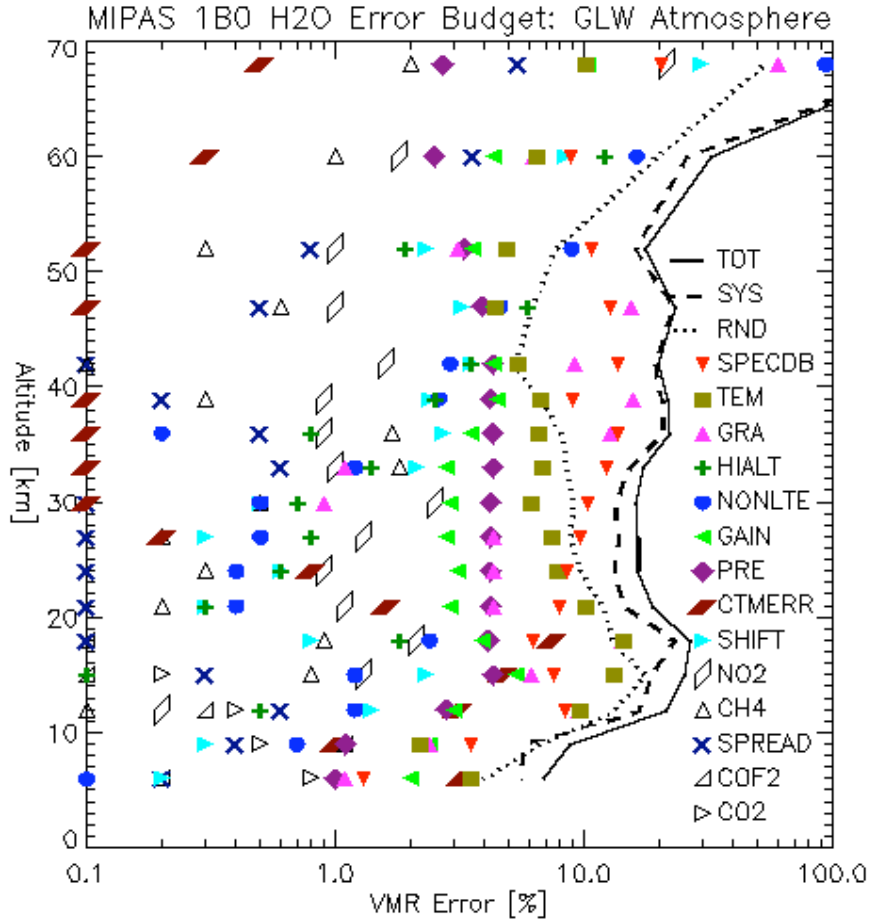
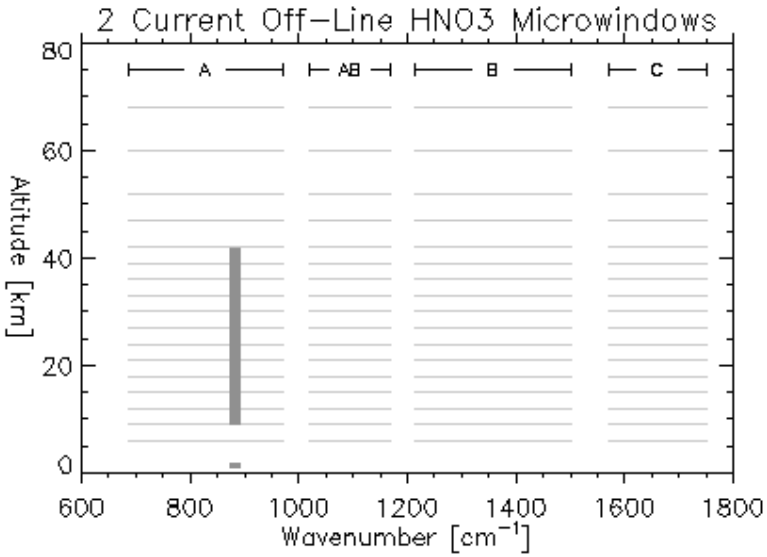
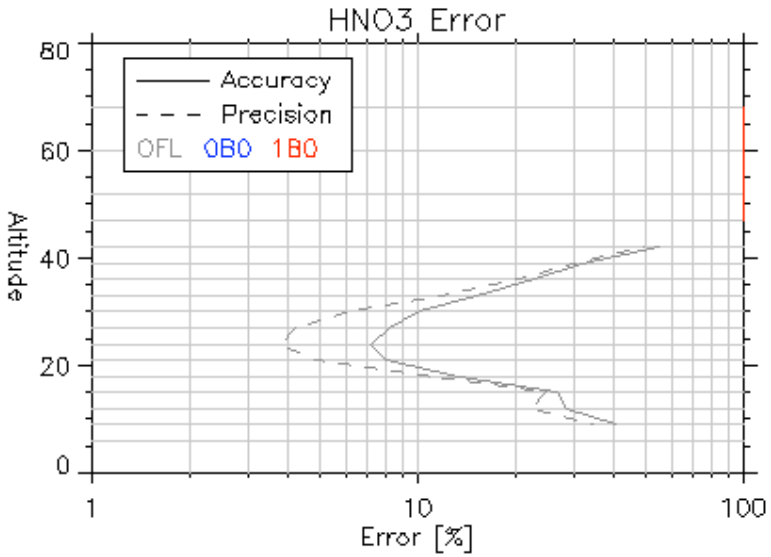
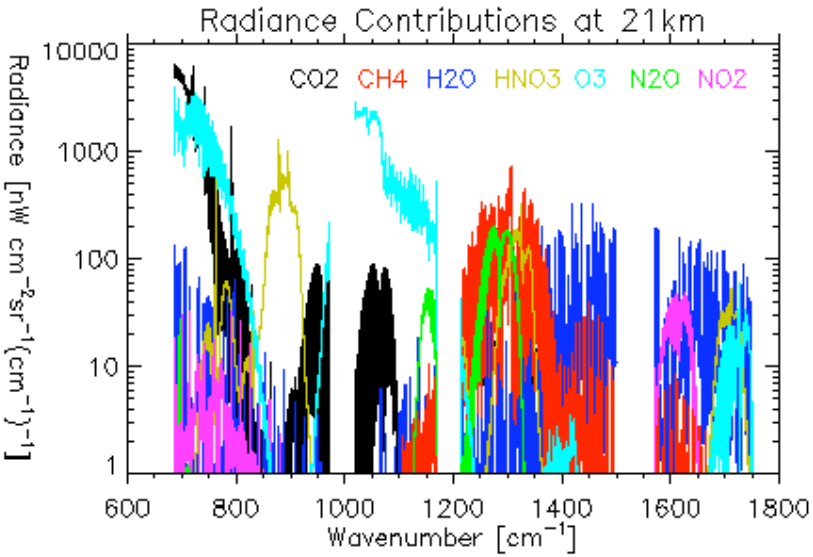




HNO3


2 Current Off-Line HNO3 Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]


HNO3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]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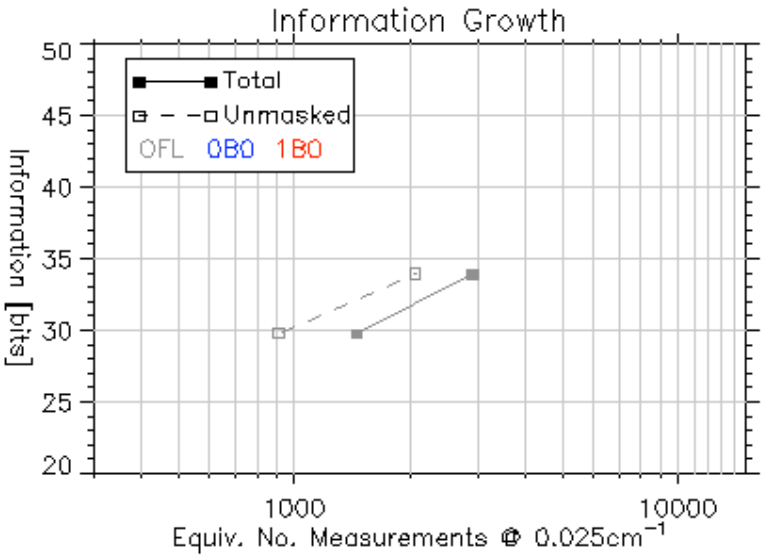
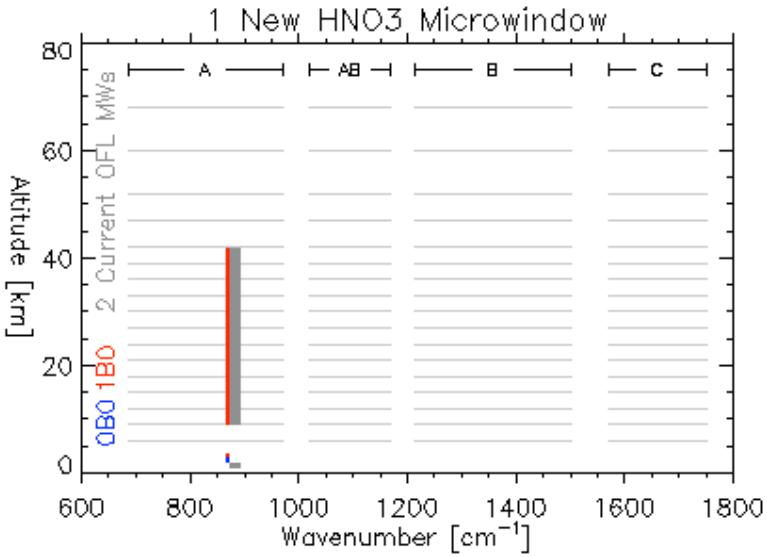
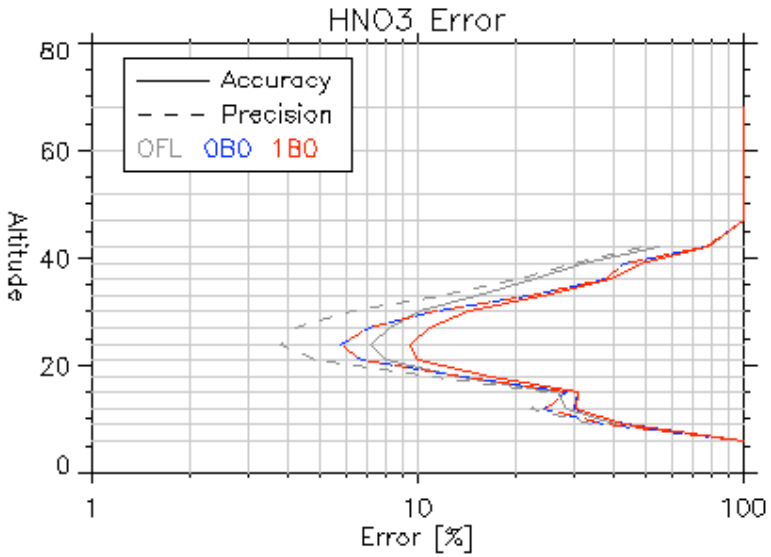
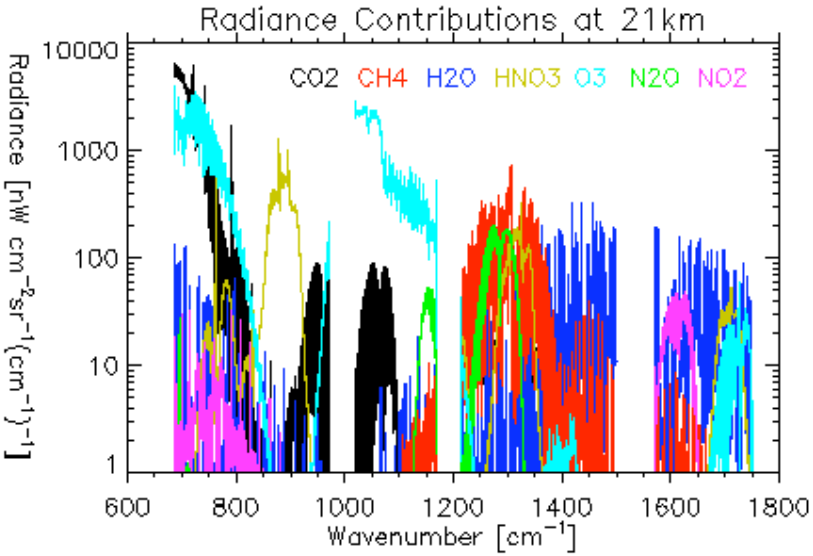
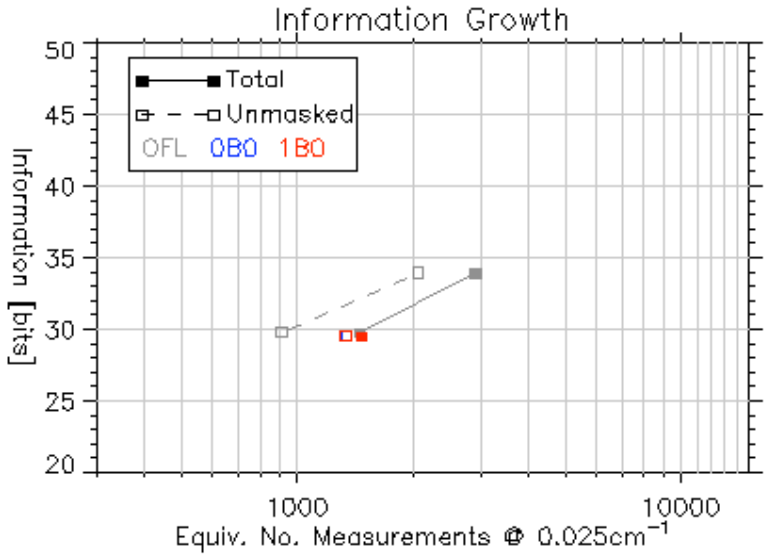
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

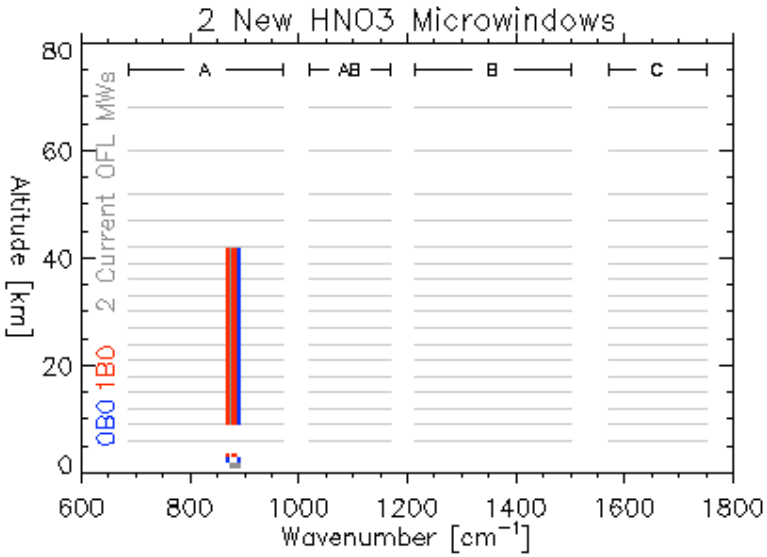

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

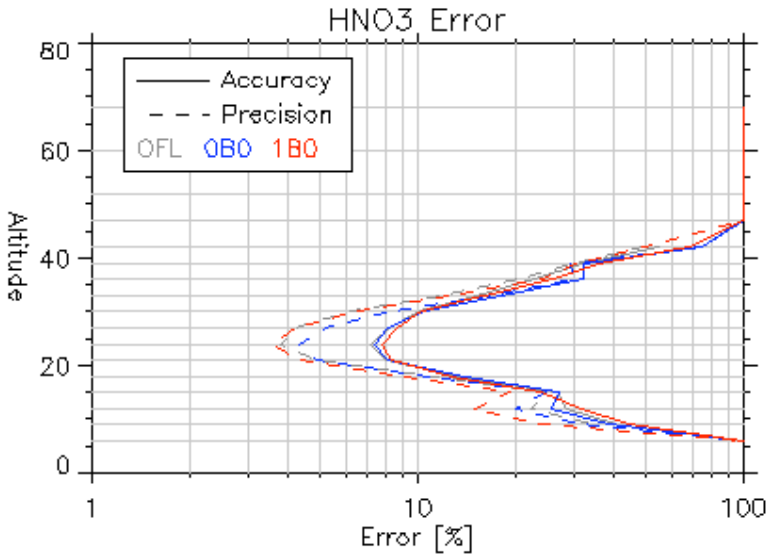

1 New HNO3 Microwindow
A
AB
B
C
0BO 1BO 2 Current OFL MWs
Altitude [km]
Wavenumber [cm^{-1}]

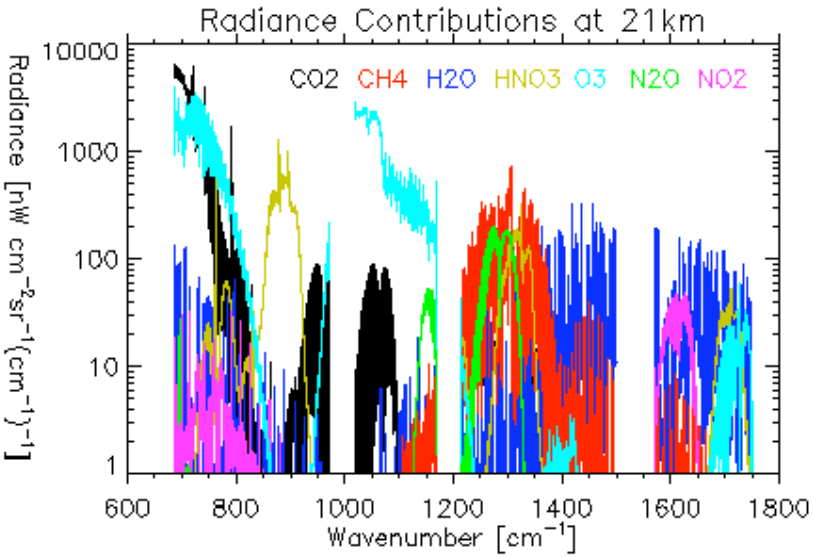

HNO3 Error
Accuracy
Precision
OFL 0BO 1BO
Altitude
Error [%]

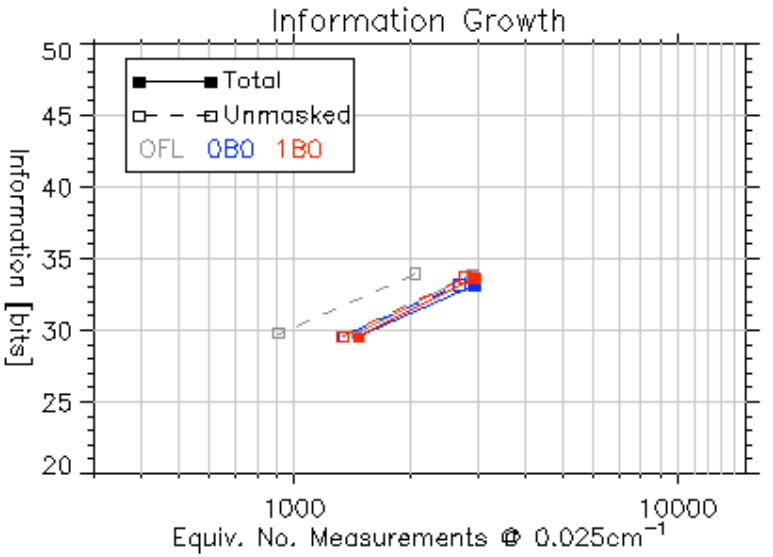

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0BO 1BO
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


