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Oxford Retrievals of MIPAS data during the 2002 Antarctic Winter

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Outline

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- Aim of the analysis
- Differences and Similarities of ESA and OPTIMO approaches
- Comparison between ESA and OPTIMO results:
  - Mean profiles for 6 latitude bands of p, T, H_2O and O_3
- Summary and further work

Aim of the analysis

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Period under study:

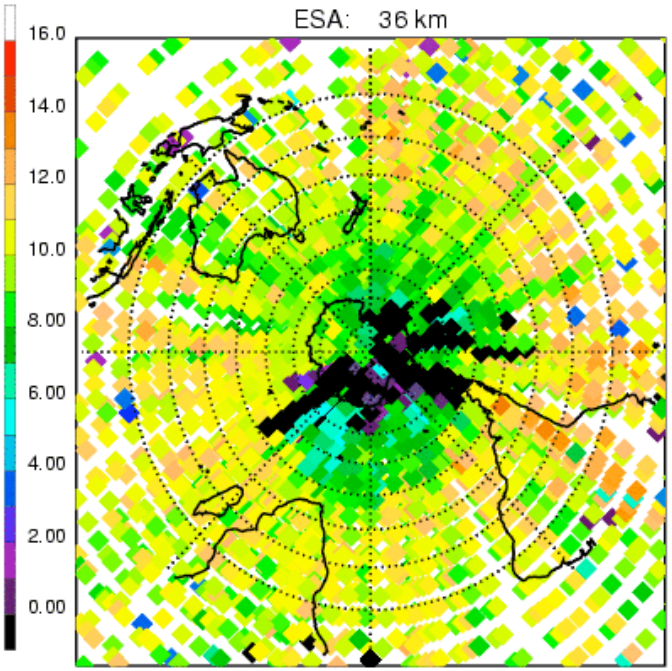
12 - 28 September 2002 (vortex splitting)

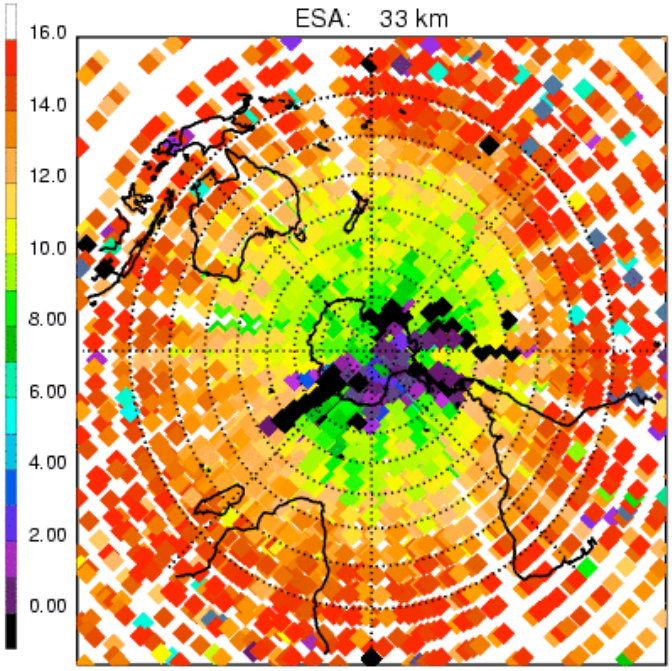
Data Assimilation of O_3 profiles:

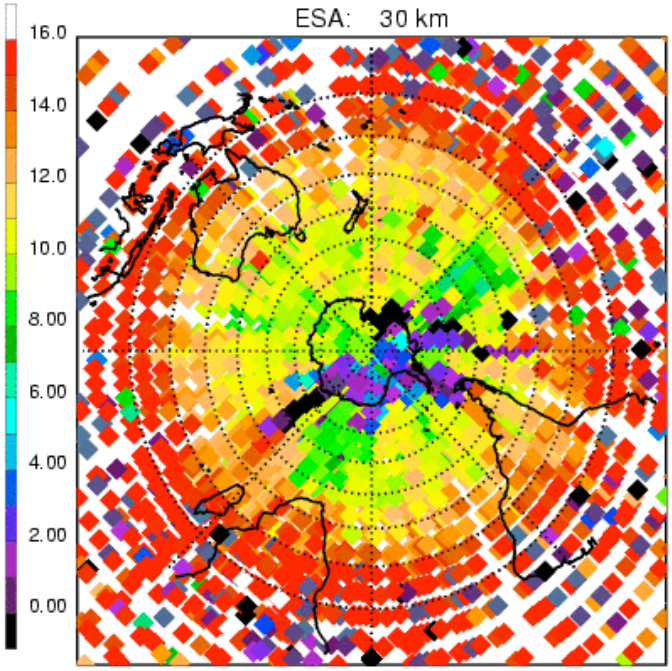
comparison and/or combination of ESA and OPTIMO profiles

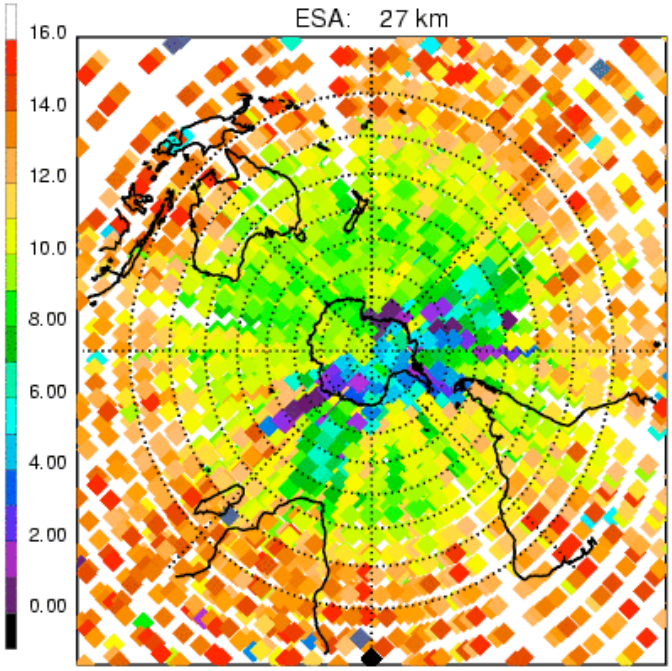
Geographical Coverage:

L1B less than expected!