2 New HNO3 Microwindows
A
AB
B
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

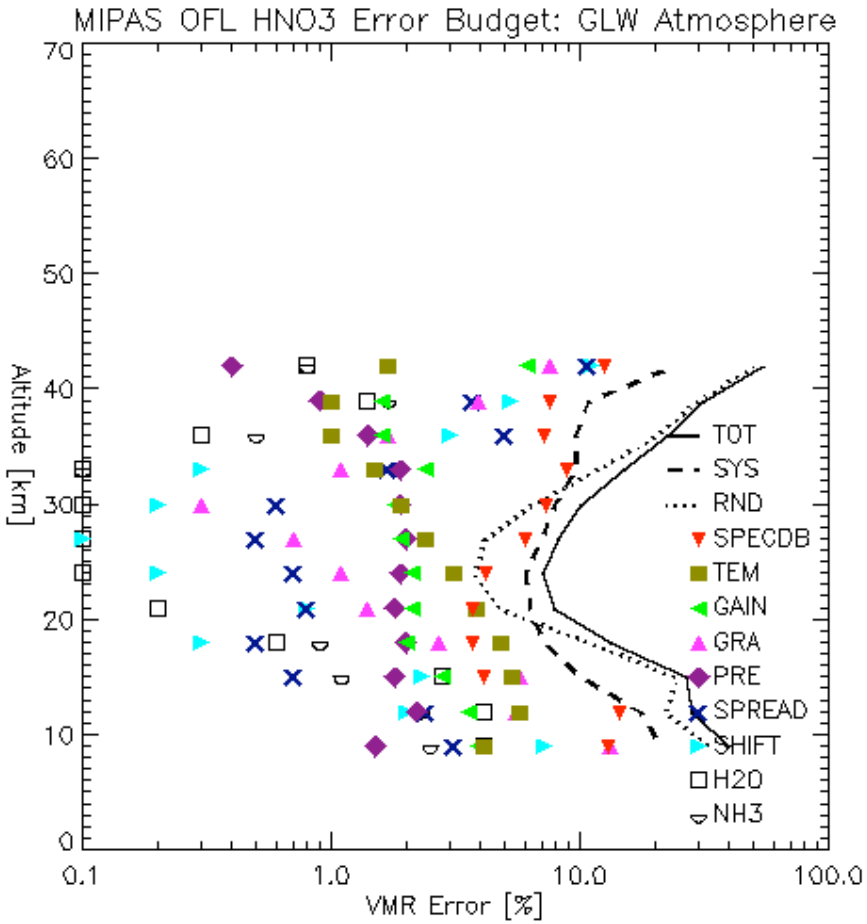

HNO3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

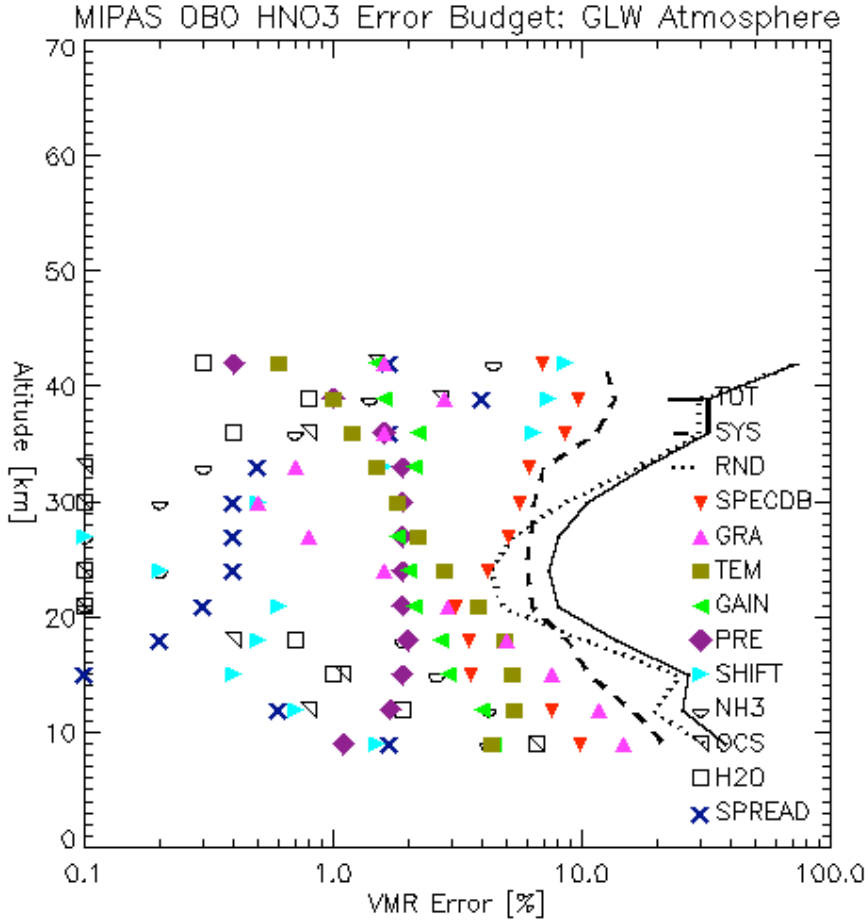

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

HNO3 Error Analysis

Atmospheric, Oceanic
& Planetary Physics,
University of Oxford





HNO3 Error Analysis

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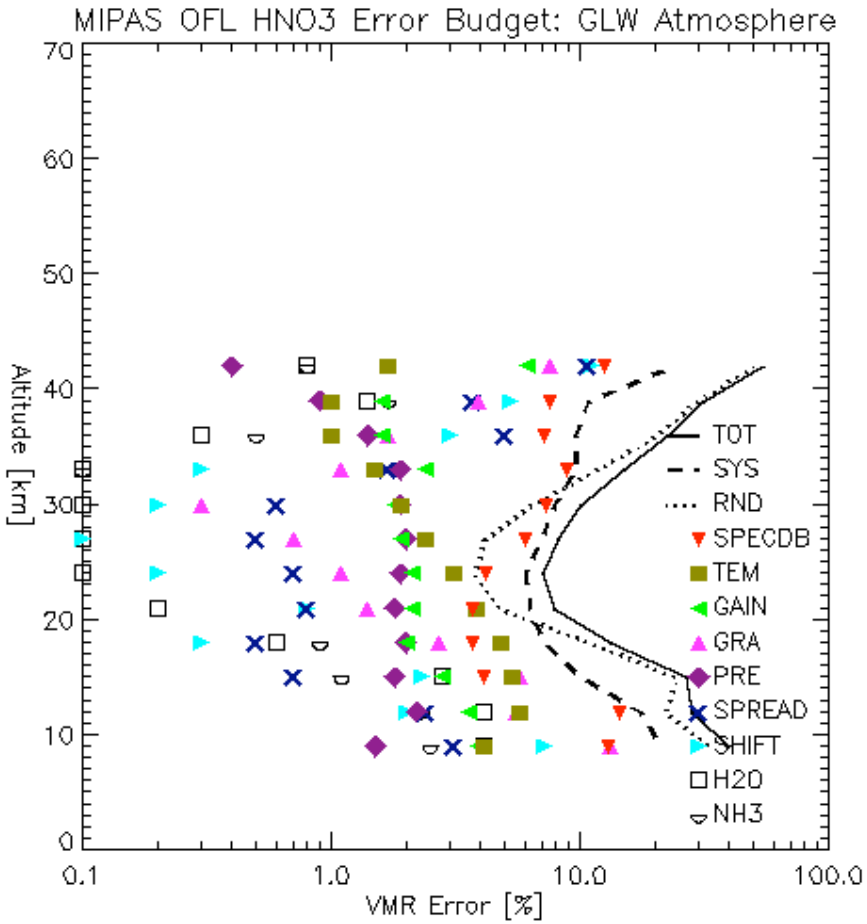
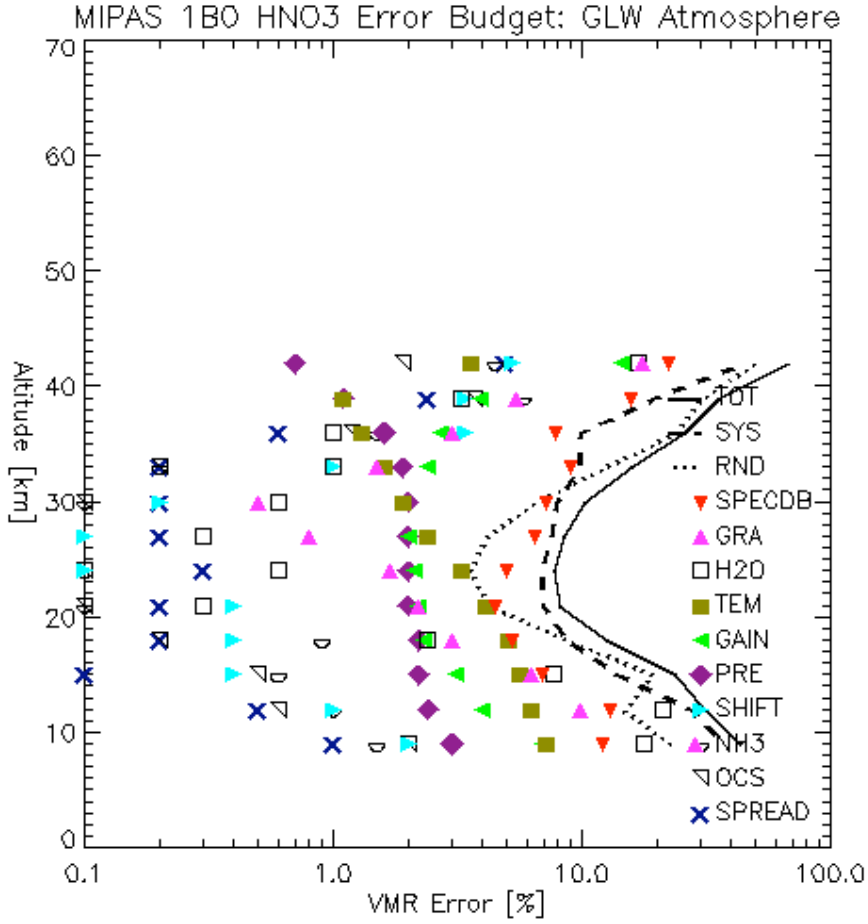
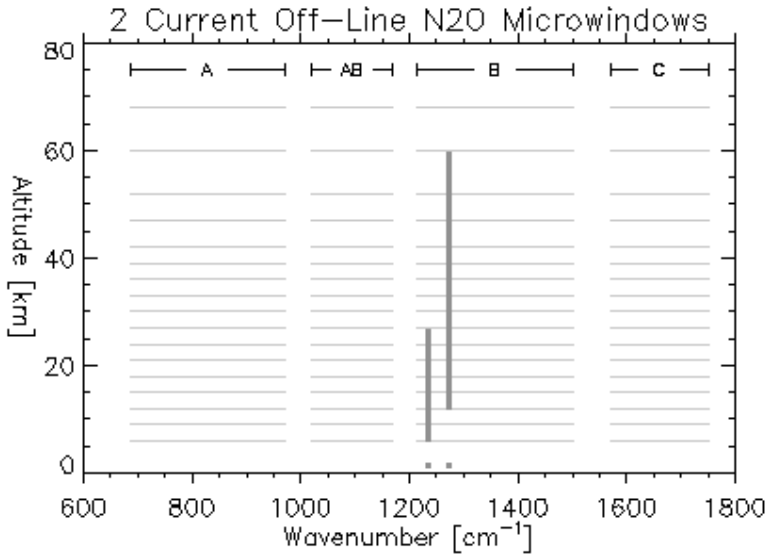
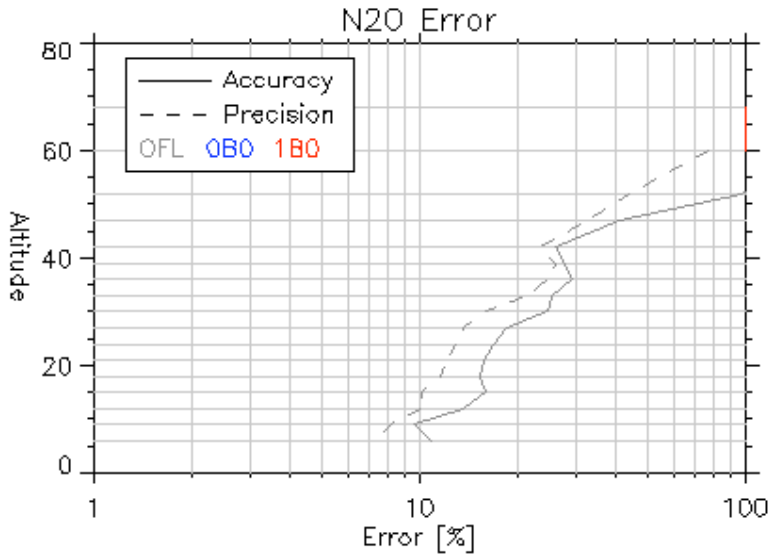
& Planetary Physics,
University of Oxford