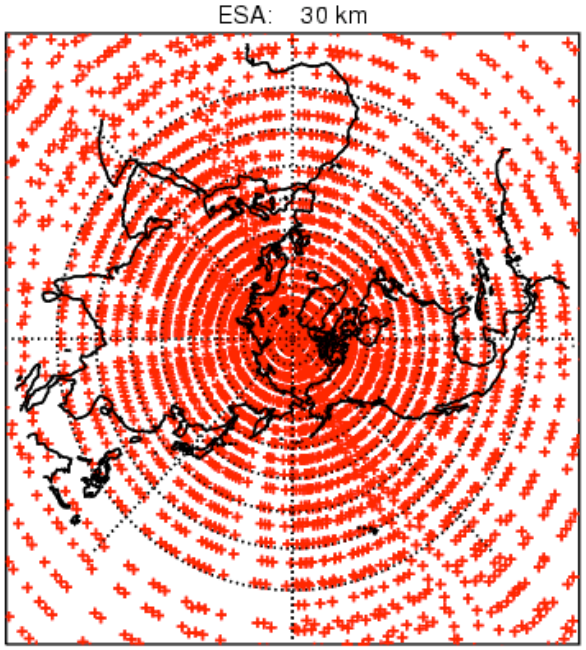

ESA: 36 km
16.0
14.0
12.0
10.0
8.00
6.00
4.00
2.00
0.00

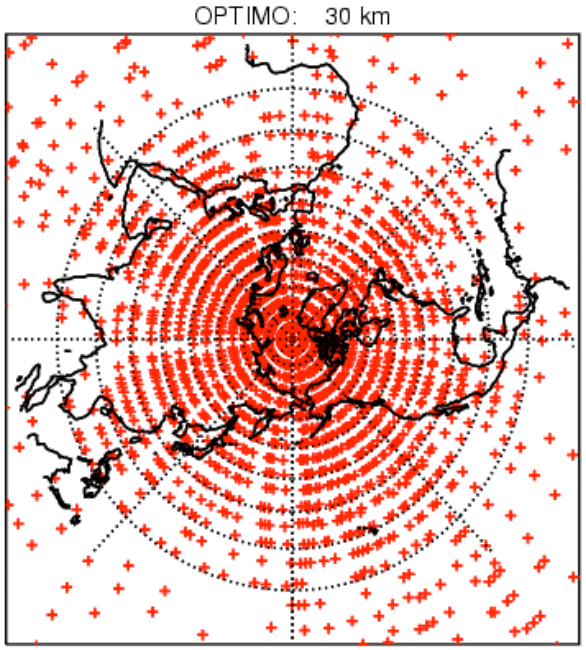

ESA: 33 km
16.0
14.0
12.0
10.0
8.00
6.00
4.00
2.00
0.00


ESA: 30 km
16.0
14.0
12.0
10.0
8.00
6.00
4.00
2.00
0.00

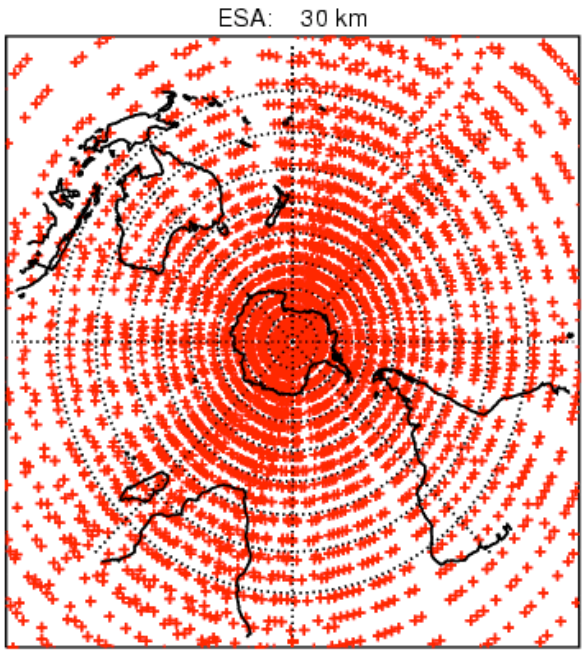

ESA: 27 km
16.0
14.0
12.0
10.0
8.00
6.00
4.00
2.00
0.00

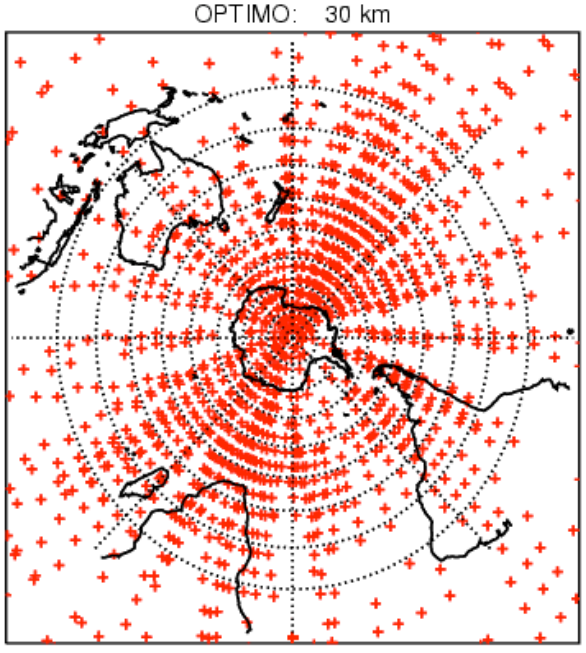
northern hemisphere





southern hemisphere





Approaches

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ESA/ORM

Selected spectral intervals: microwindows
Non linear least squares method
Global fit approach for limb sequence
Sequential fit of the target species

OPTIMO

Selected spectral intervals: microwindows
Optimal Estimation method
Global fit approach for limb sequence
Sequential fit of the target species

Pressure, ***temperature*** and ***H_2O***, ***O_3***, HNO_3, CH_4, N_2O and NO_2
Auxiliary Data (OMs, LUTs, Climatology, …)
AILS: ideal Apodised Instrumental Line Shape

Nominal Microwindows

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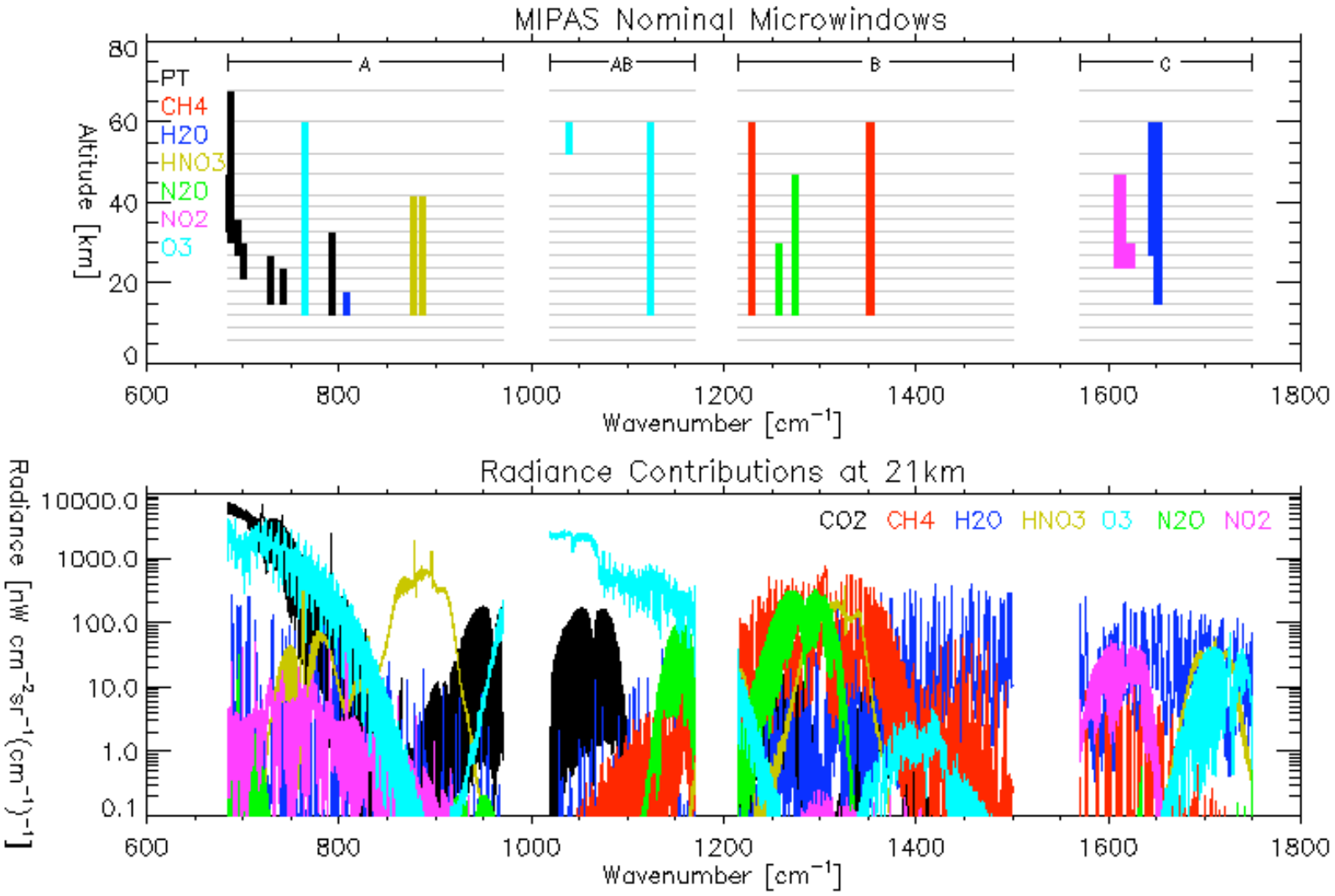
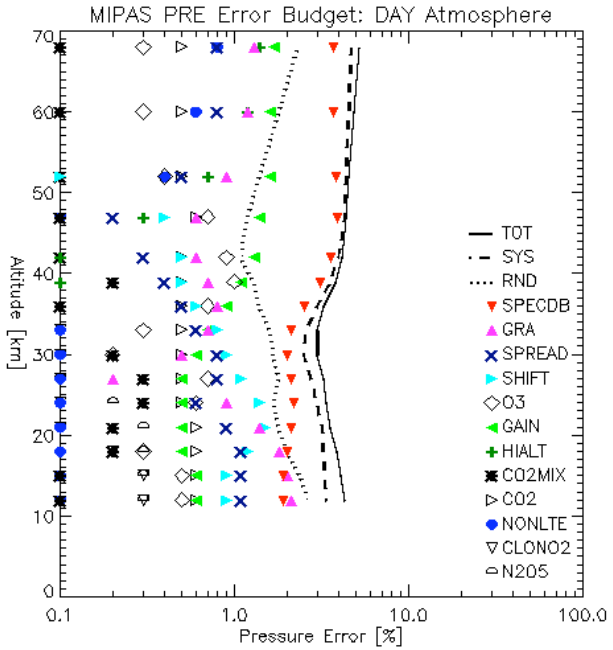
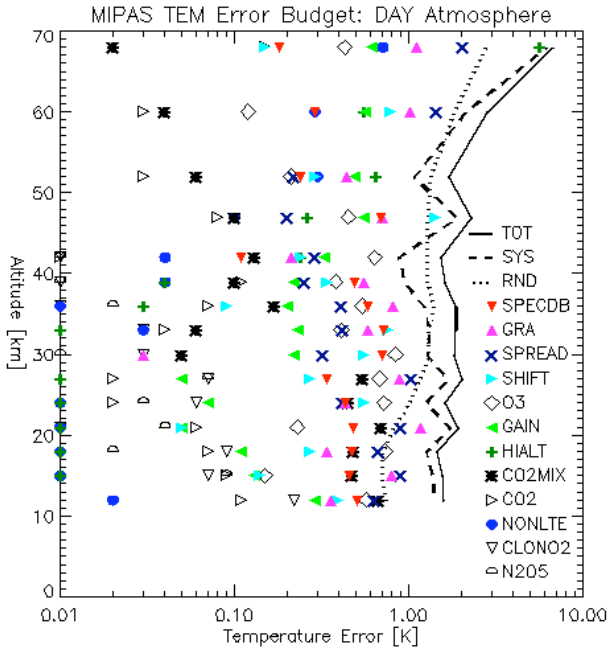