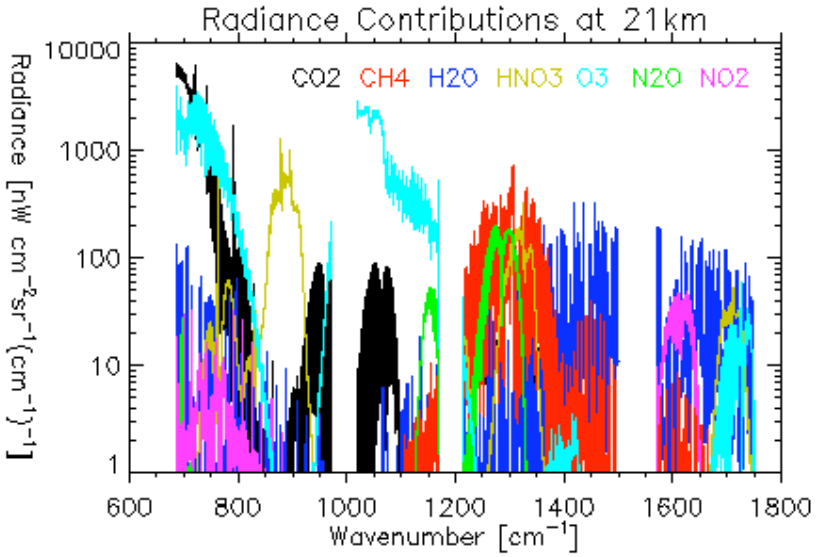


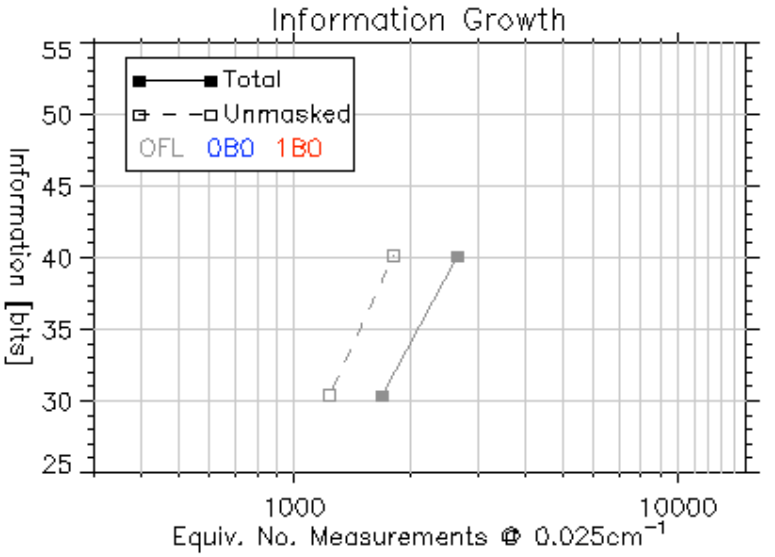


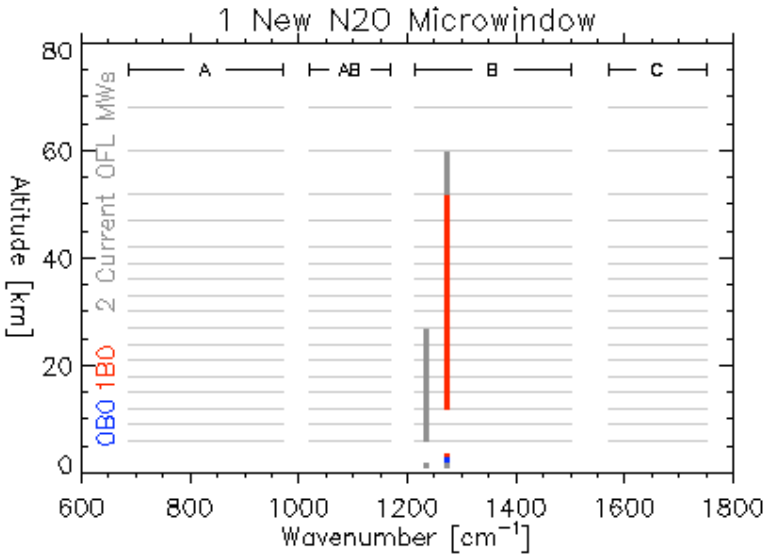
N2O

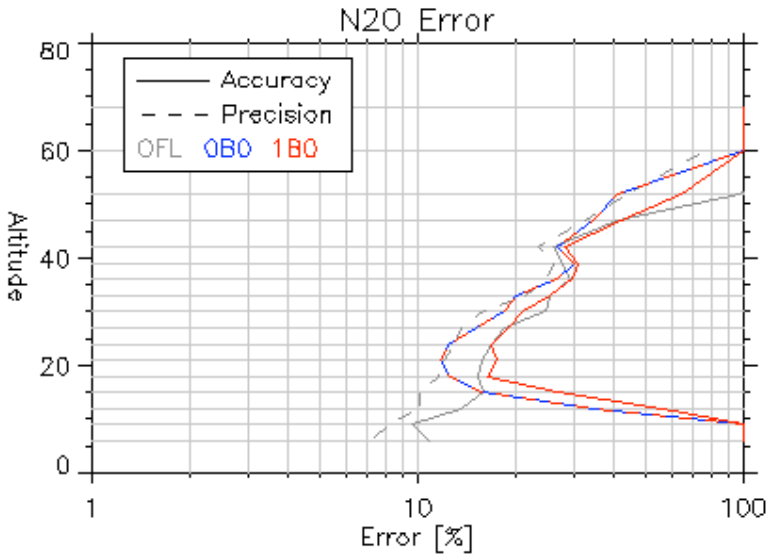

2 Current Off-Line N2O Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]

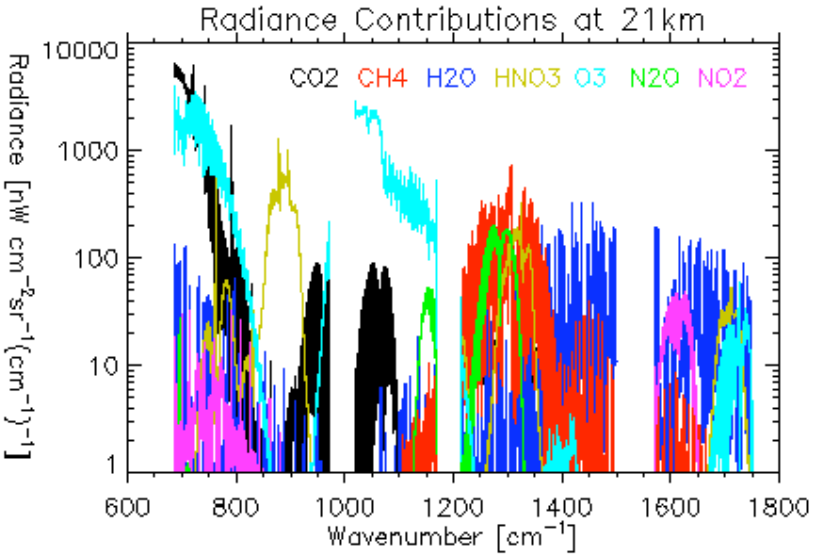

N2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

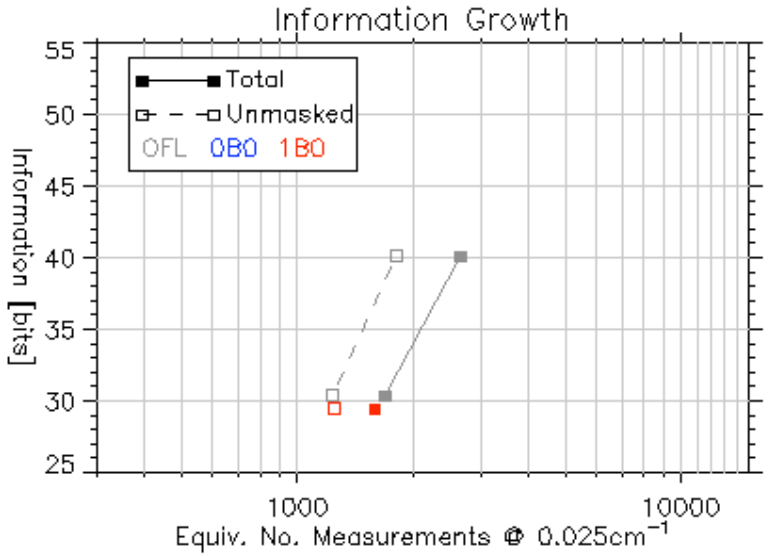

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

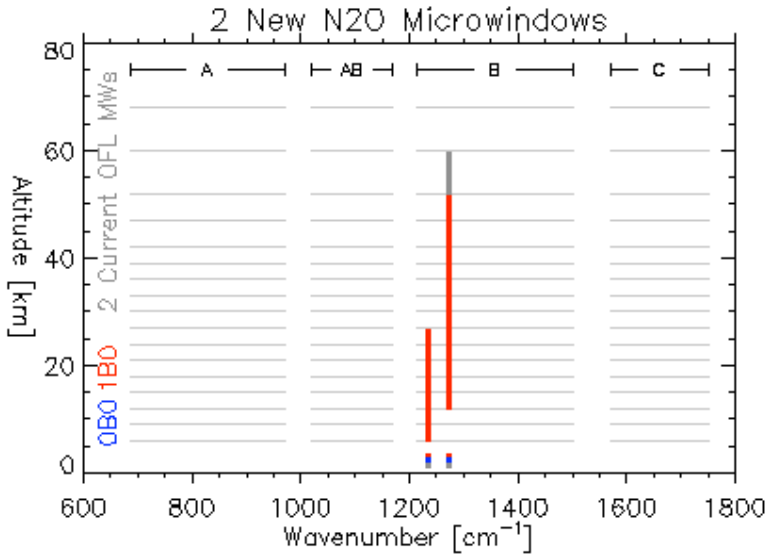

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

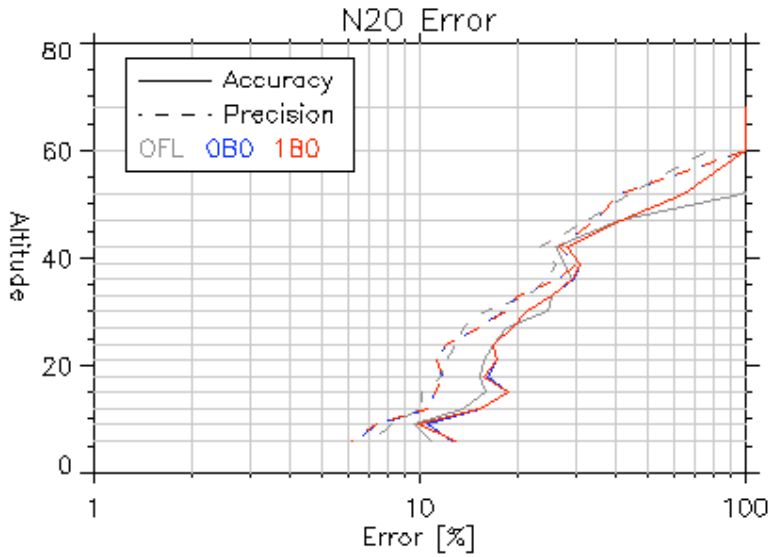

1 New N2O Microwindow
A
AB
B
C
2 Current OFL MWs
1B0
0B0
Altitude [km]
Wavenumber [cm^{-1}]

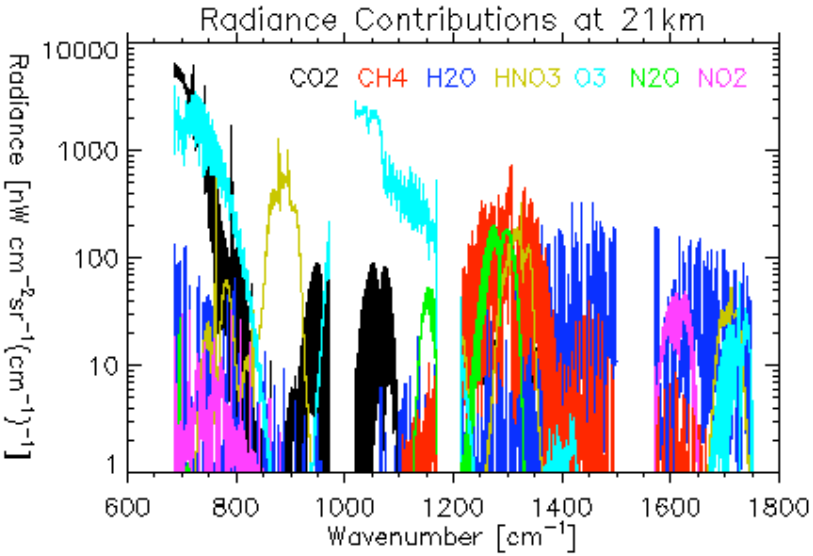

N2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

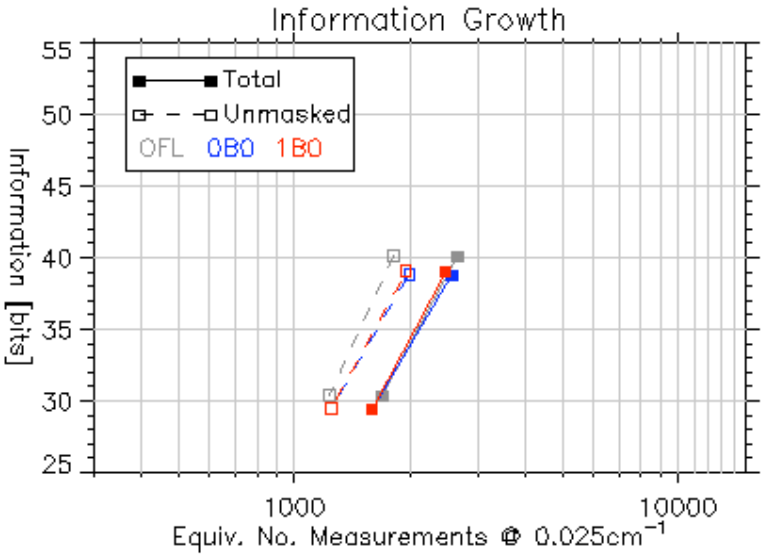

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

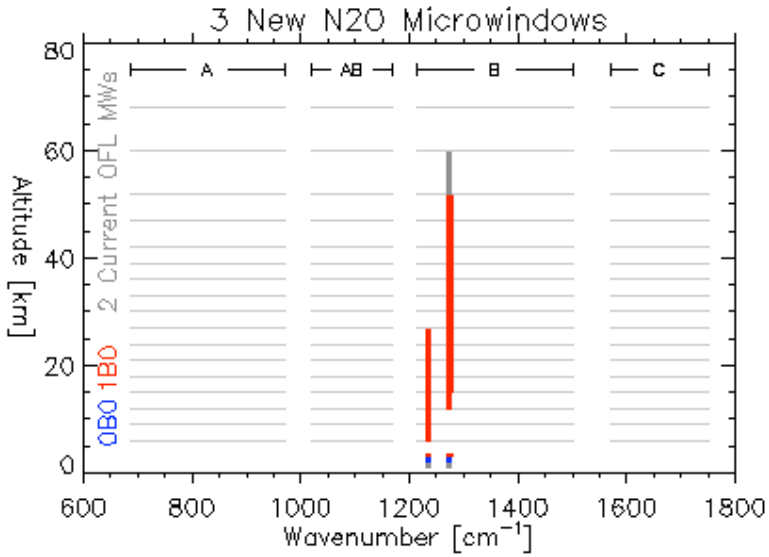

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

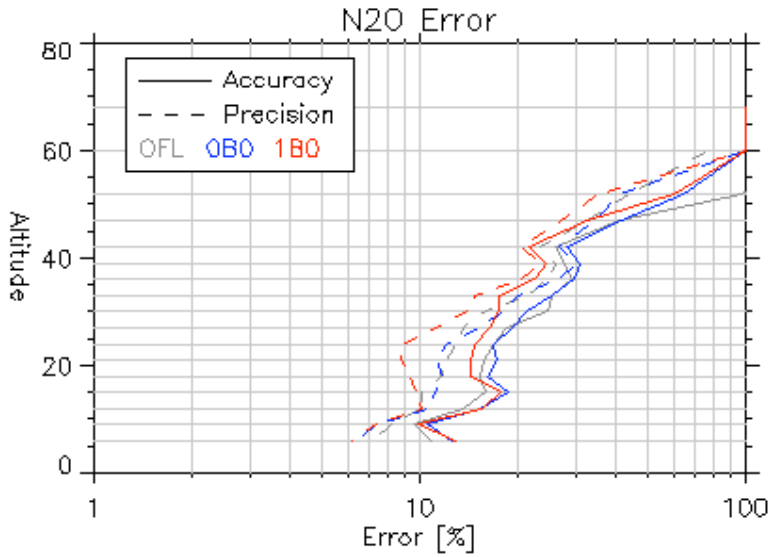

2 New N2O Microwindows
A
AB
B
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]

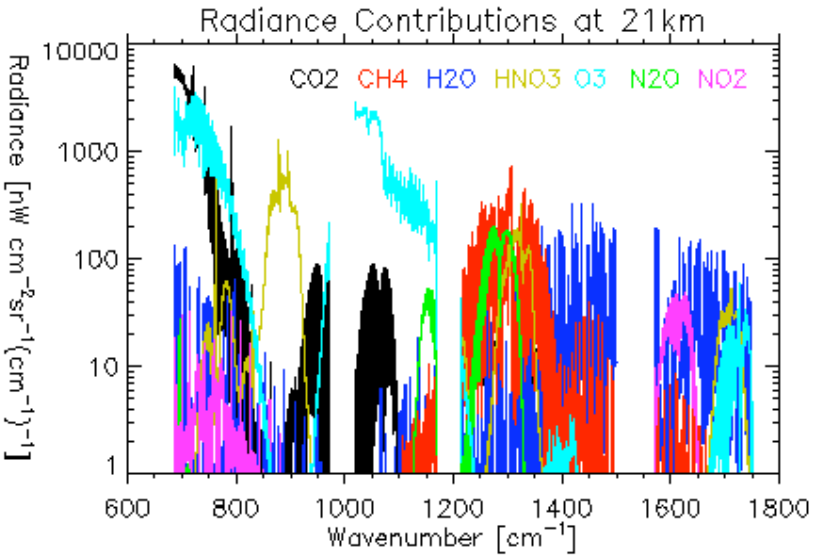

N2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

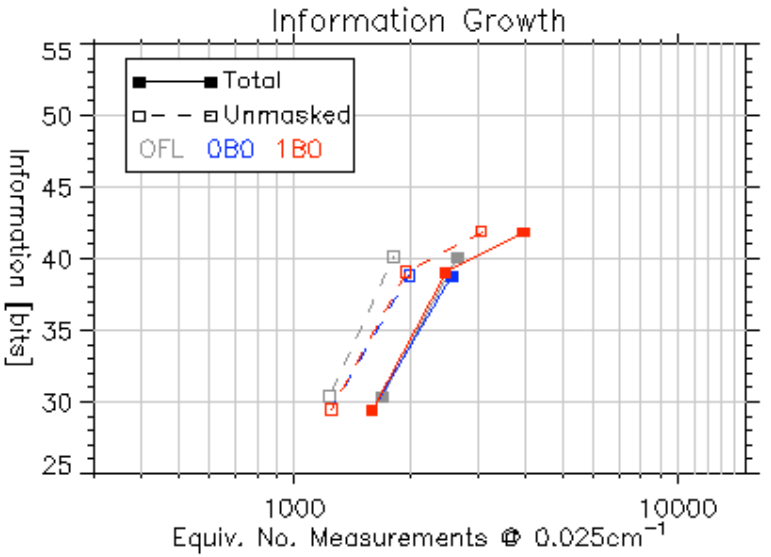

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm-2sr-1(cm-1)-1]
Wavenumber [cm-1]

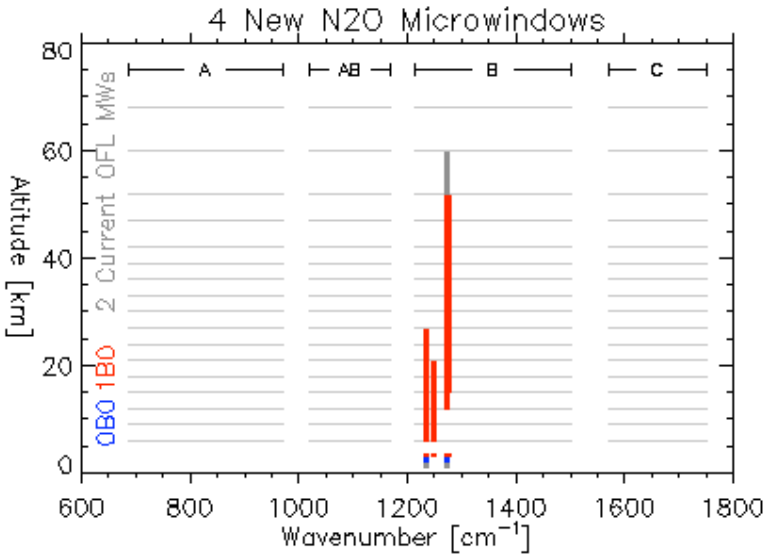

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm-1

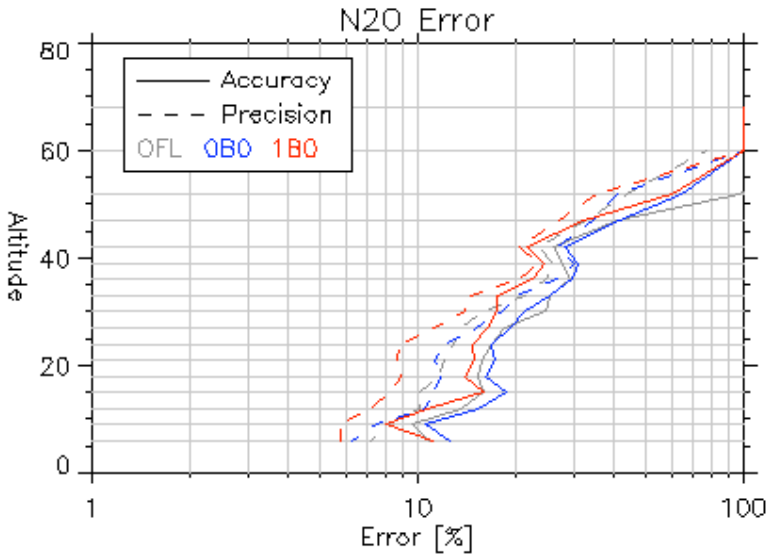

3 New N2O Microwindows
A
AB
B
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]

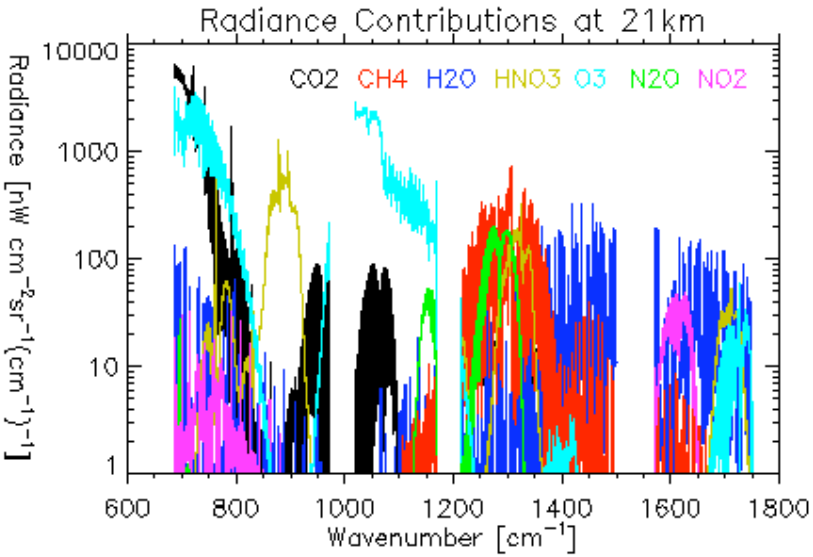

N2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

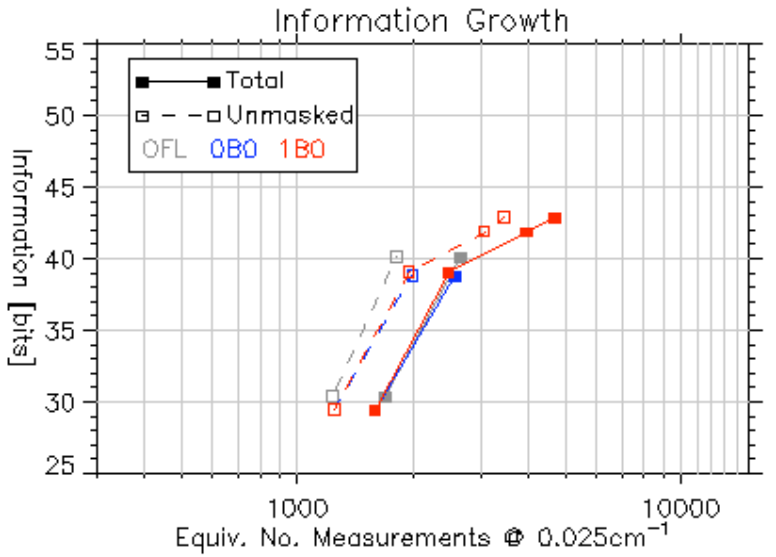

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm-2sr-1(cm-1)-1]
Wavenumber [cm-1]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm-1


4 New N2O Microwindows
A
AB
B
C
2 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]


N2O Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]


Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

N2O Error Analysis

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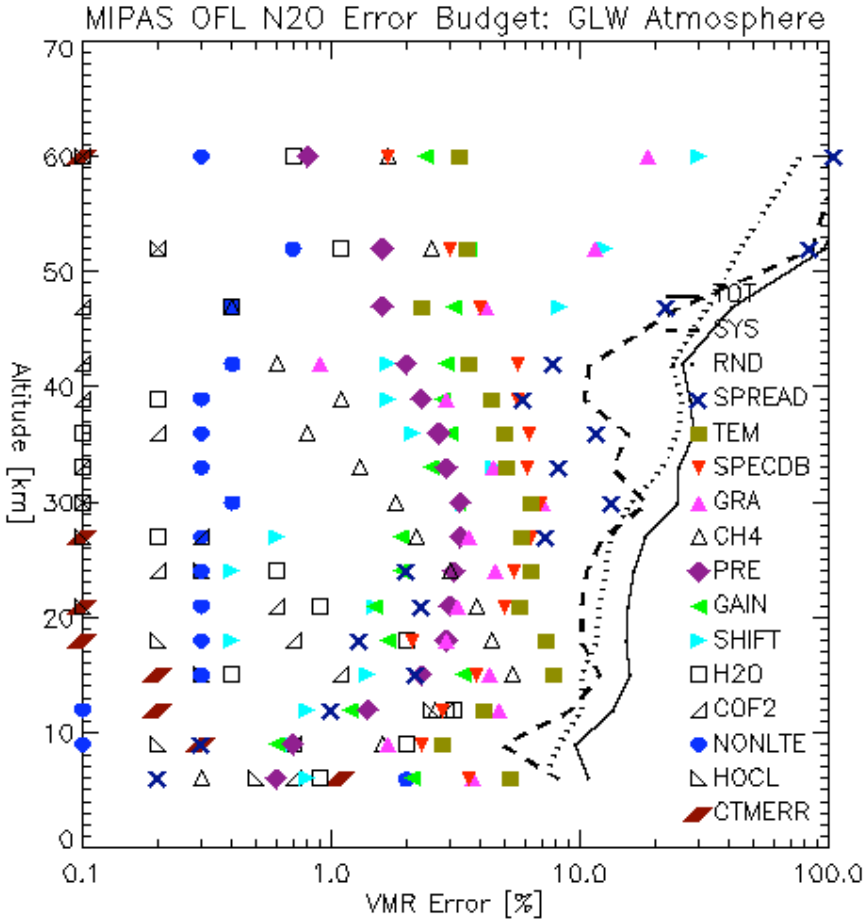
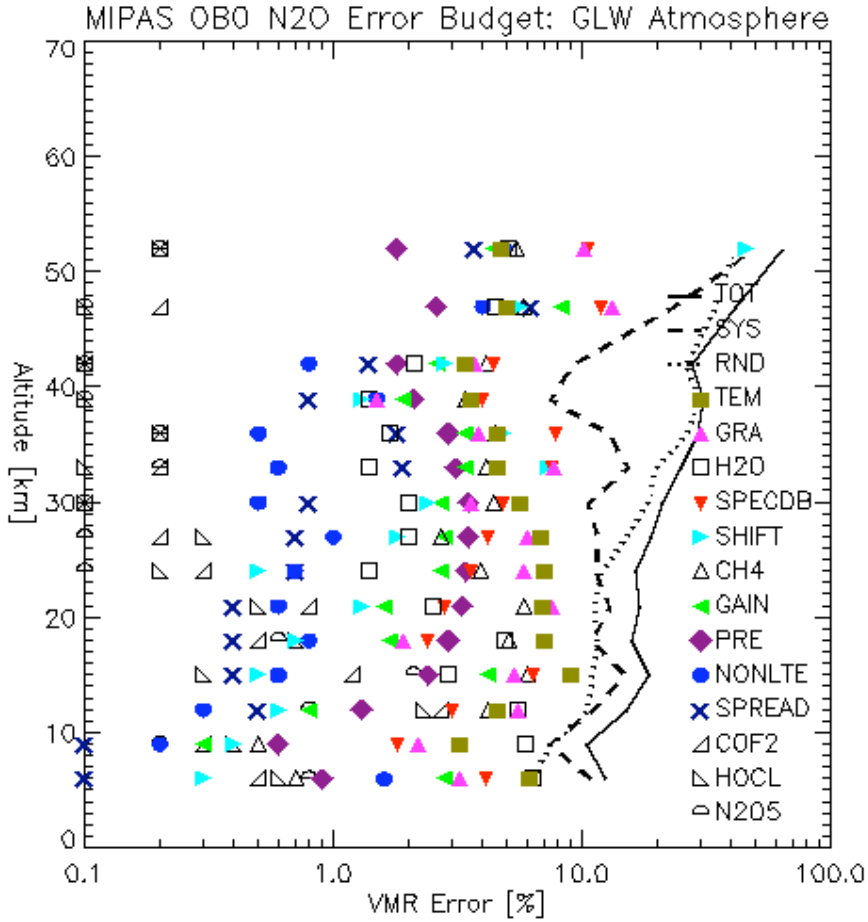
& Planetary Physics,
University of Oxford





N2O Error Analysis

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& Planetary Physics,
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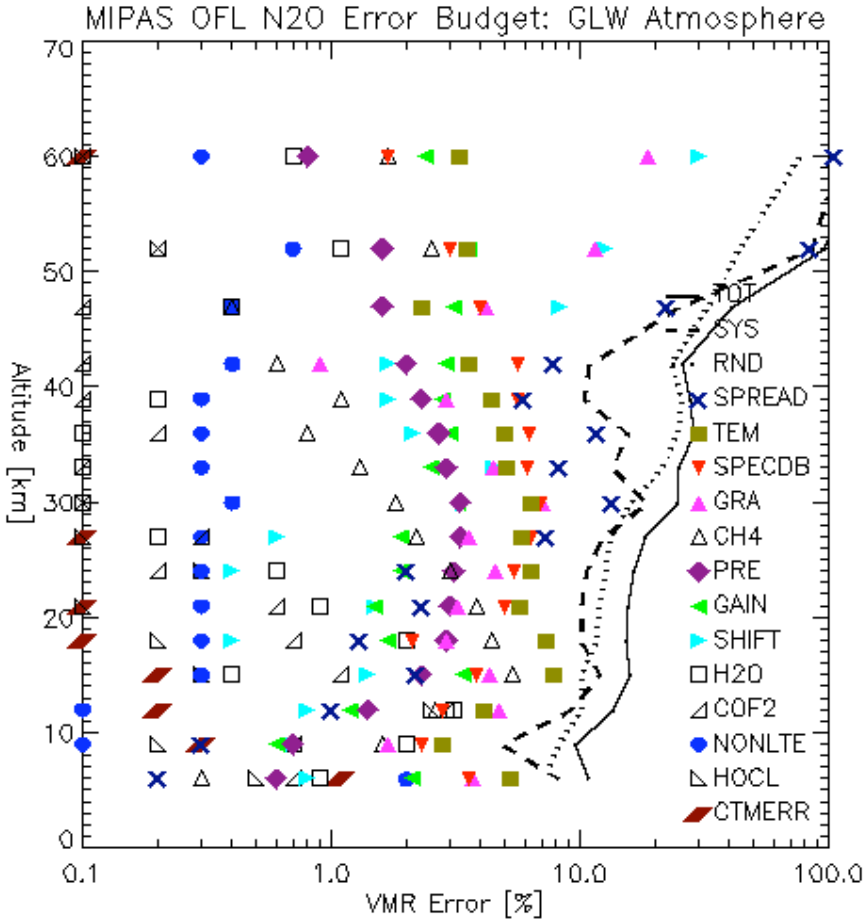
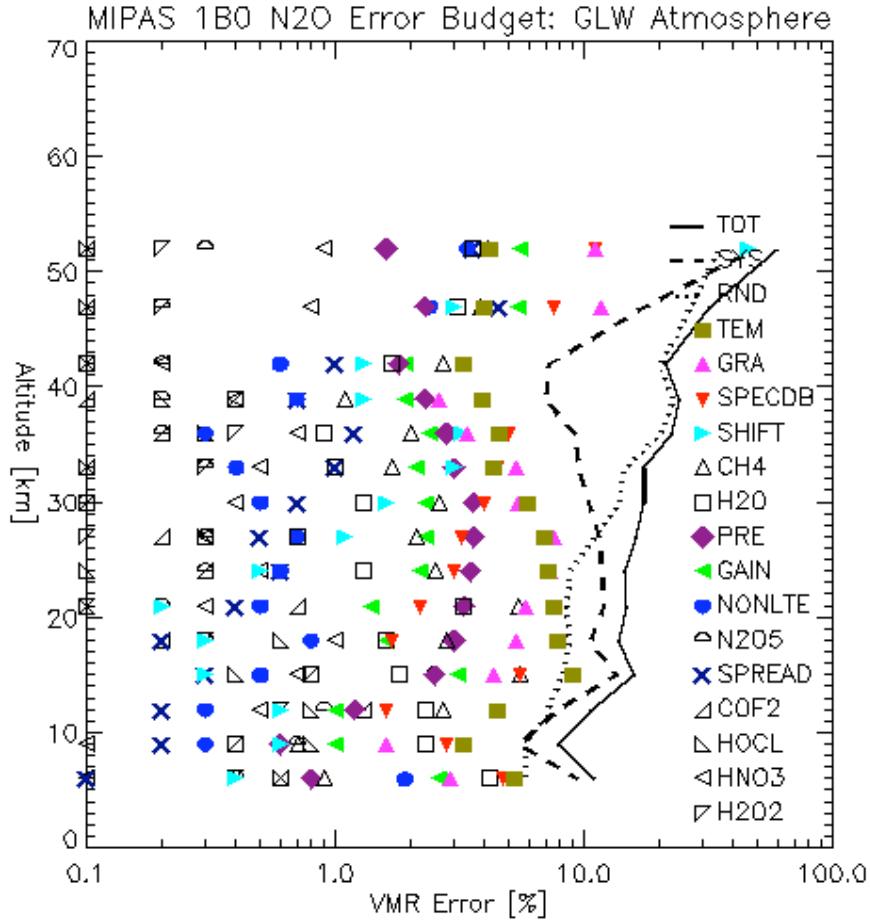
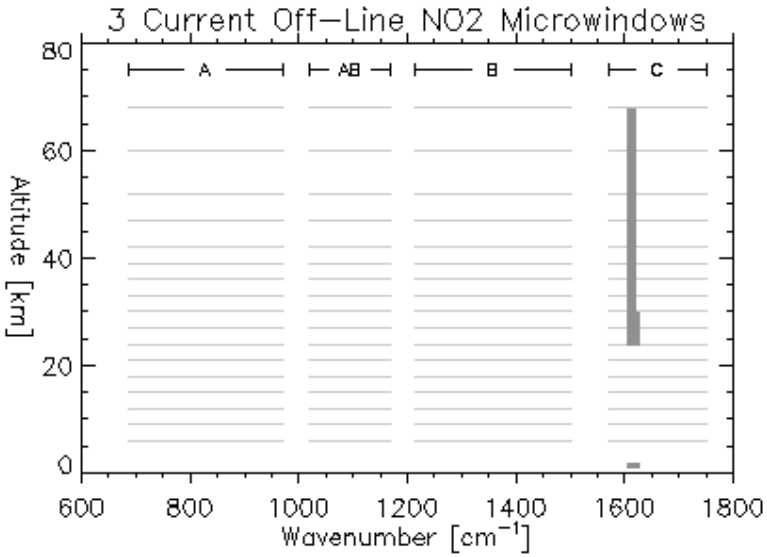
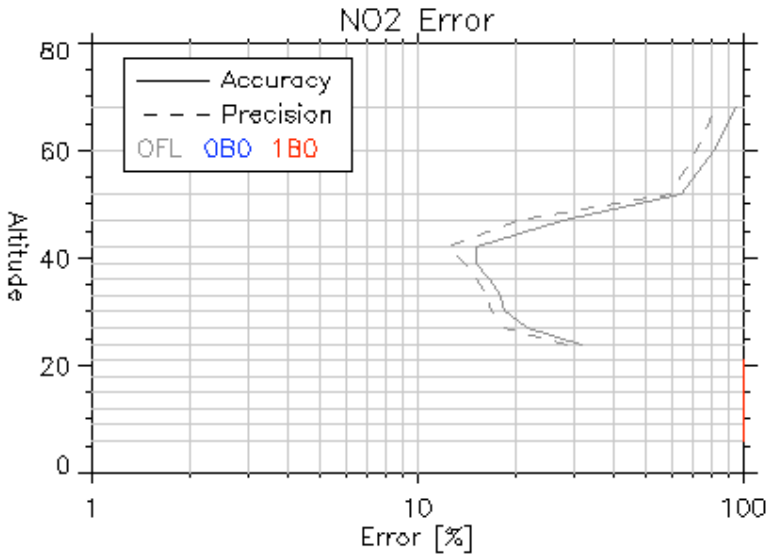
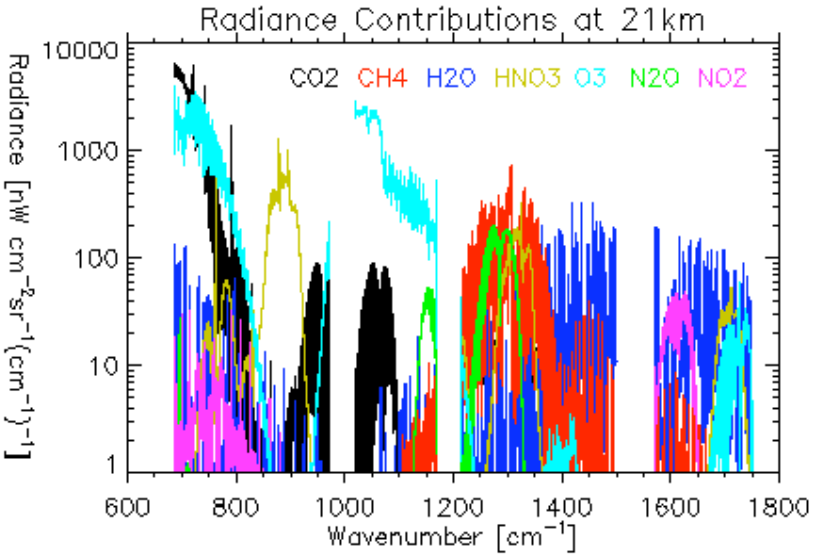