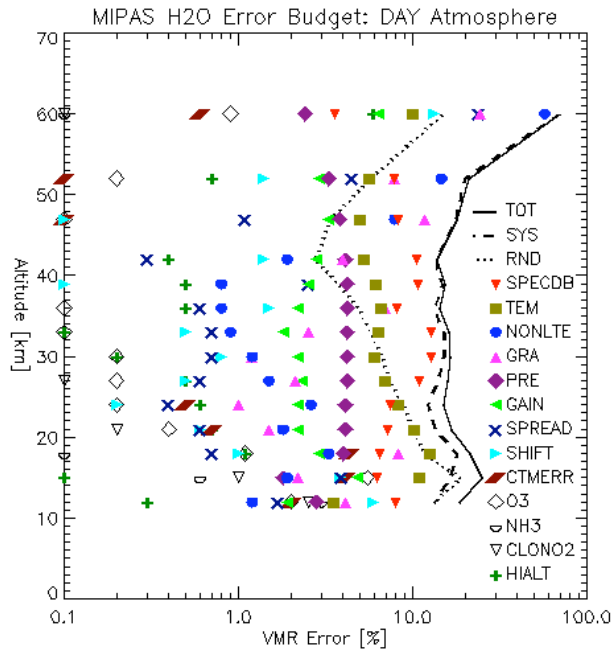
Pressure

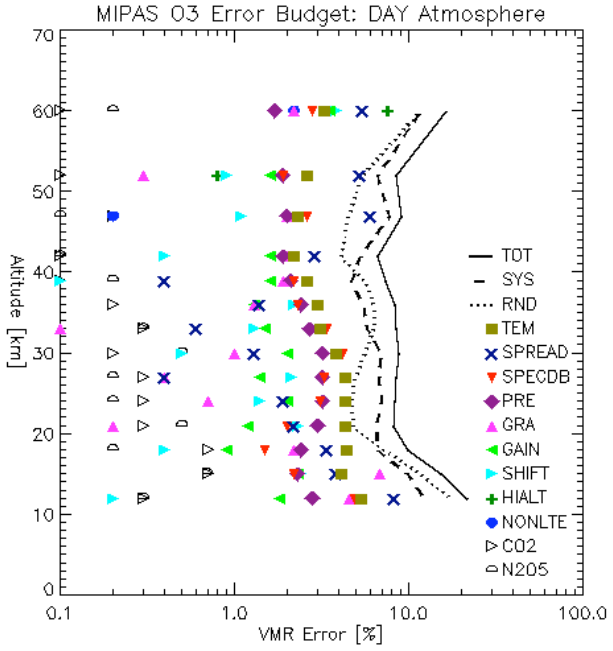




Temperature

H_2O





O_3

Comparison

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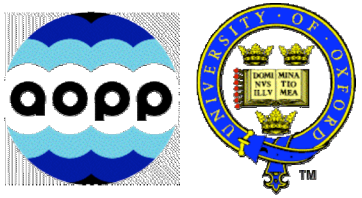

- 16 days: 12-28 September 2002
- around 6900 ESA profiles
- around 4800 OPTIMO profiles
- around 4000 coincidences

Preliminary Results

❖ Mean profiles over the period separated in six latitude bands:

65N-90N 20N-65N 000-20N 000-20S 20S-65S 65S-90S

❖ Plots for pressure, temperature, H_2O and O_3

1. ESA and OPTIMO mean profiles
2. Differences between the two

Pressure

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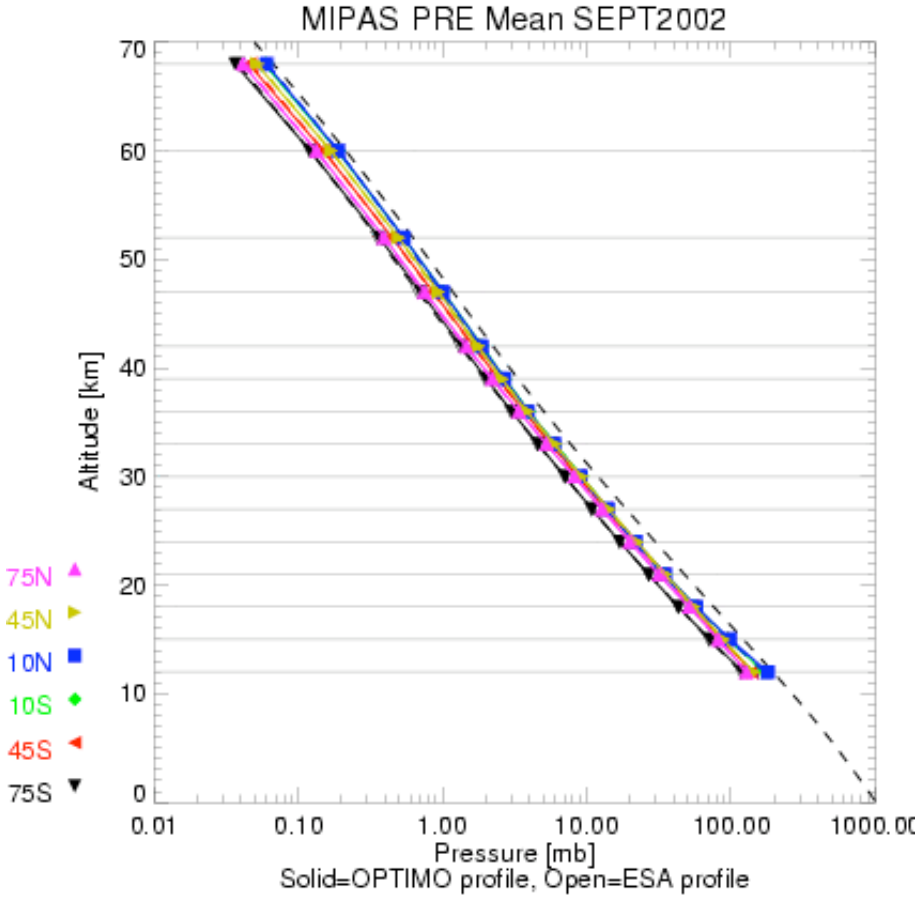