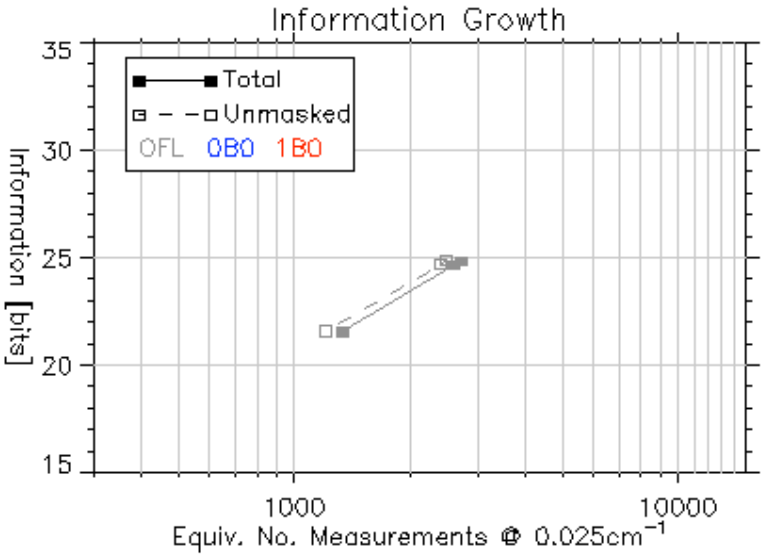


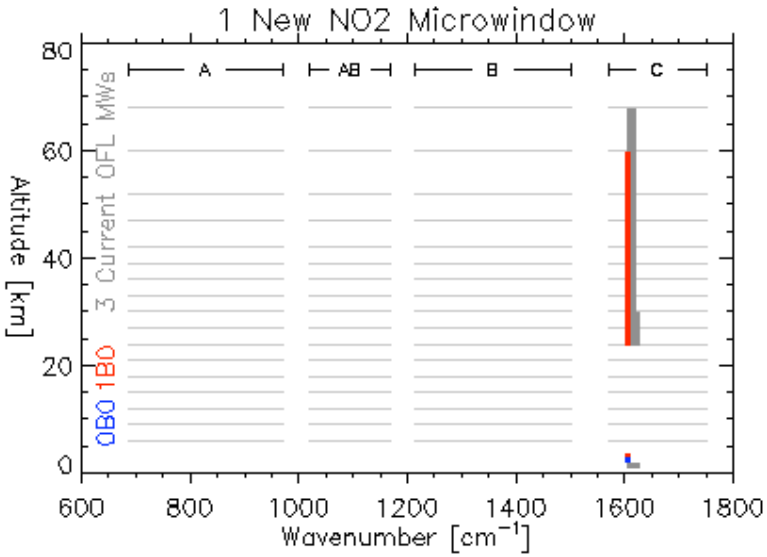
NO2

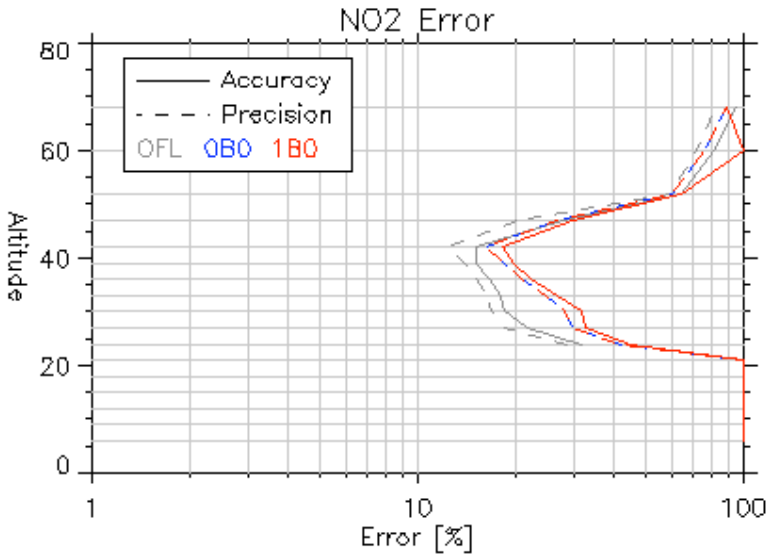

3 Current Off-Line NO2 Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]

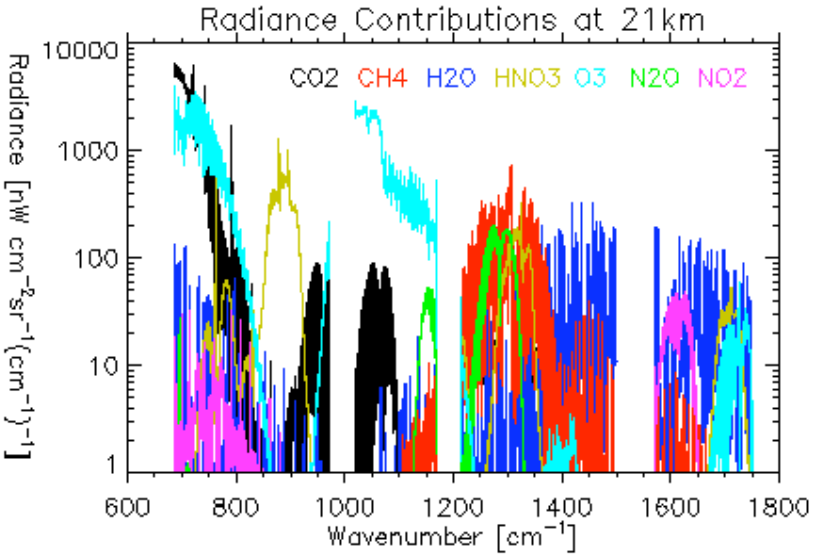

NO2 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

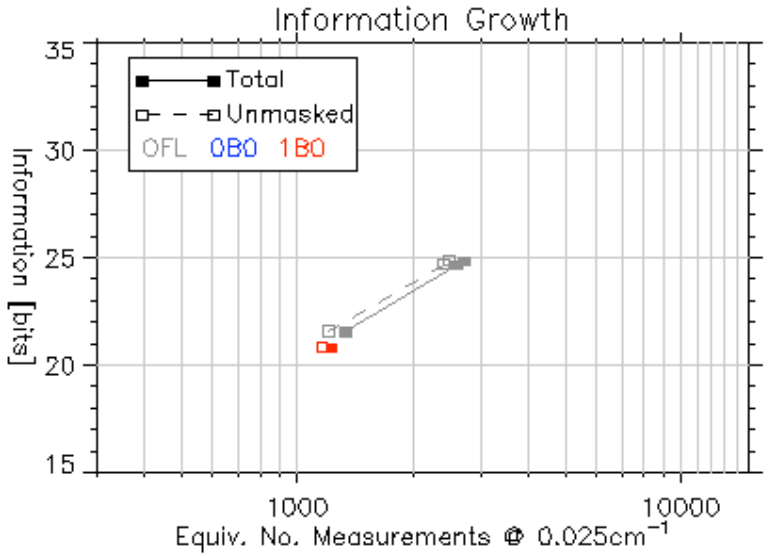

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

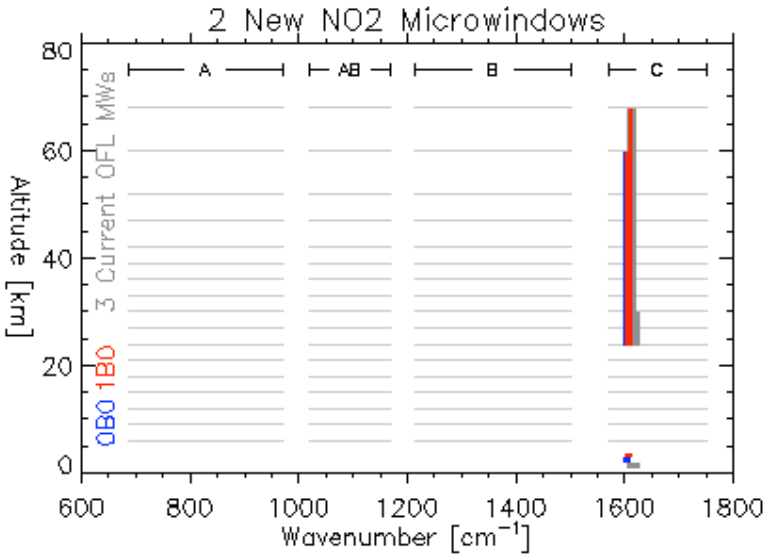

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

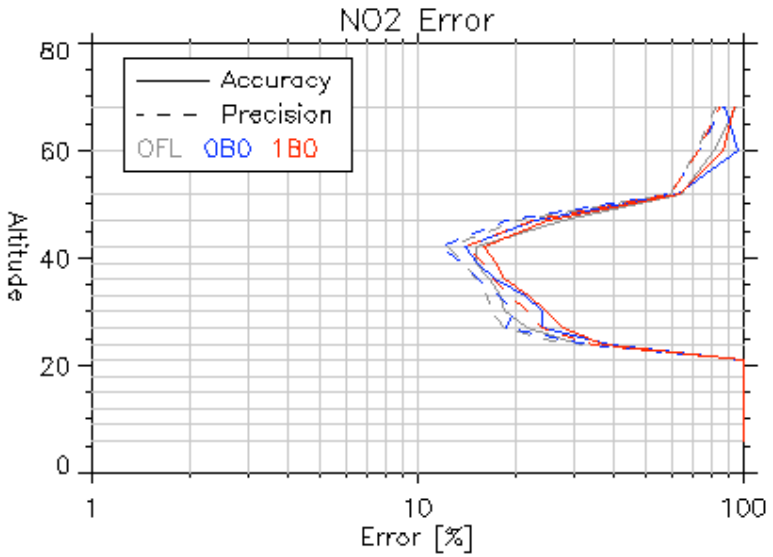

1 New NO2 Microwindow
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

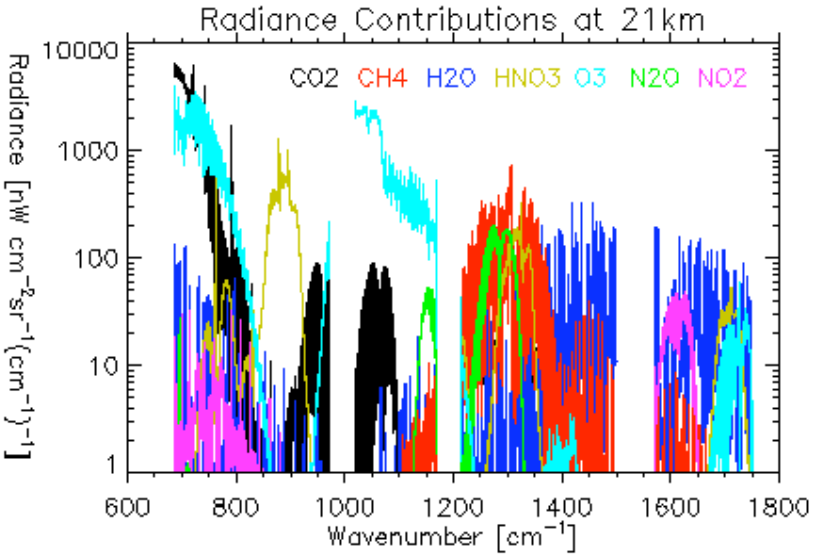

NO2 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

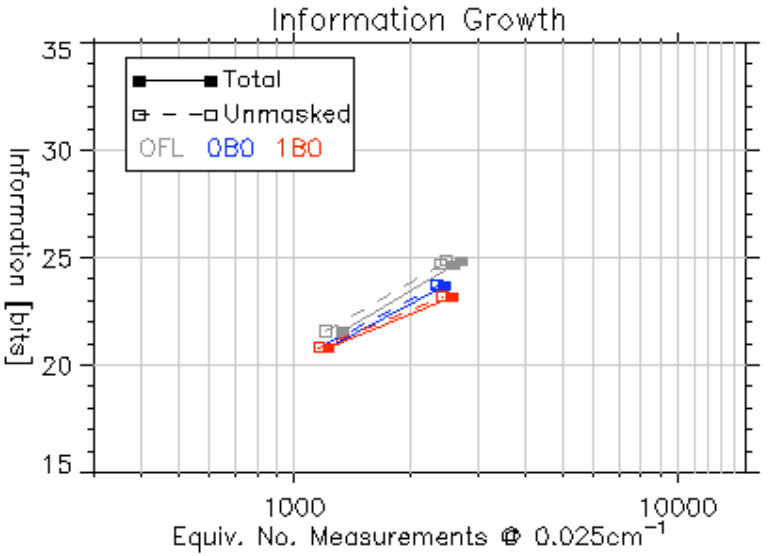

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


2 New NO2 Microwindows
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm-1]


NO2 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]


Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm-2sr-1(cm-1)-1]
Wavenumber [cm-1]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm-1

NO2 Error Analysis

Atmospheric, Oceanic
& Planetary Physics,
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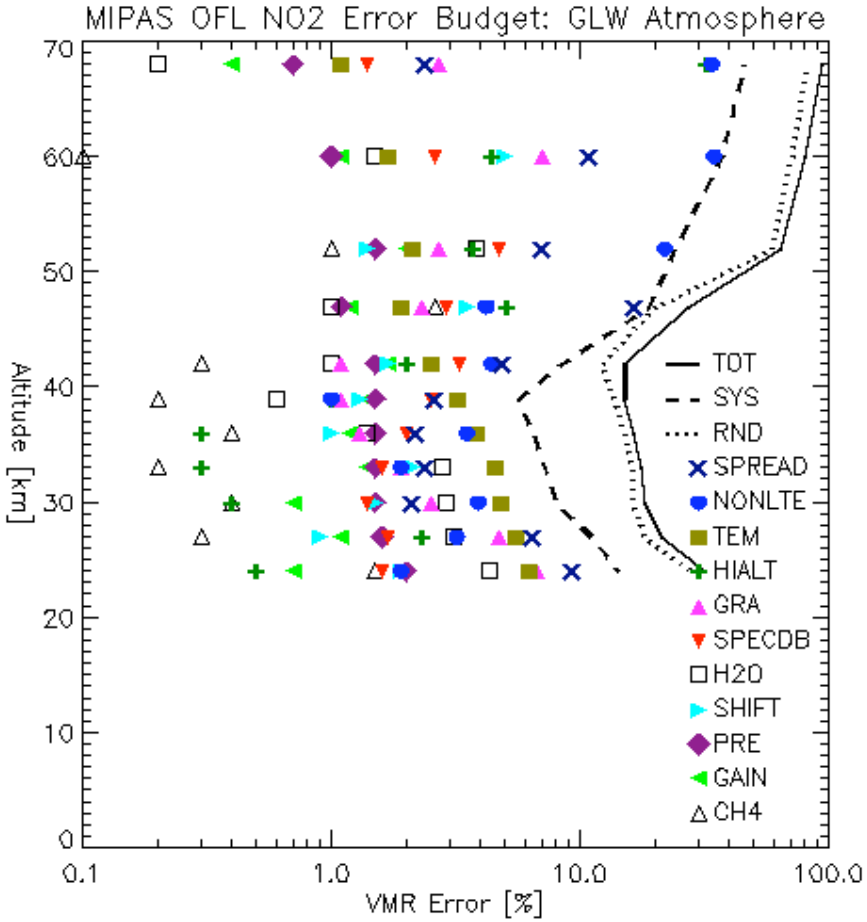

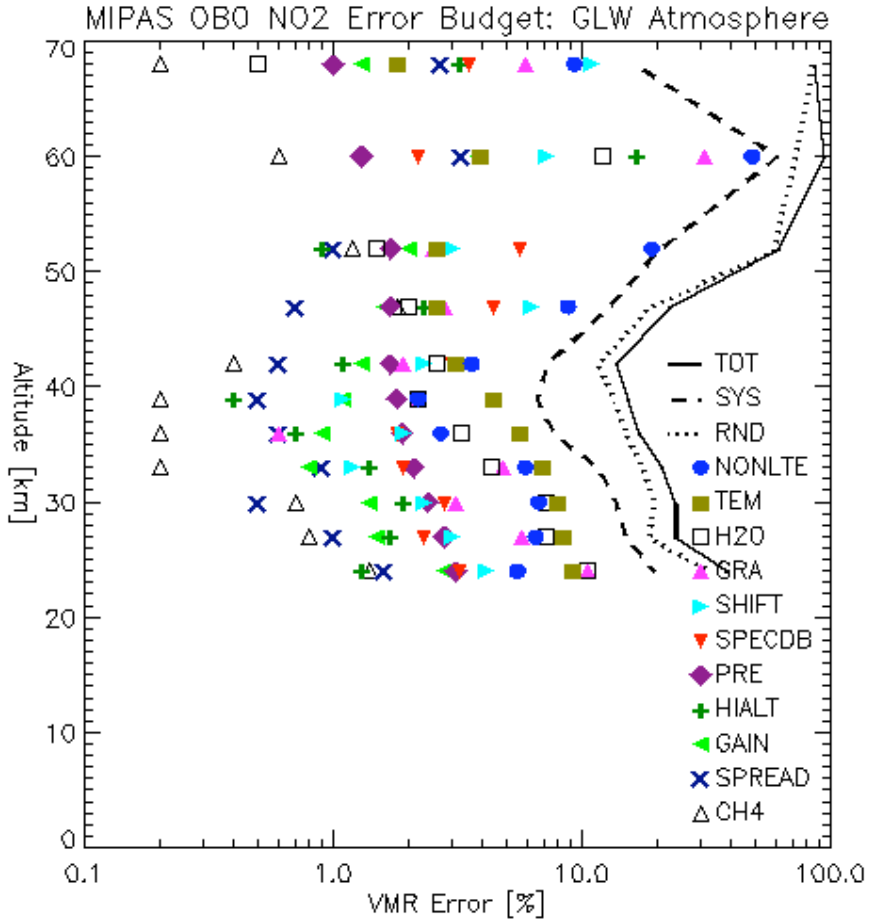

NO2 Error Analysis

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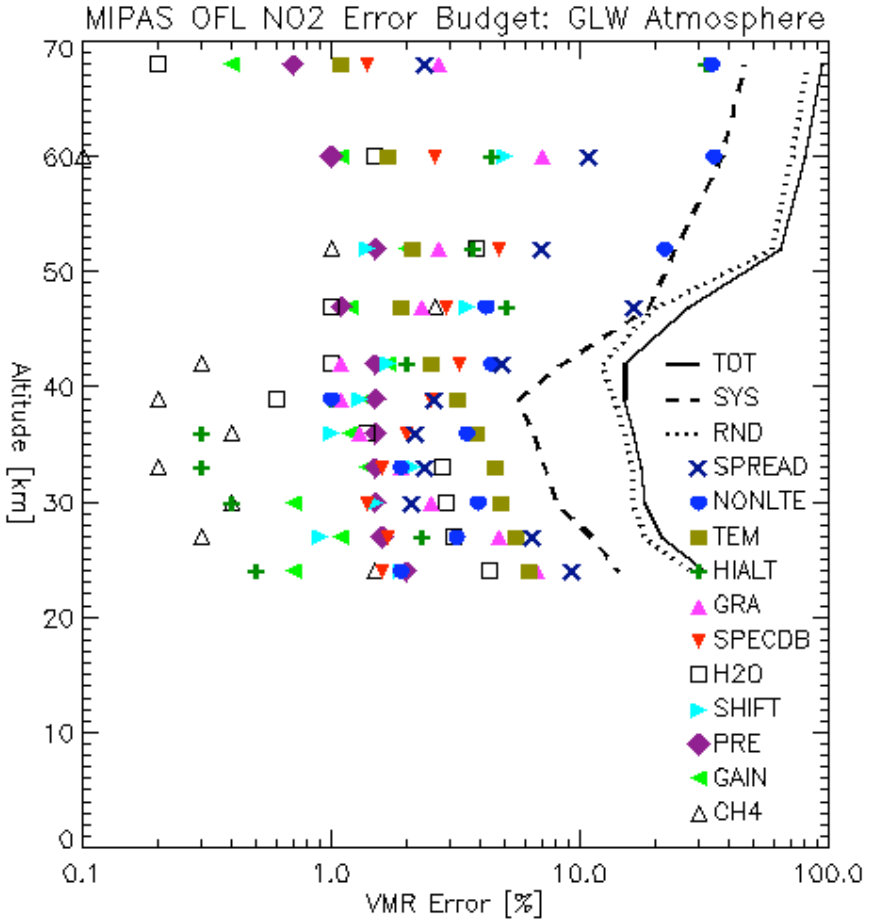
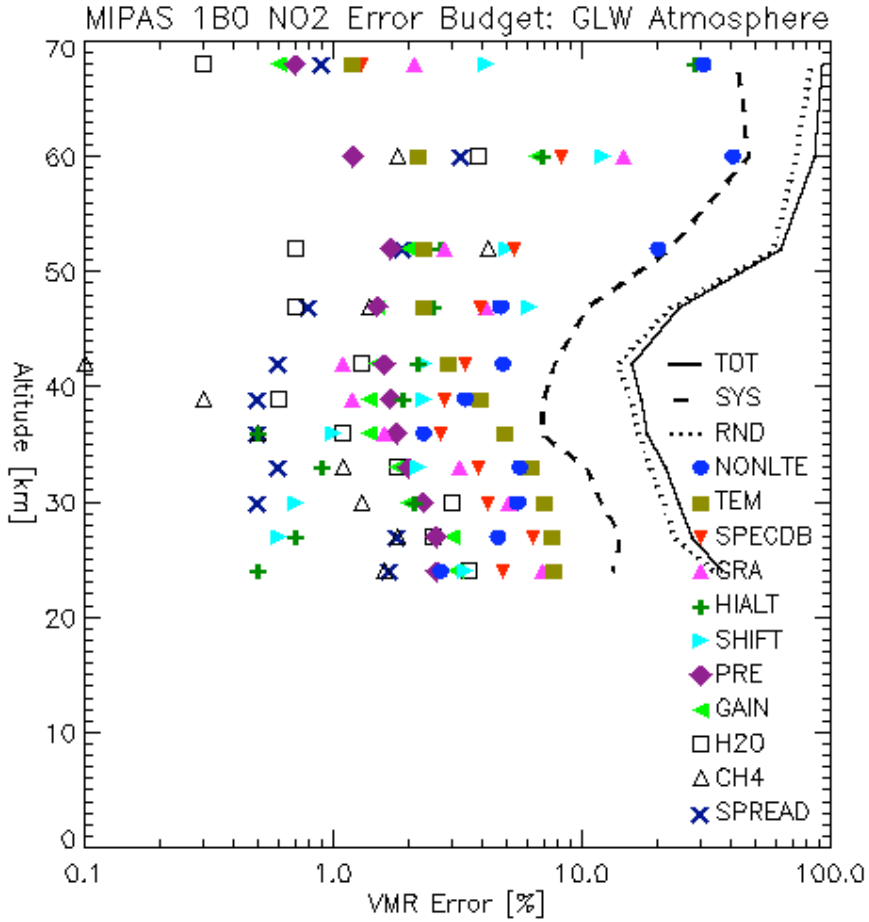
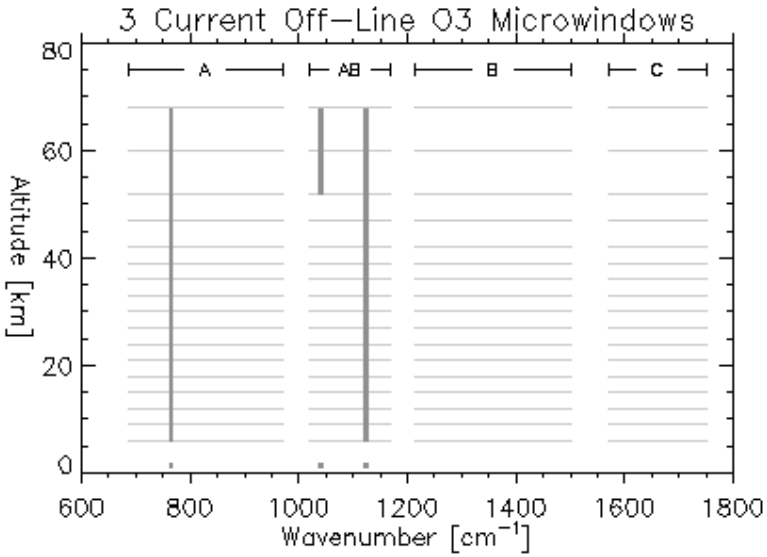
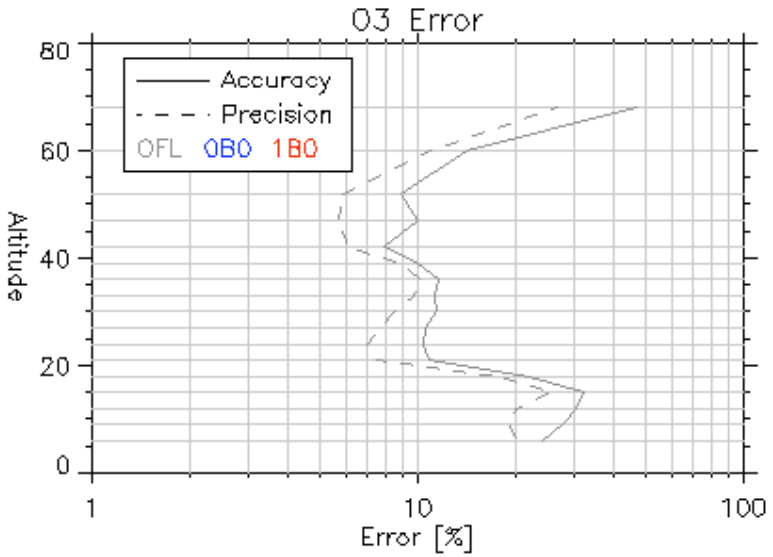
& Planetary Physics,
University of Oxford