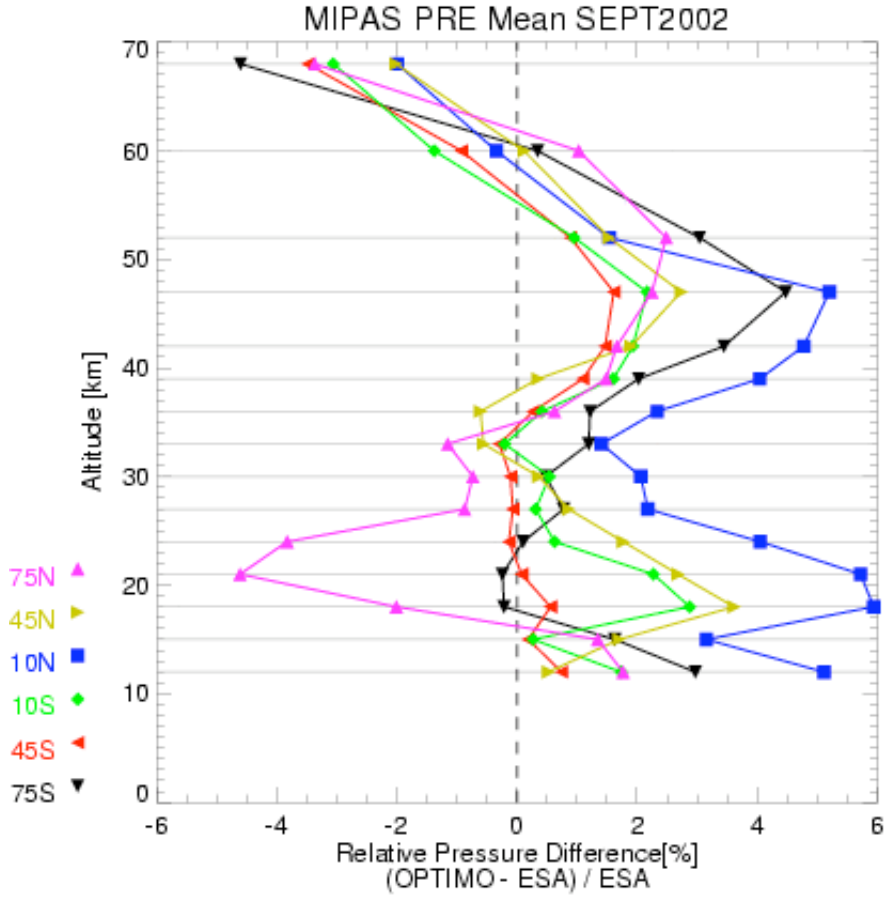

Temperature

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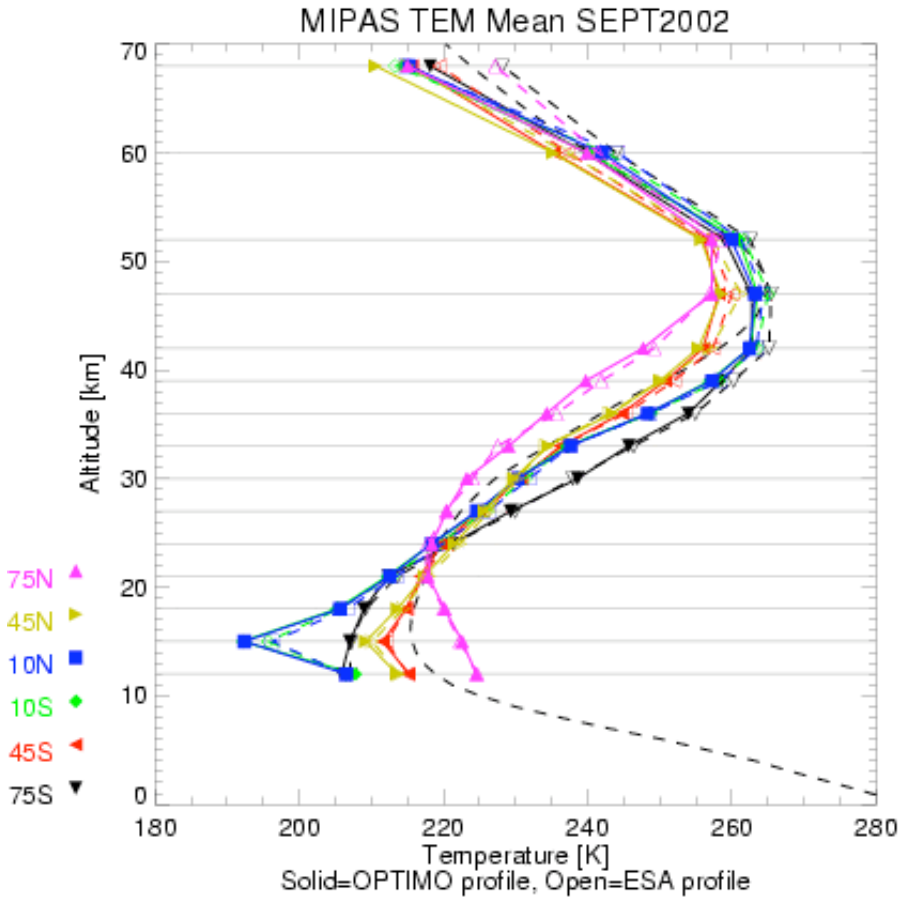