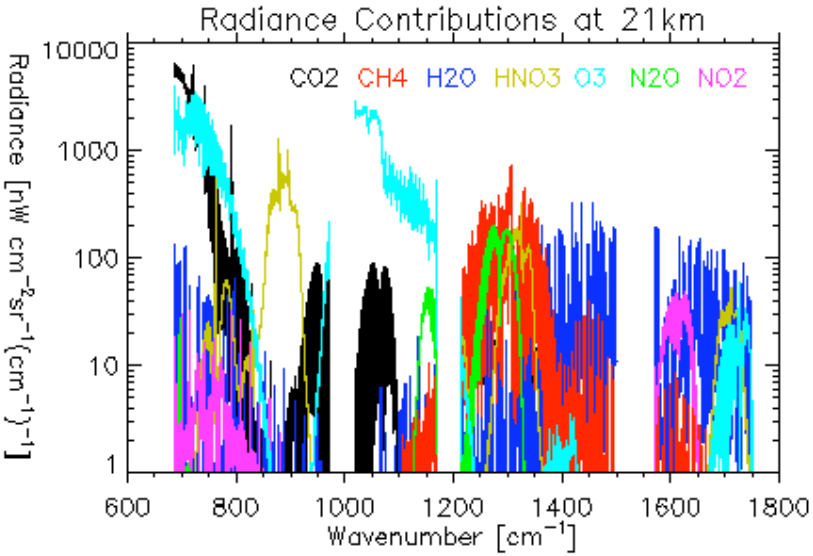


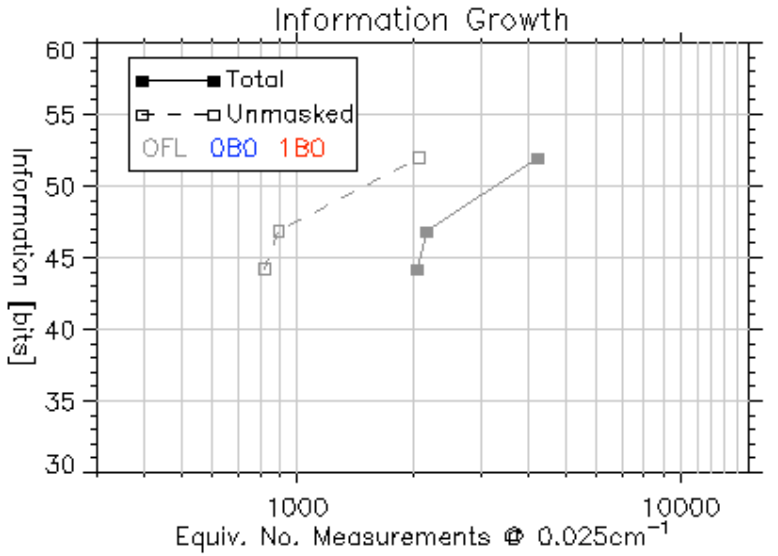


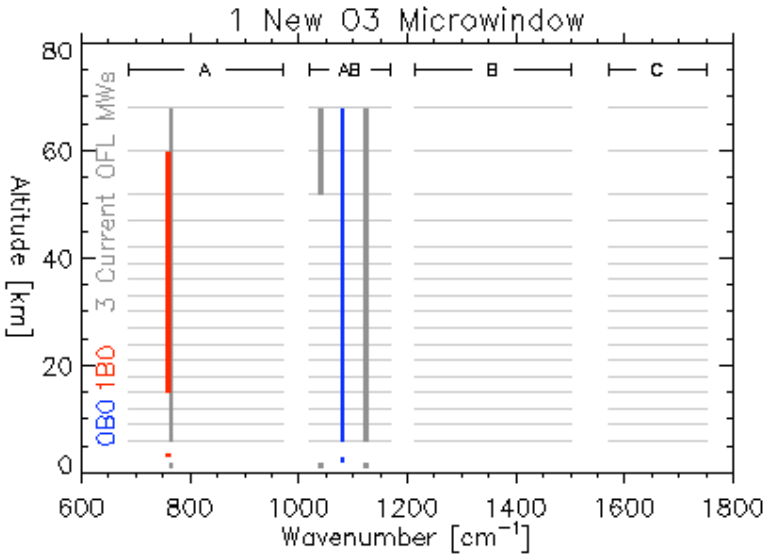
O3

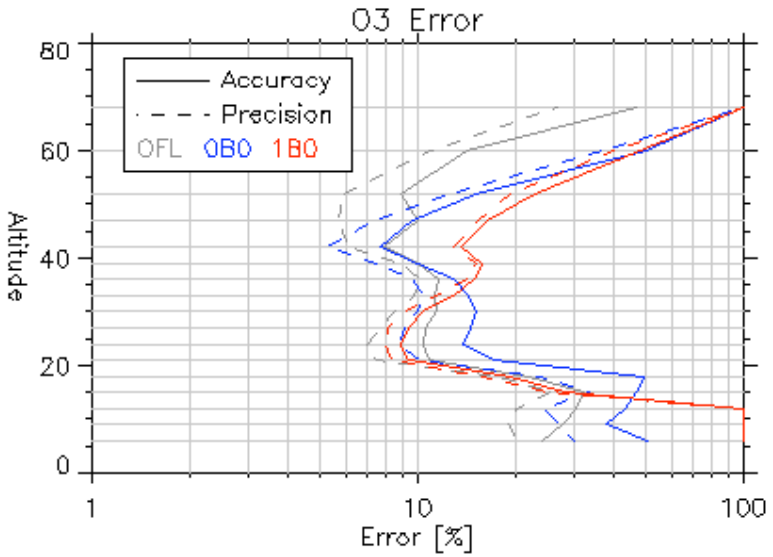

3 Current Off-Line O3 Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]

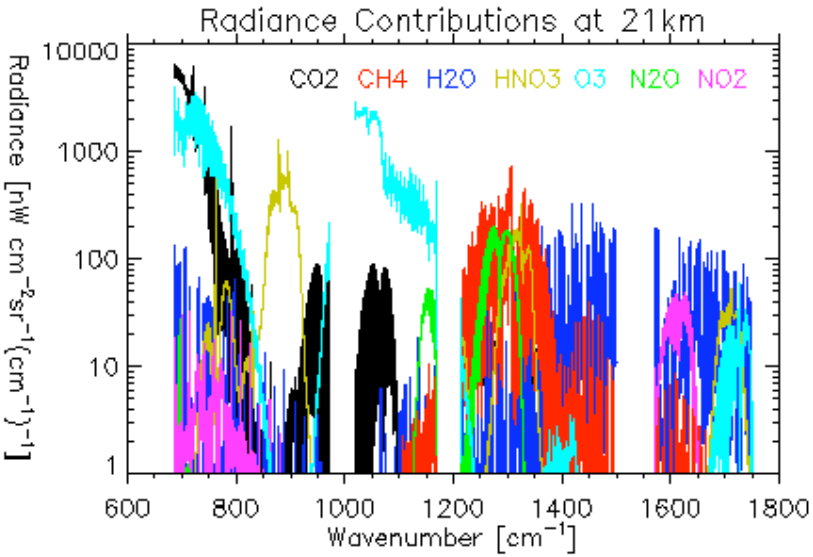

O3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

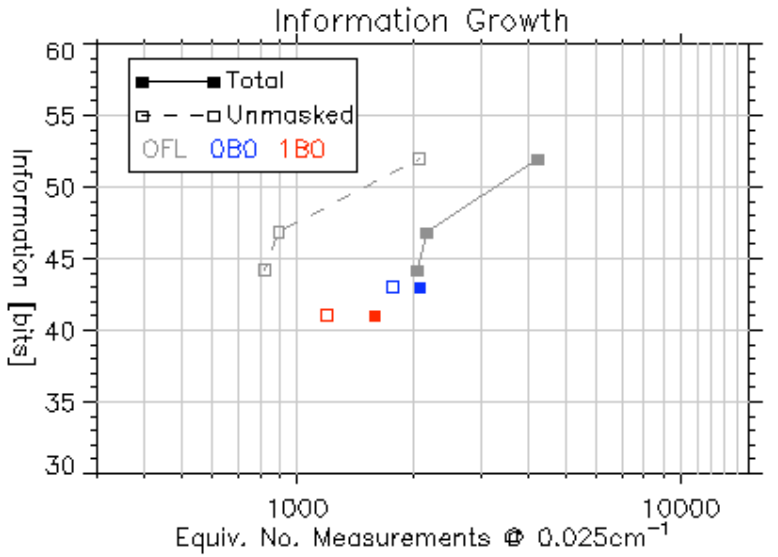

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

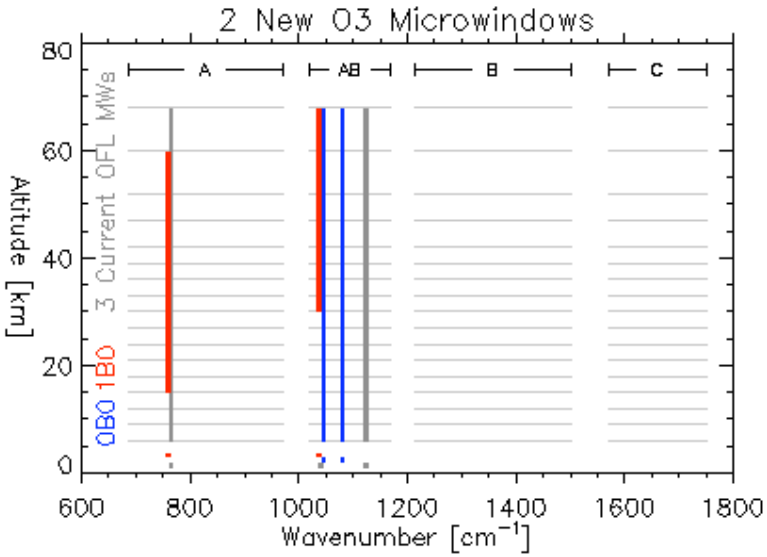

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

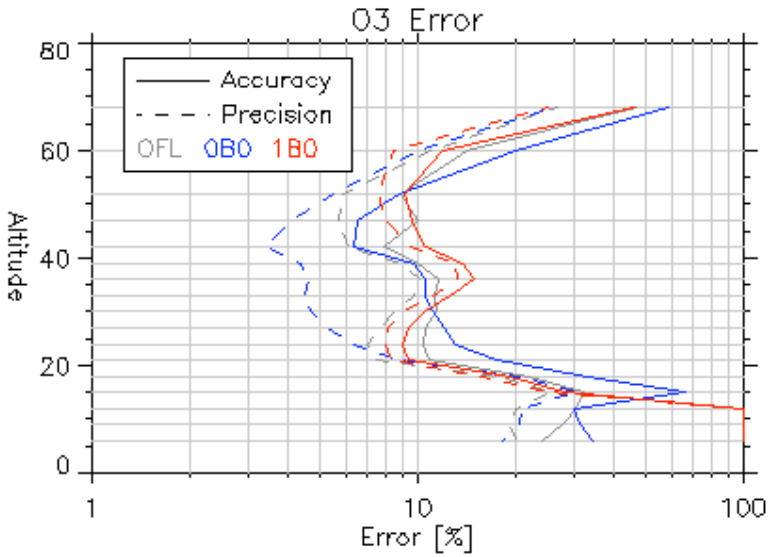

1 New O3 Microwindow
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]


O3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]


Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


2 New O3 Microwindows
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]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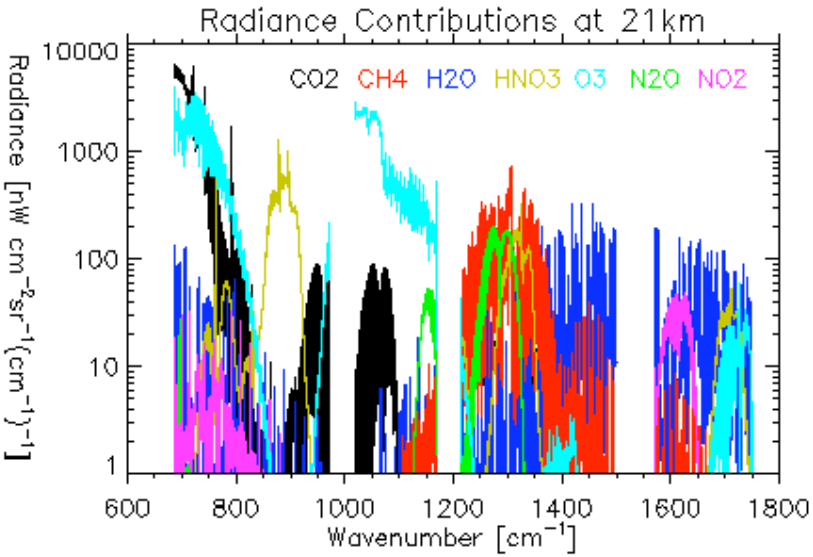
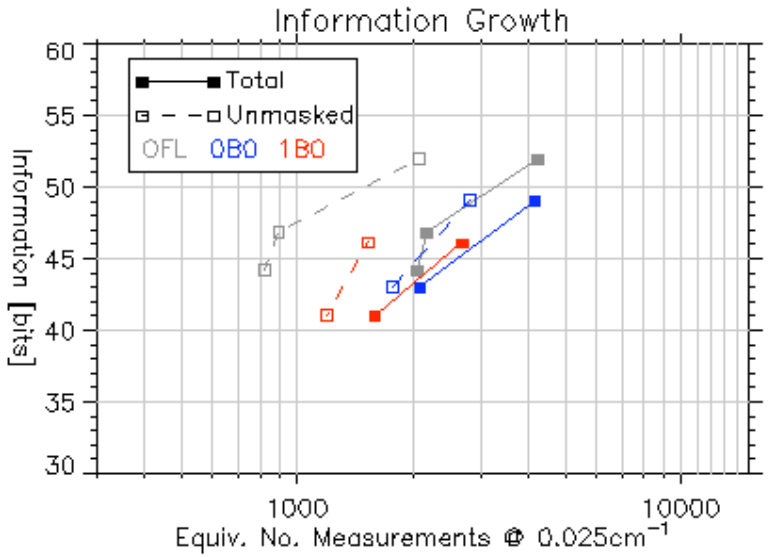
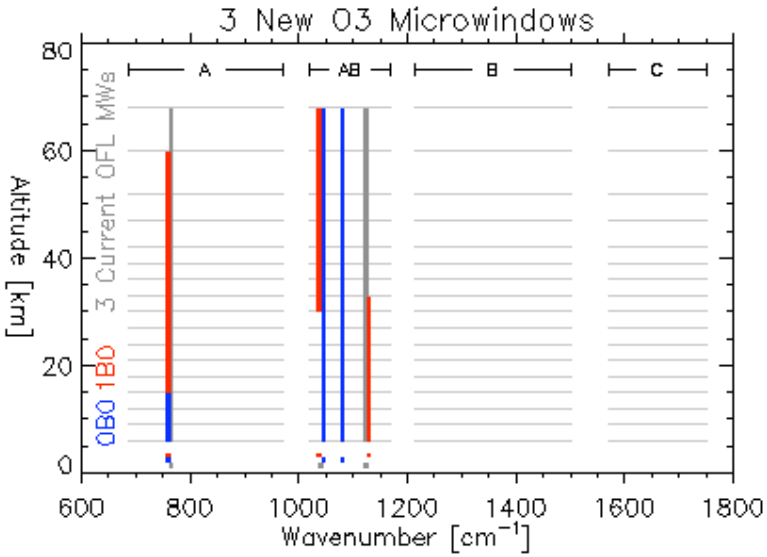
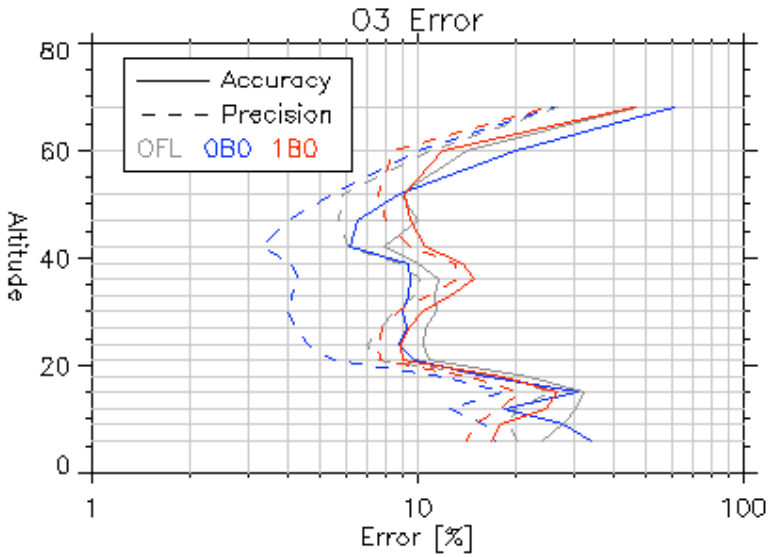
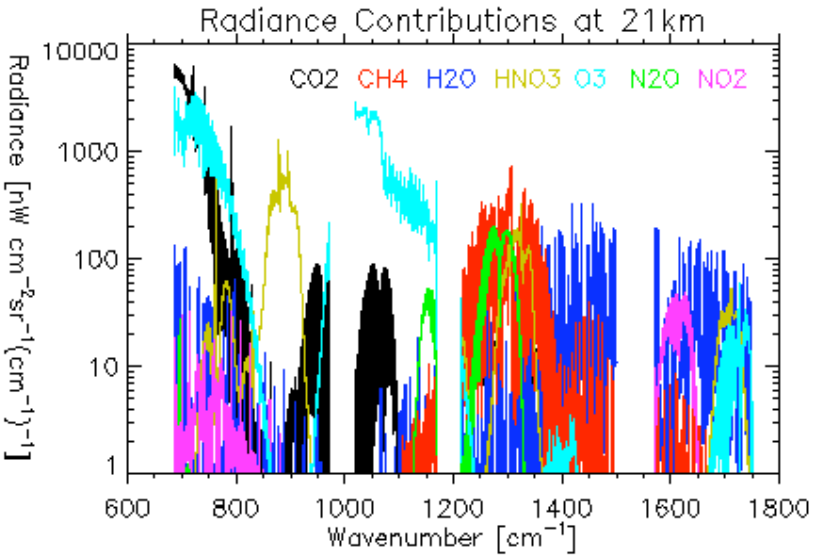
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

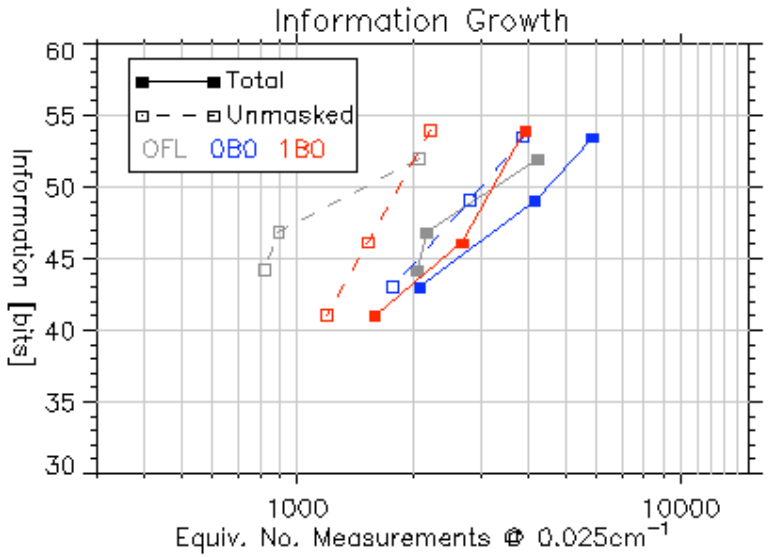

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


3 New O3 Microwindows
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]


O3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]


Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]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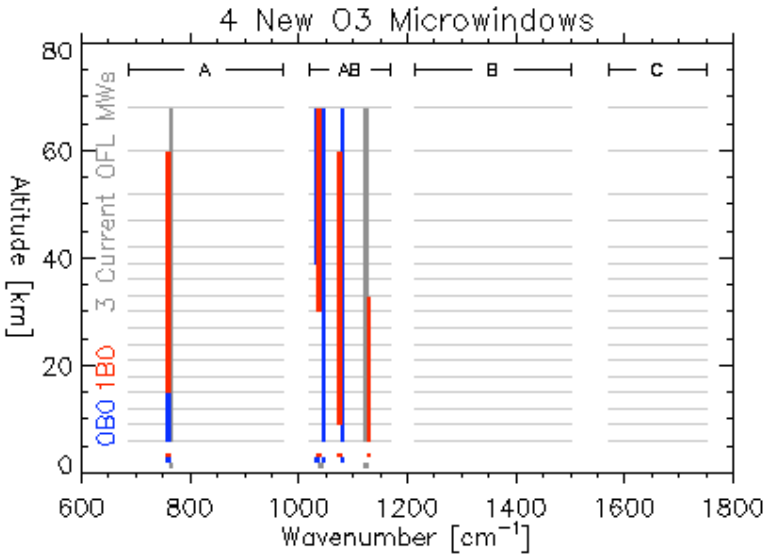
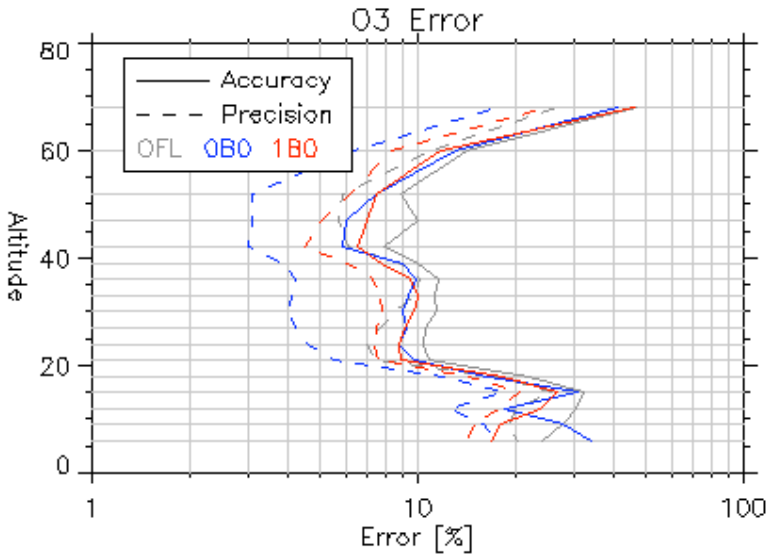
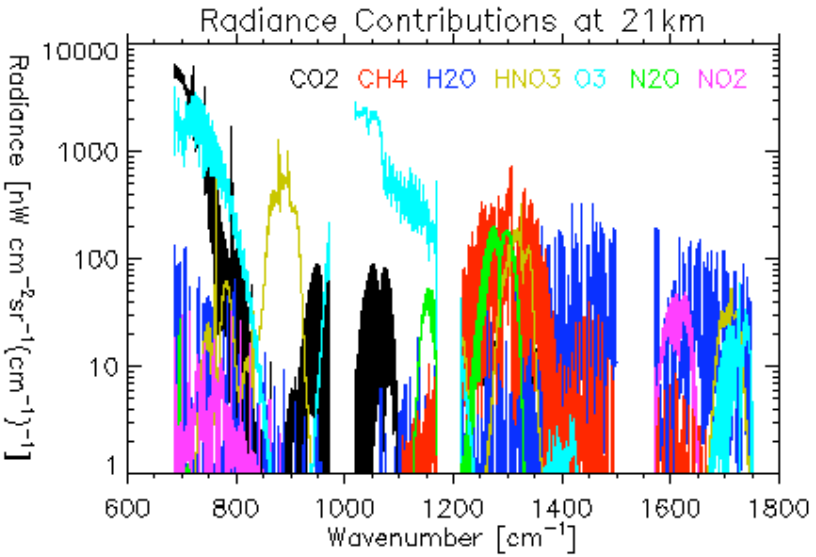
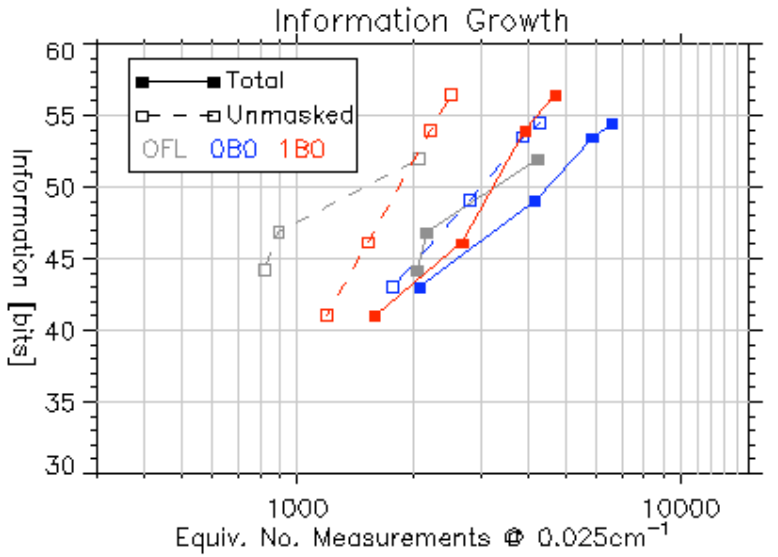
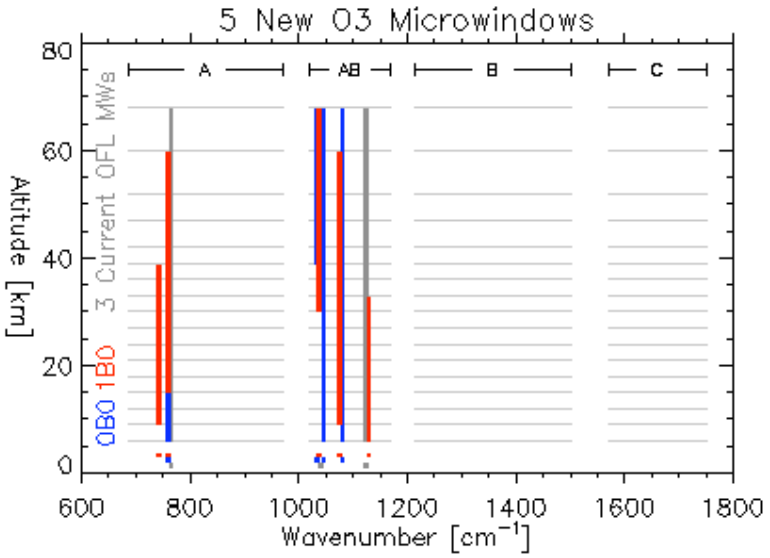
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

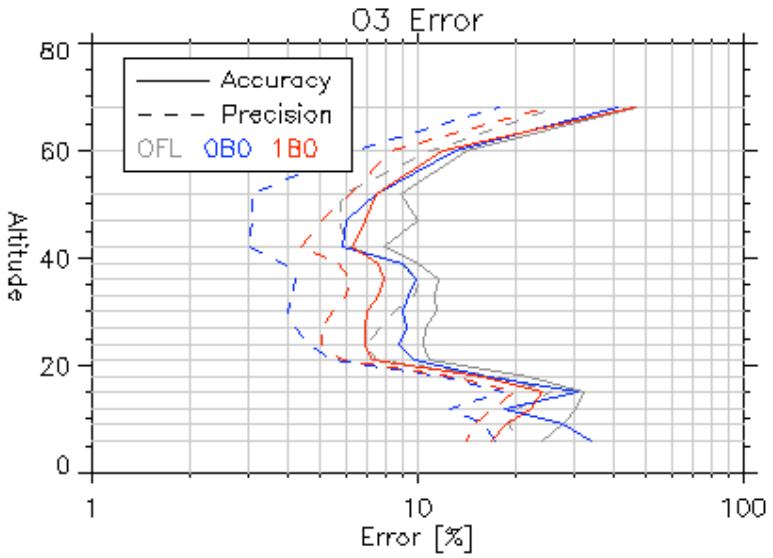

4 New O3 Microwindows
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

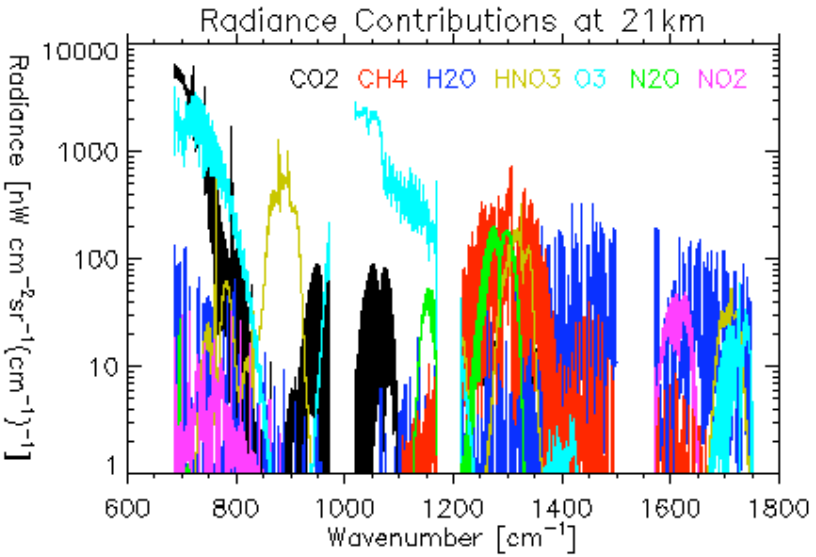

O3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

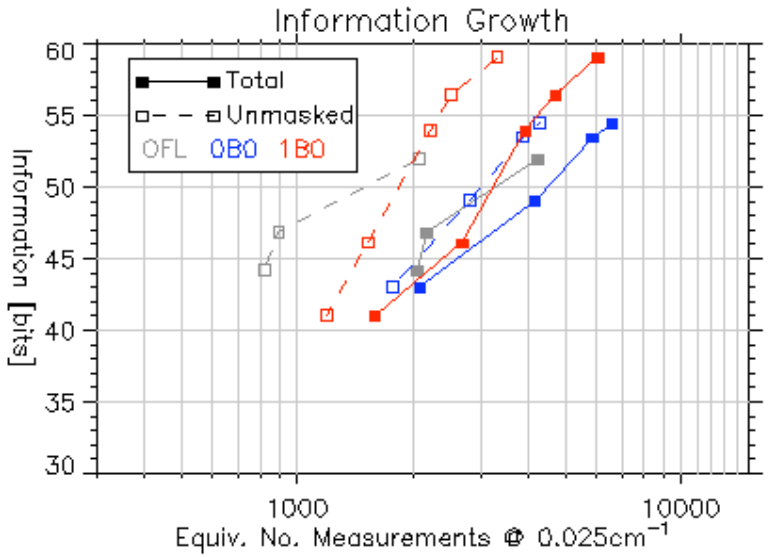

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


5 New O3 Microwindows
A
AB
B
C
3 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

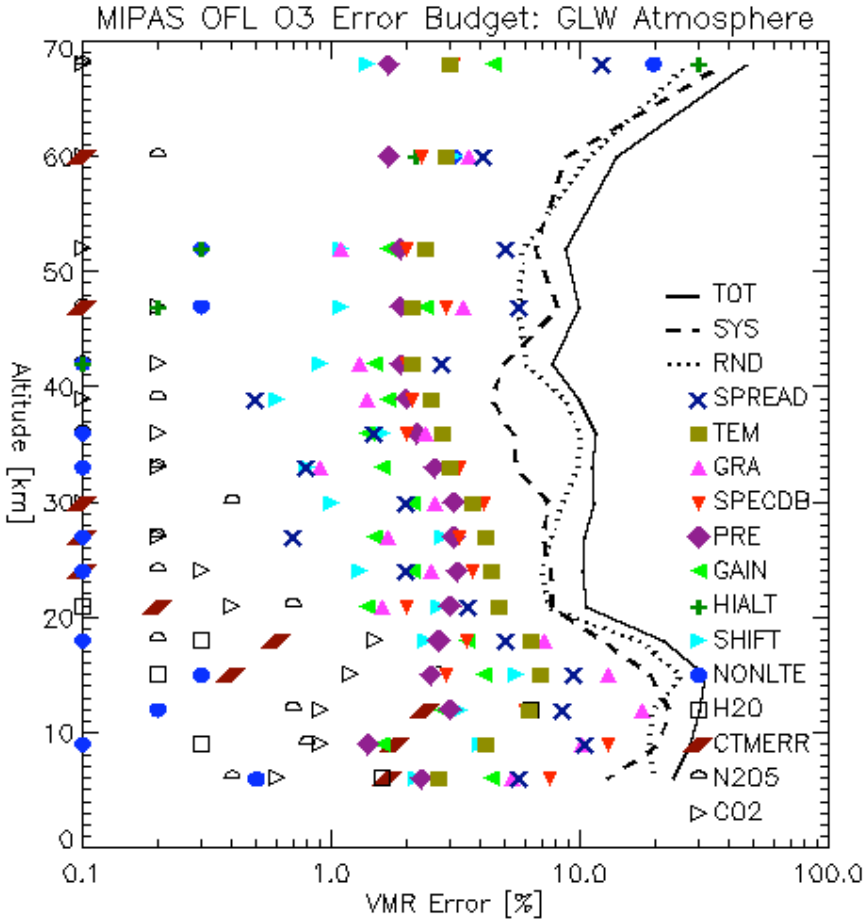

O3 Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [%]

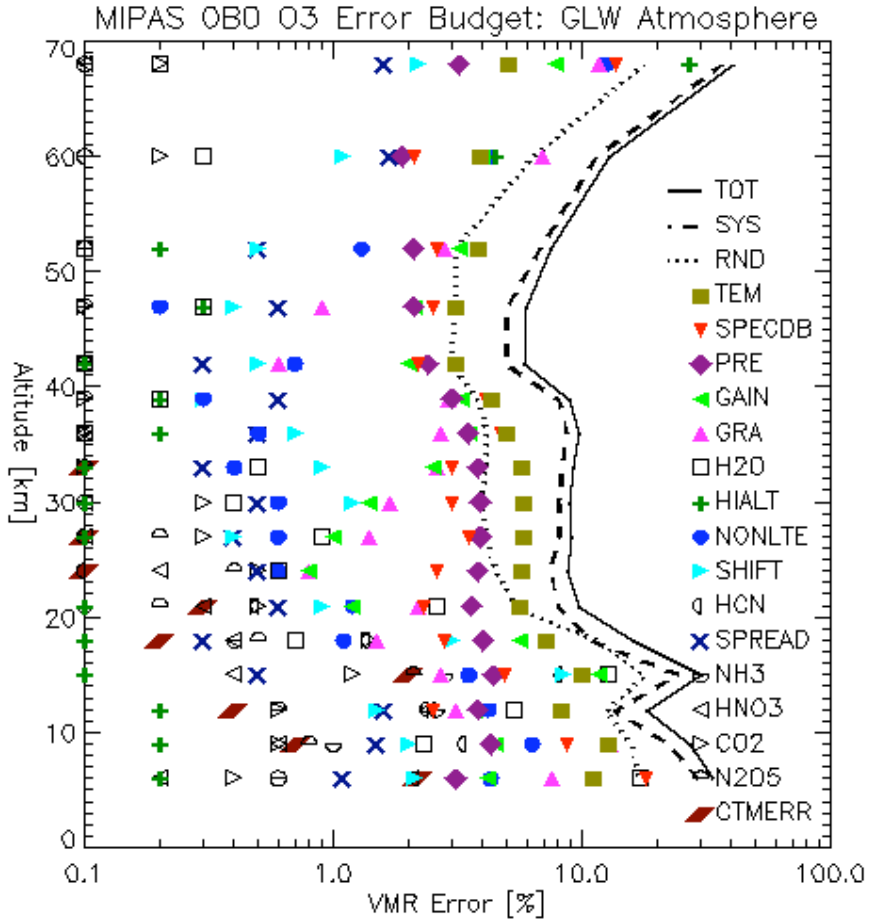

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

O3 Error Analysis

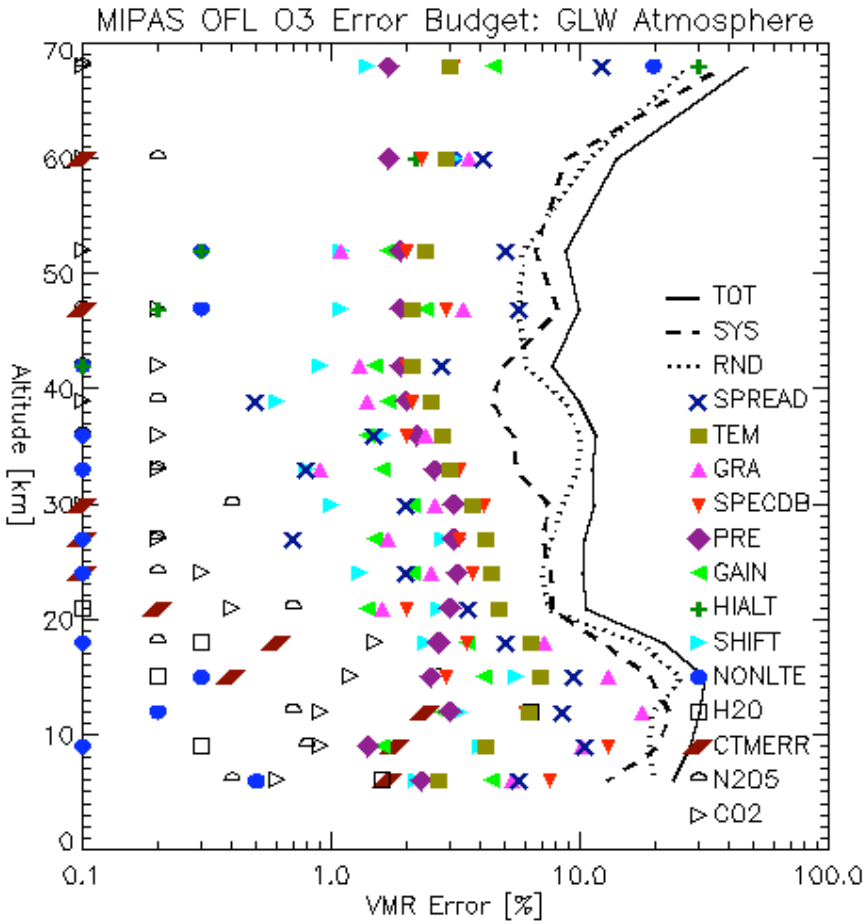
Atmospheric, Oceanic
& Planetary Physics,
University of Oxford

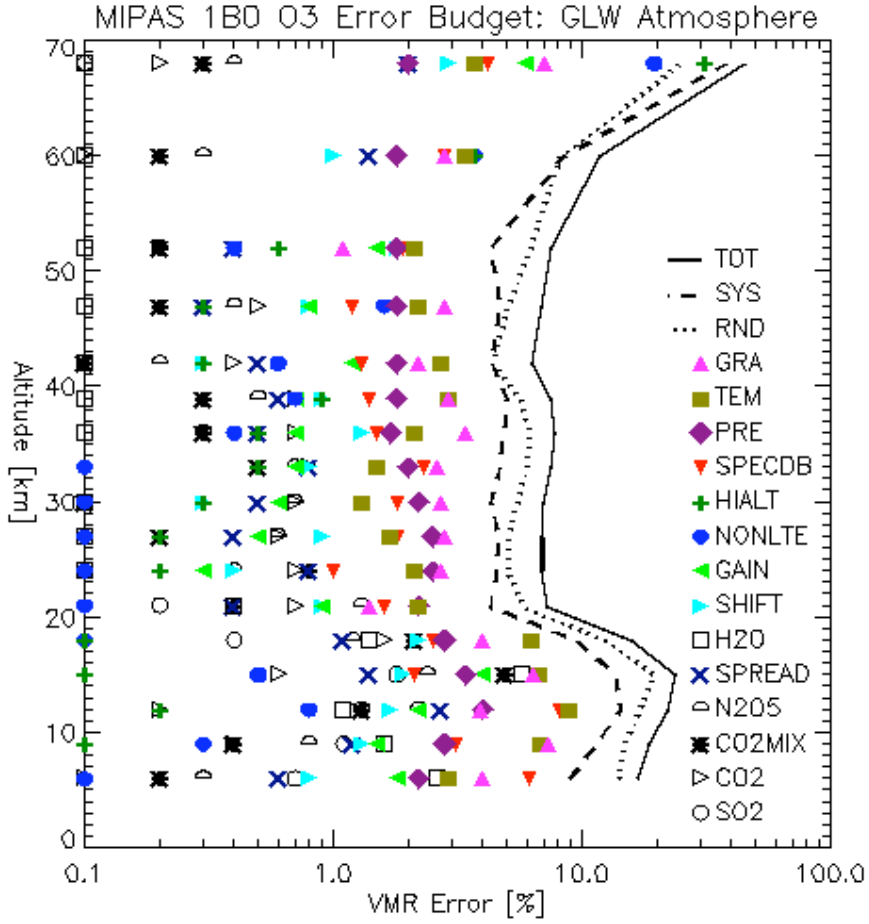




O3 Error Analysis

Atmospheric, Oceanic
& Planetary Physics,
University of Oxford





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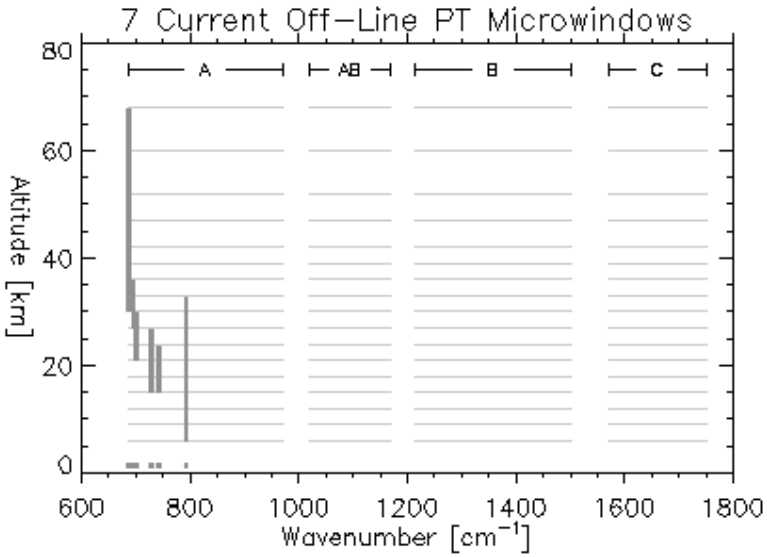
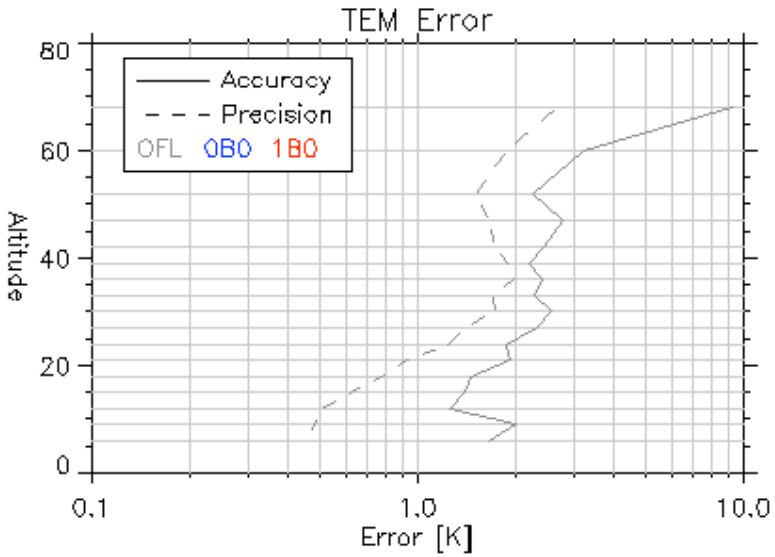
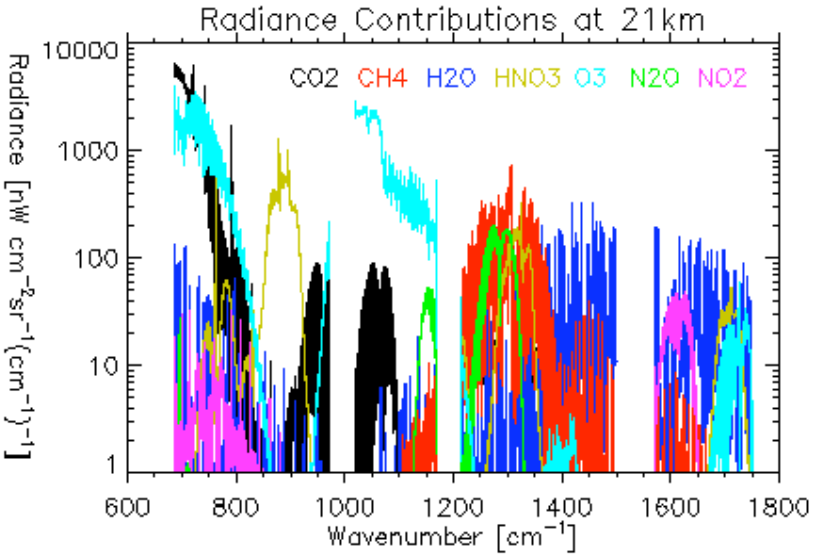
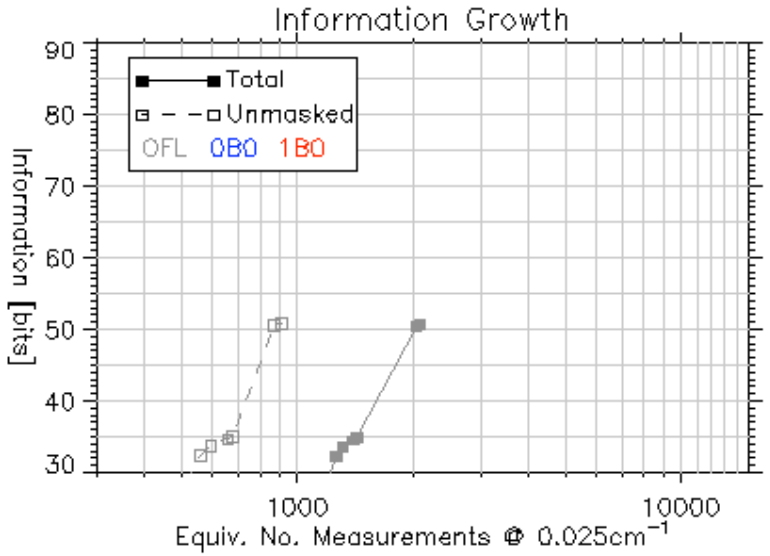
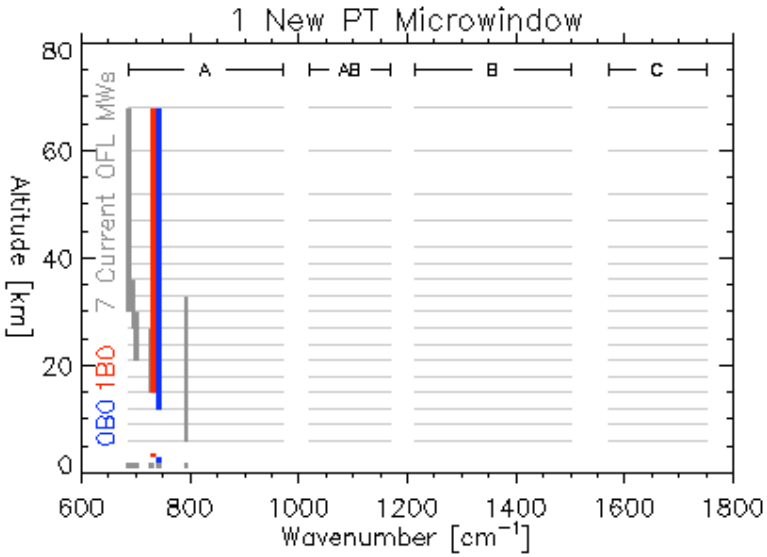
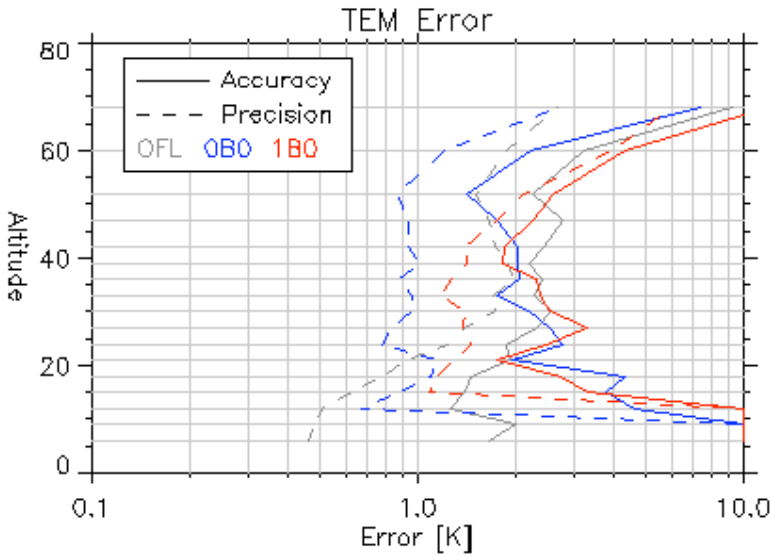

7 Current Off-Line PT Microwindows
A
AB
B
C
Altitude [km]
Wavenumber [cm^{-1}]

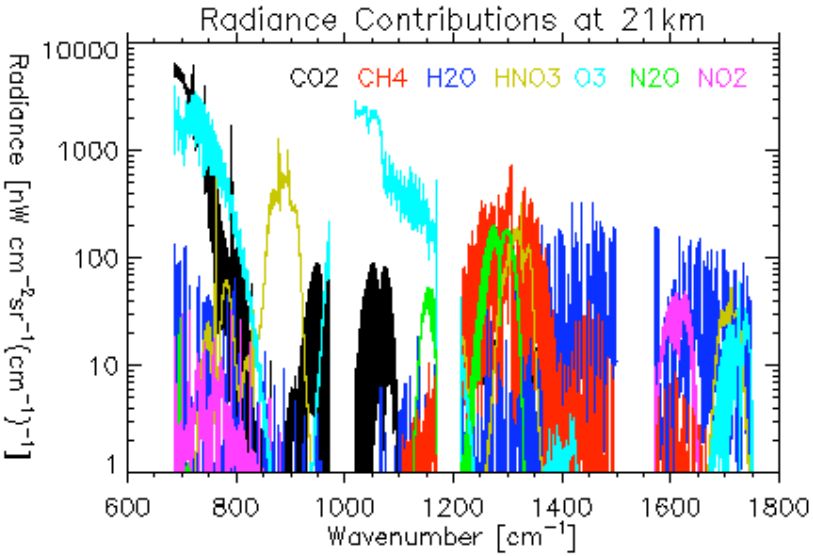

TEM Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [K]

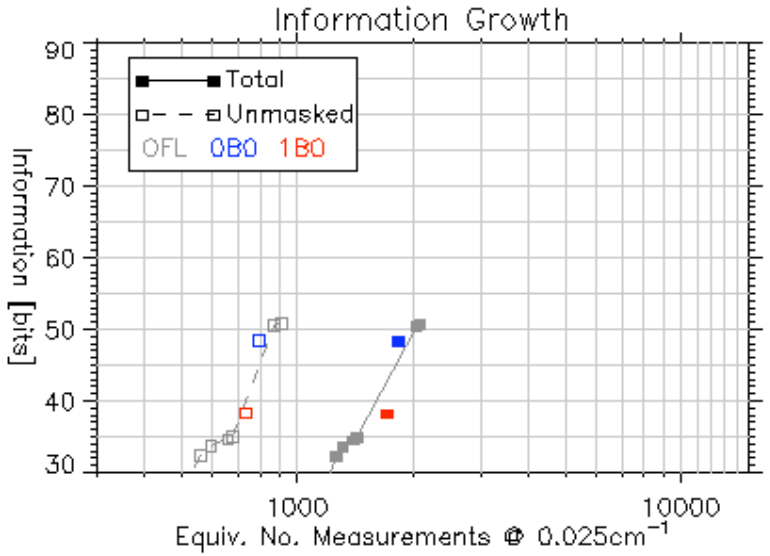

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

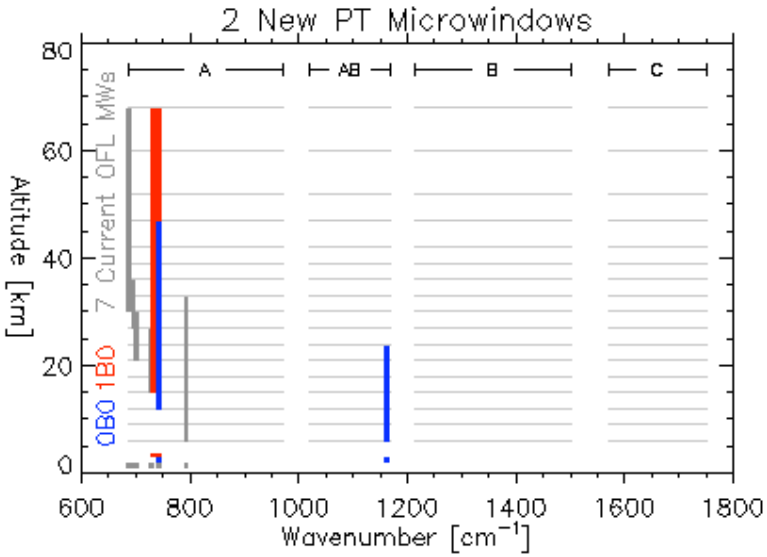

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

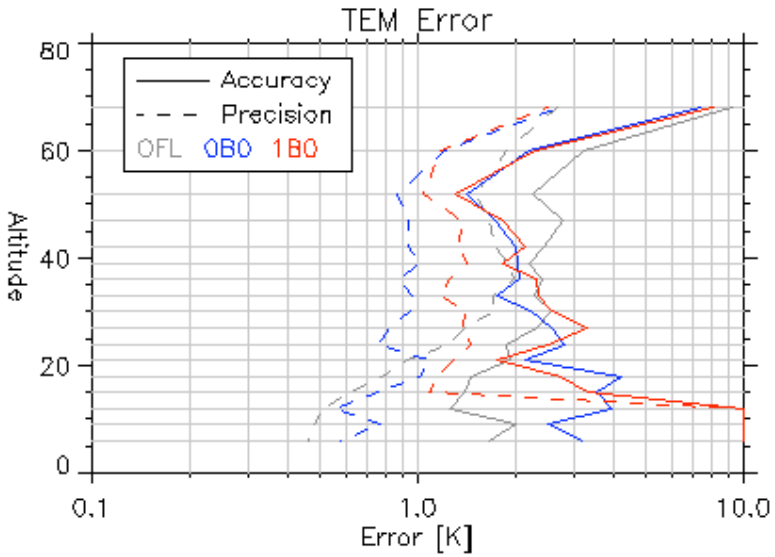

1 New PT Microwindow
A
AB
B
C
7 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

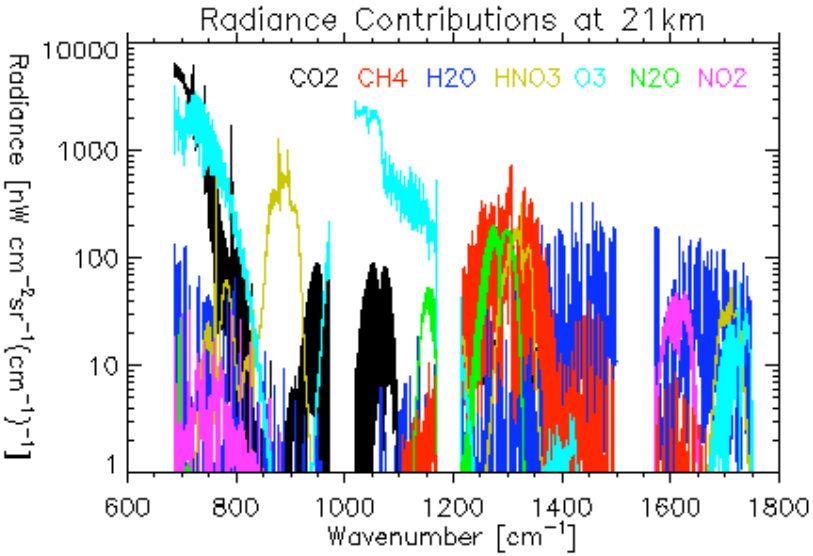

TEM Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [K]

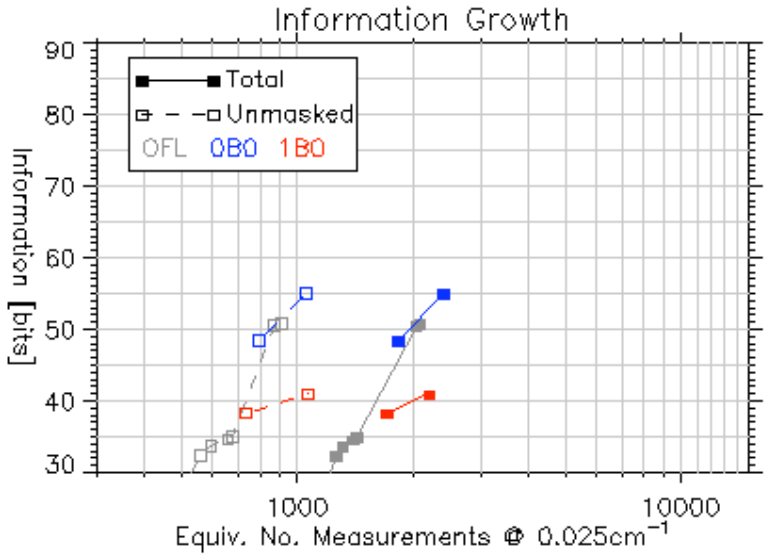

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

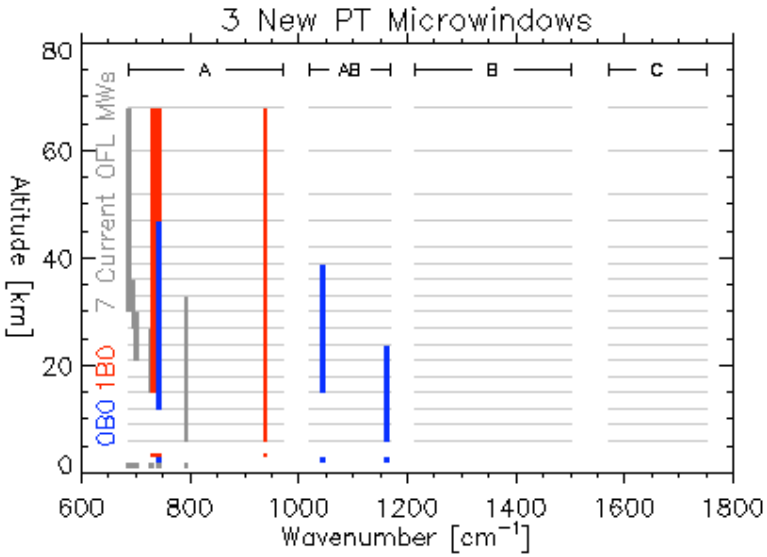

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

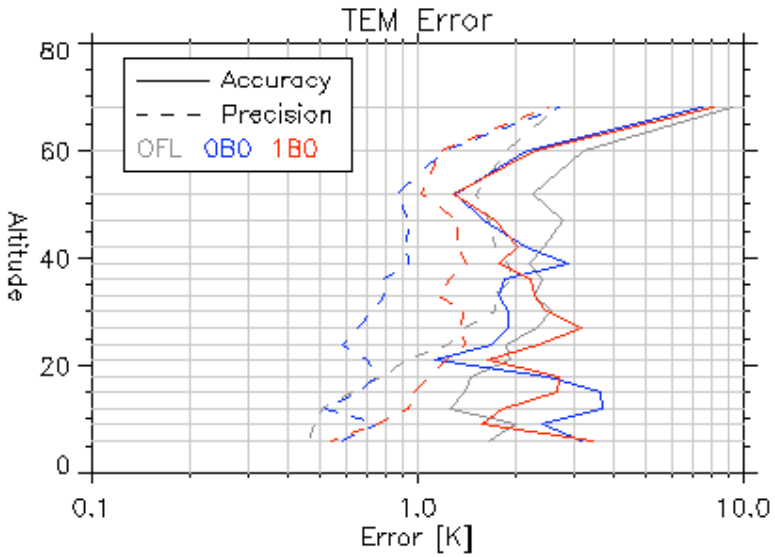

2 New PT Microwindows
A
AB
B
C
7 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

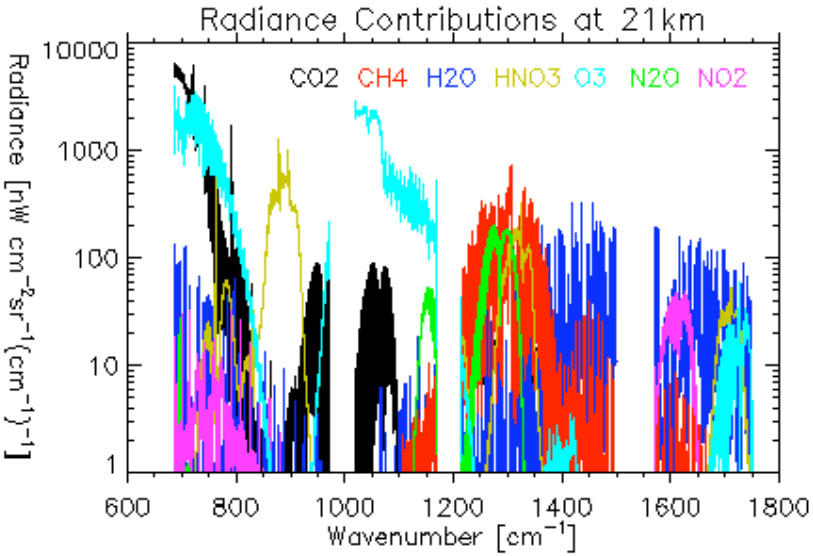

TEM Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [K]

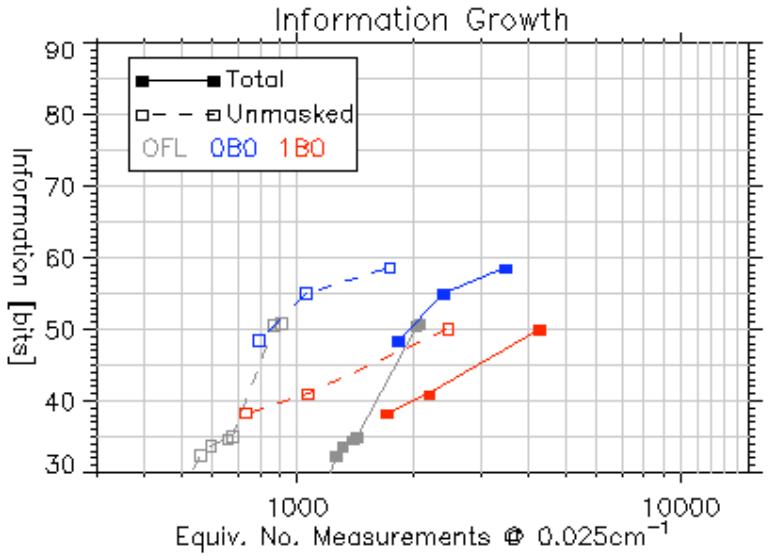

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]

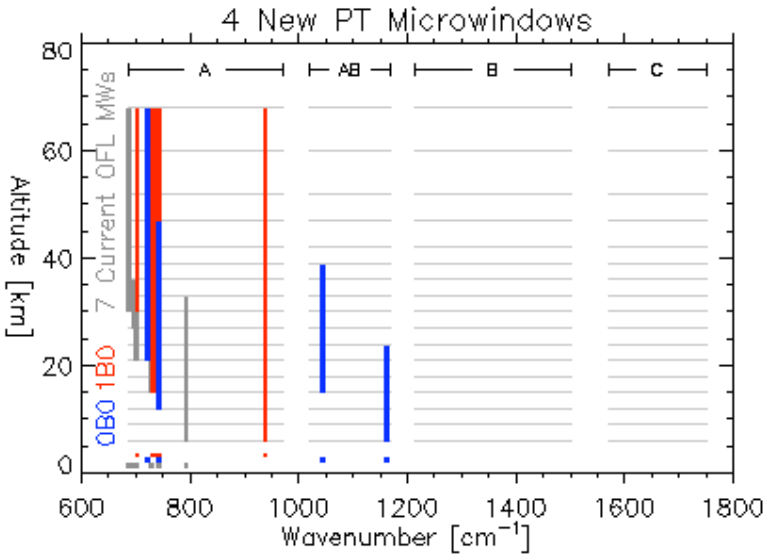

Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

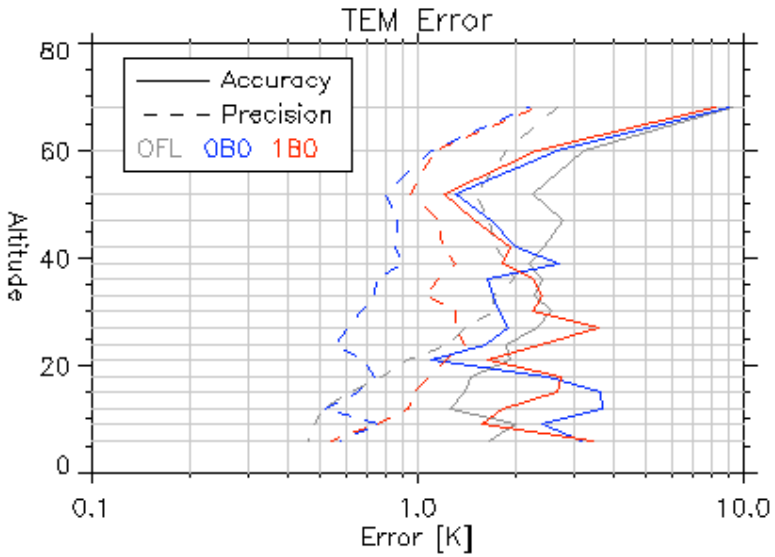

3 New PT Microwindows
A
AB
B
C
7 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]

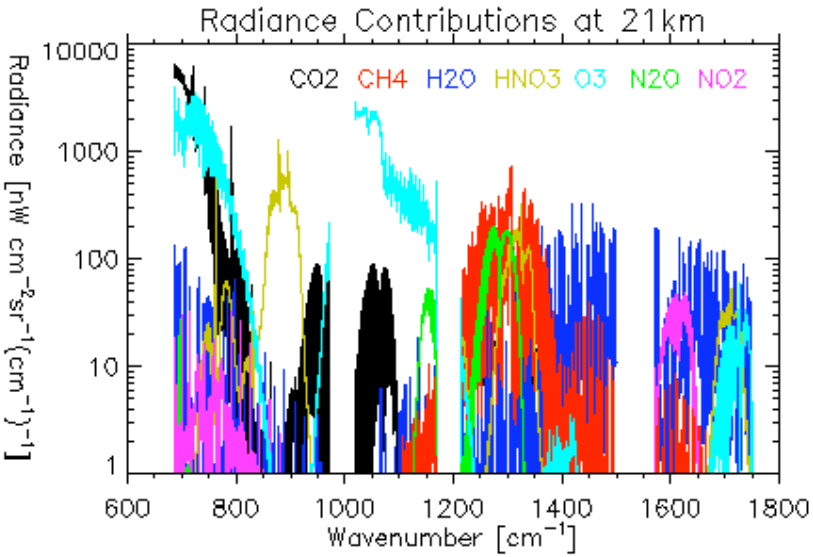

TEM Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [K]

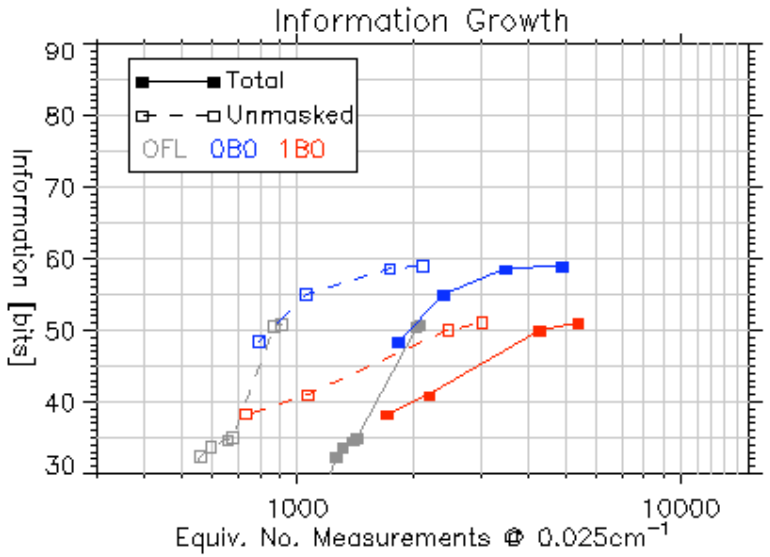

Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}


4 New PT Microwindows
A
AB
B
C
7 Current OFL MWs
0B0 1B0
Altitude [km]
Wavenumber [cm^{-1}]


TEM Error
Accuracy
Precision
OFL 0B0 1B0
Altitude
Error [K]


Radiance Contributions at 21km
CO2 CH4 H2O HNO3 O3 N2O NO2
Radiance [nW cm^{-2}sr^{-1}(cm^{-1})$^{-1}$]
Wavenumber [cm^{-1}]


Information Growth
Total
Unmasked
OFL 0B0 1B0
Information [bits]
Equiv. No. Measurements @ 0.025cm^{-1}

TEM Error Analysis

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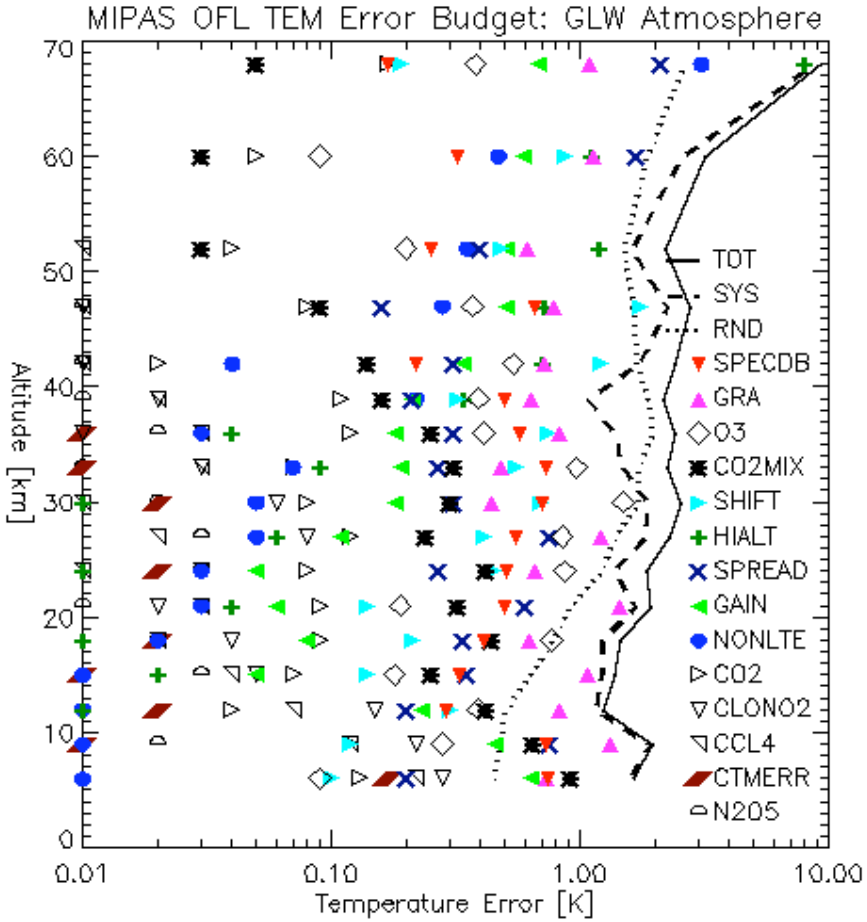

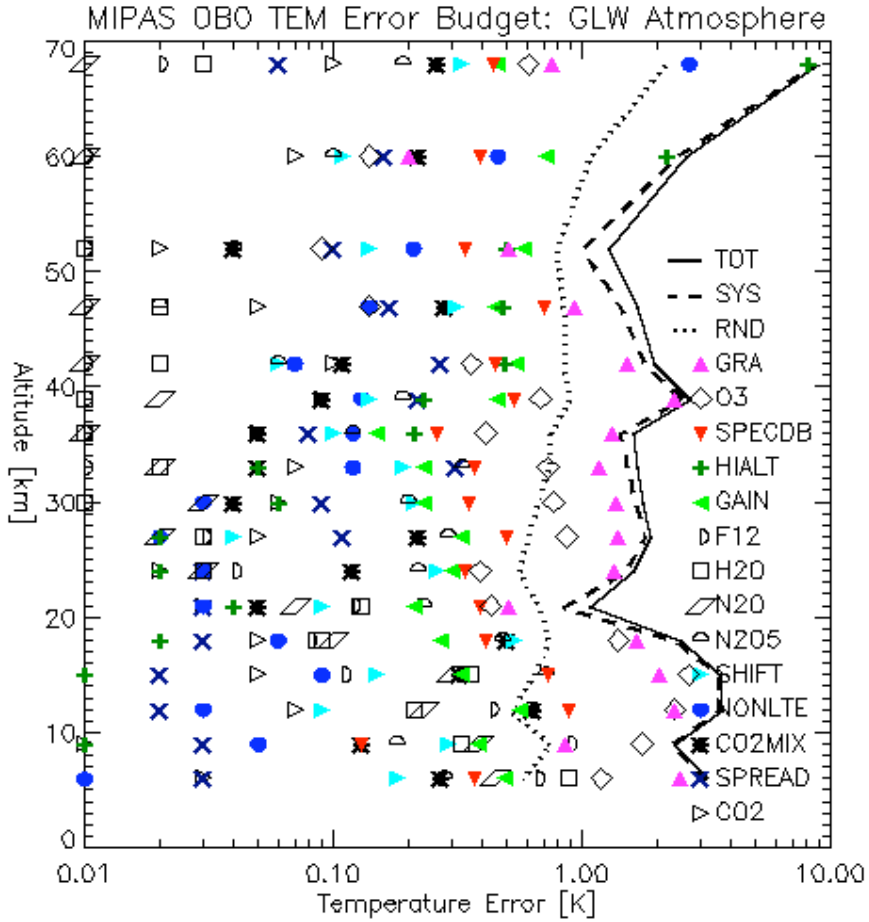

TEM Error Analysis

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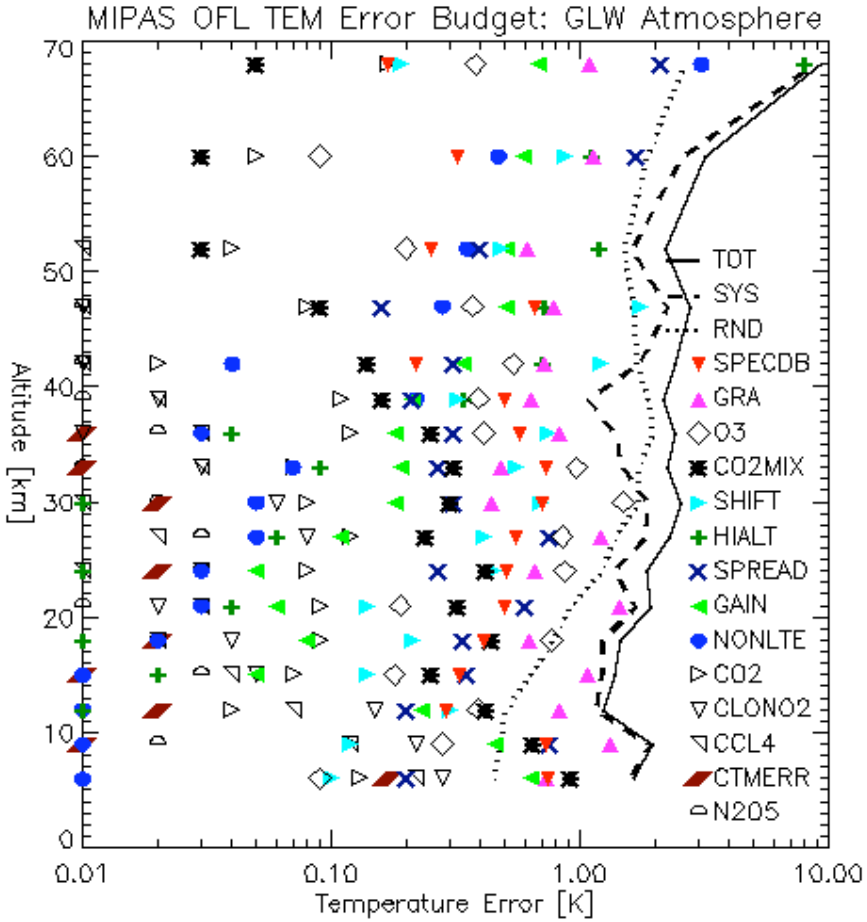

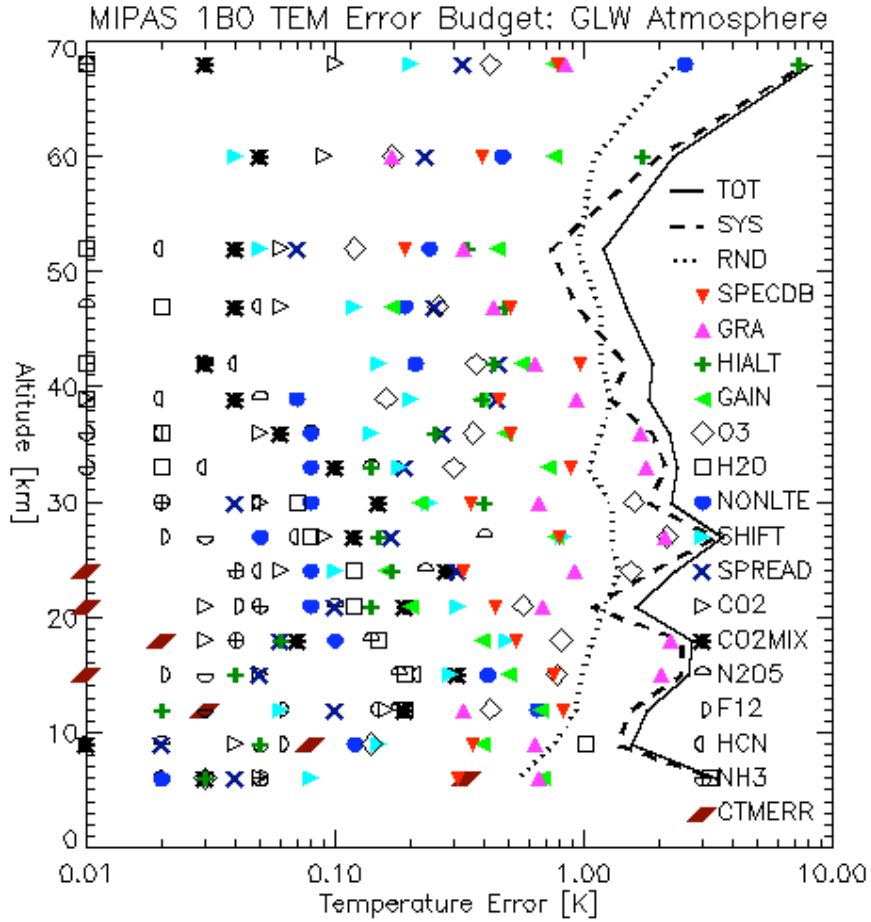

PRE Error Analysis

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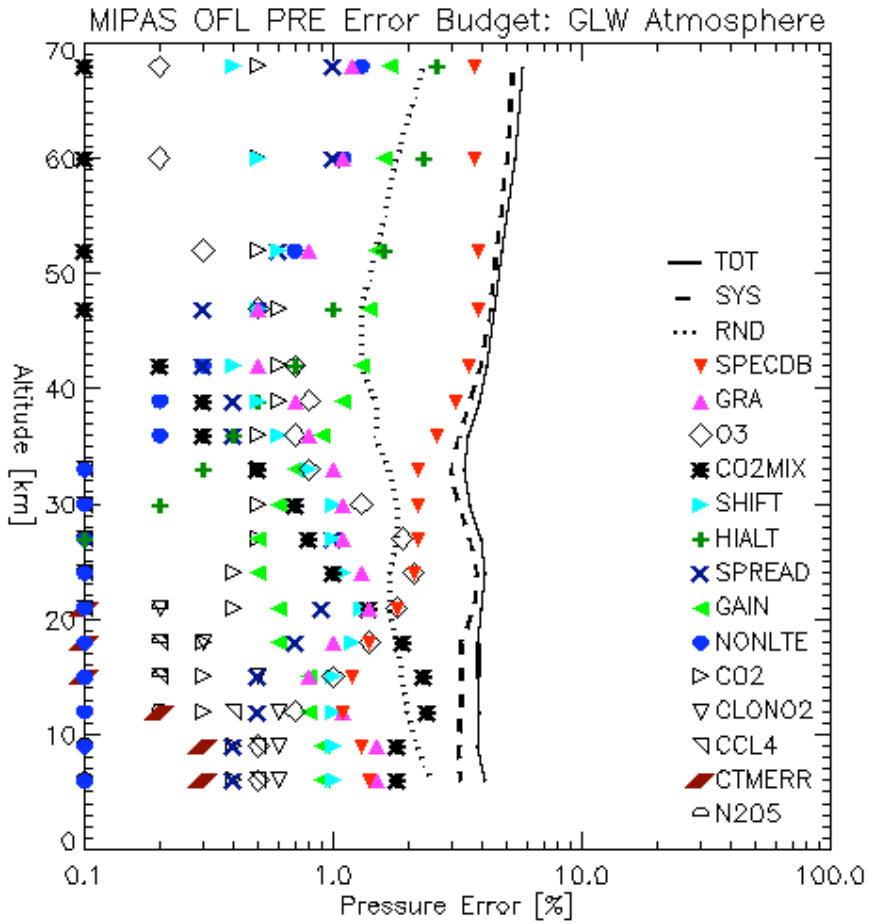

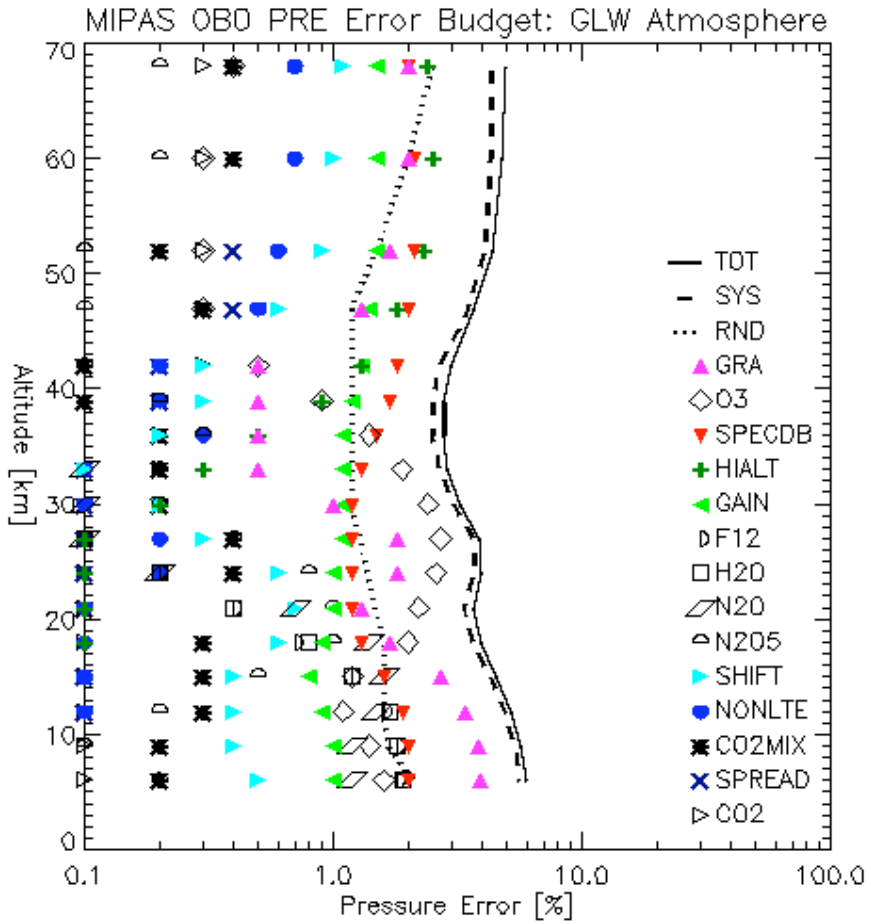

PRE Error Analysis

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& Planetary Physics,
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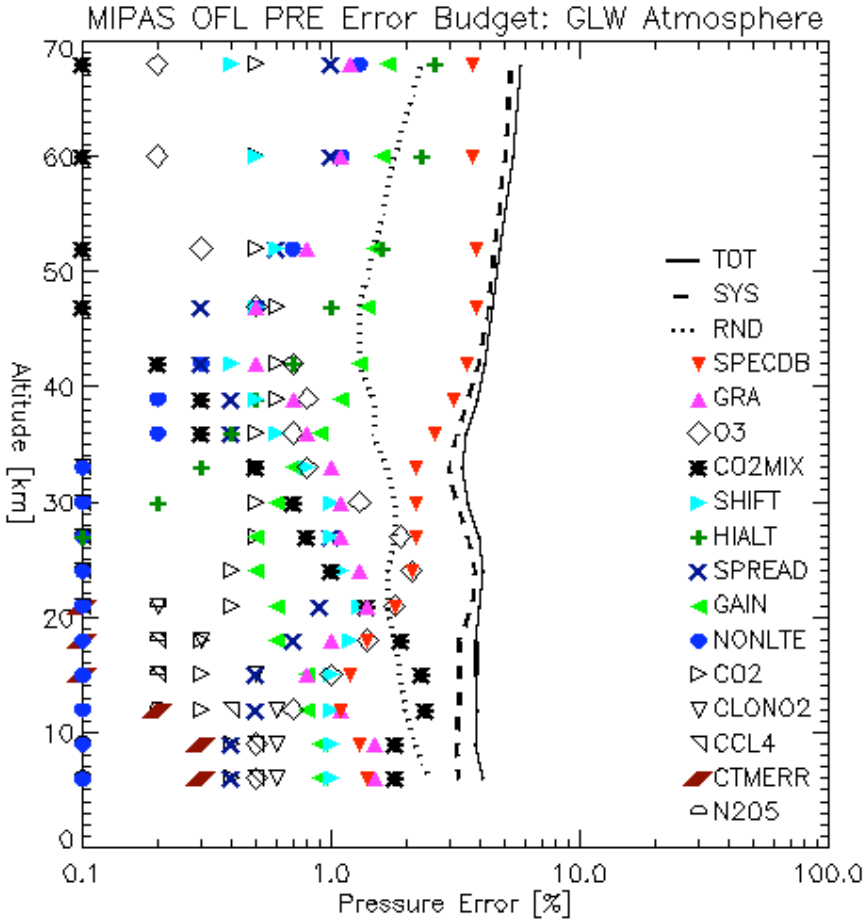

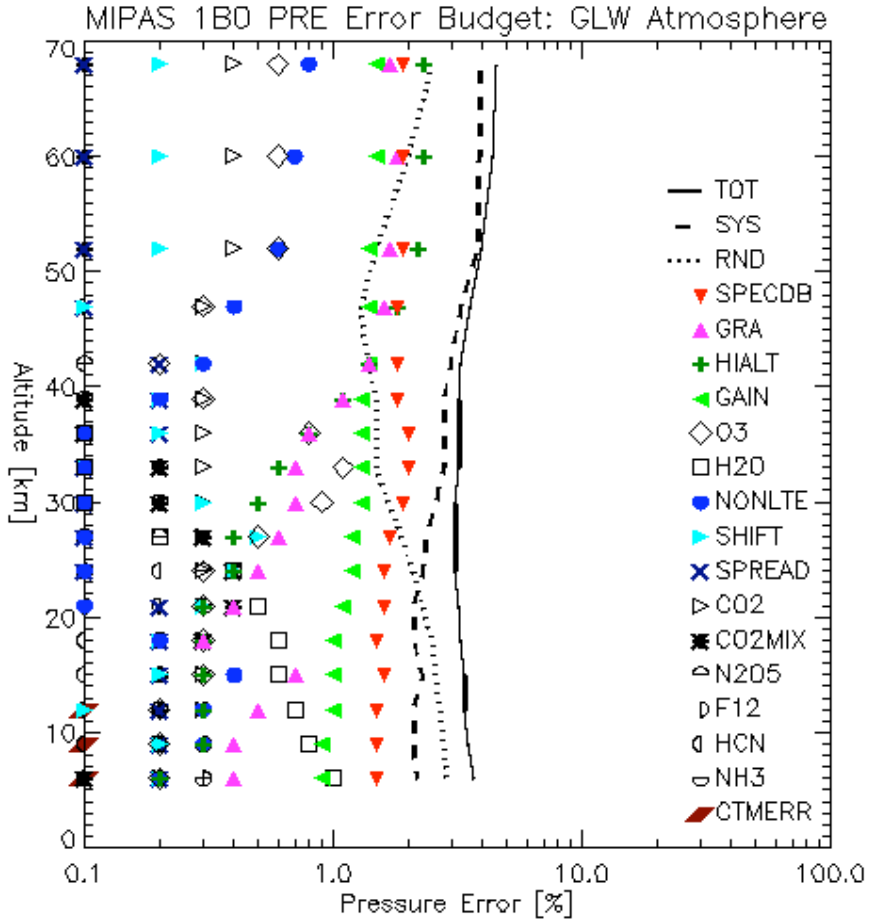

Summary

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	Current OFL			0B0			1B0		
	N.MW	N.Pt	Inf	N.MW	N.Pt	Inf	N.MW	N.Pt	Inf
CH4	2	1500	45.2	2	1568	45.8	3	2156	48.3
H2O	3	904	42.2	3	1171	44.9	3	1323	45.2
HNO3	2	1162	34.0	2	1176	33.1	2	1176	33.7
N2O	2	1065	40.1	2	1029	38.8	4	1871	42.9
NO2	3	1088	24.9	2	980	23.7	2	1029	23.2
O3	3	862	52.0	4	2646	54.4	5	2422	59.1
PT	7	832	50.8	4	1964	58.9	4	2156	51.1