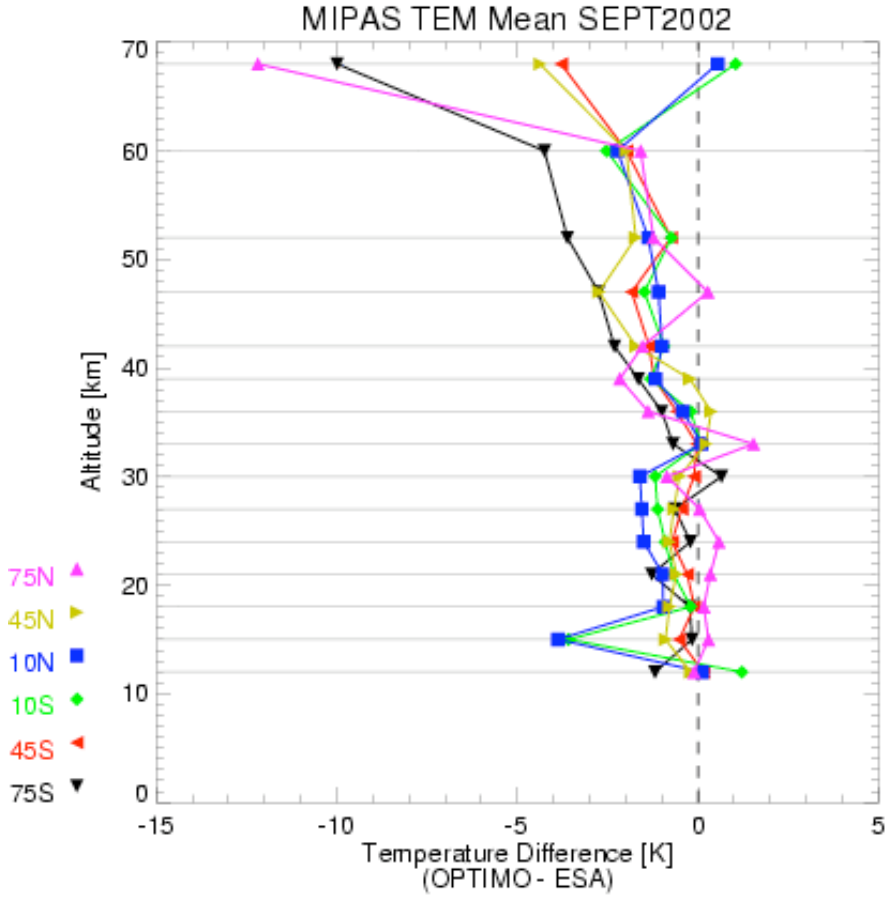

H_2O

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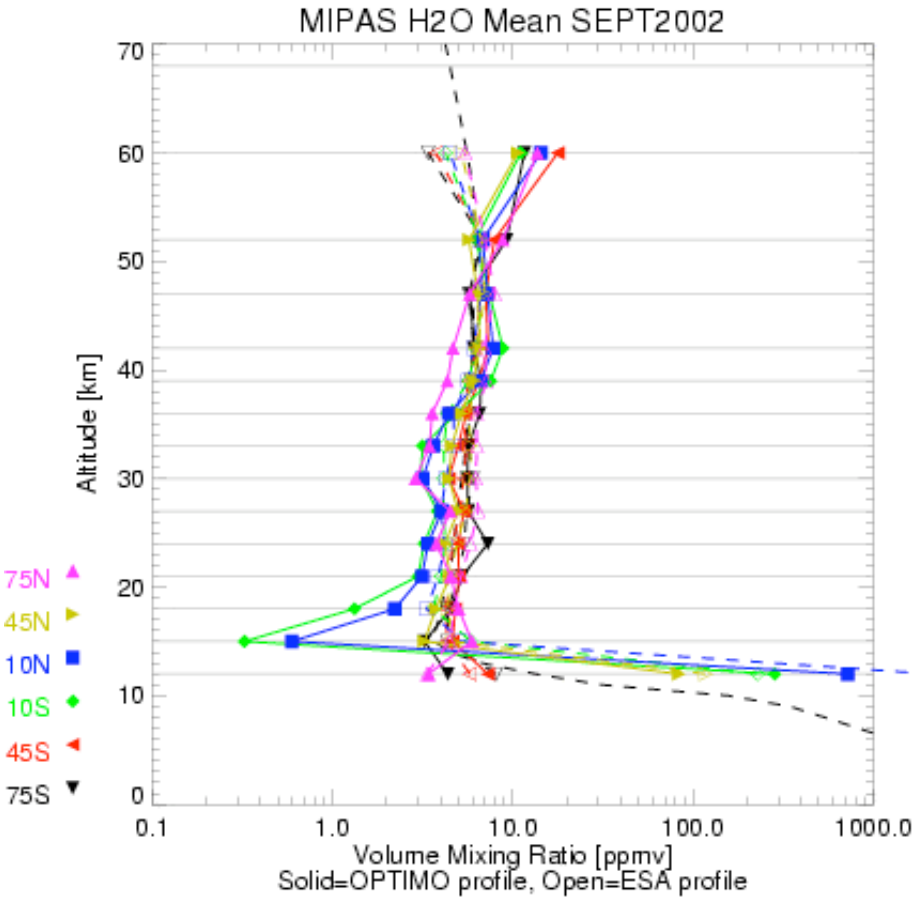

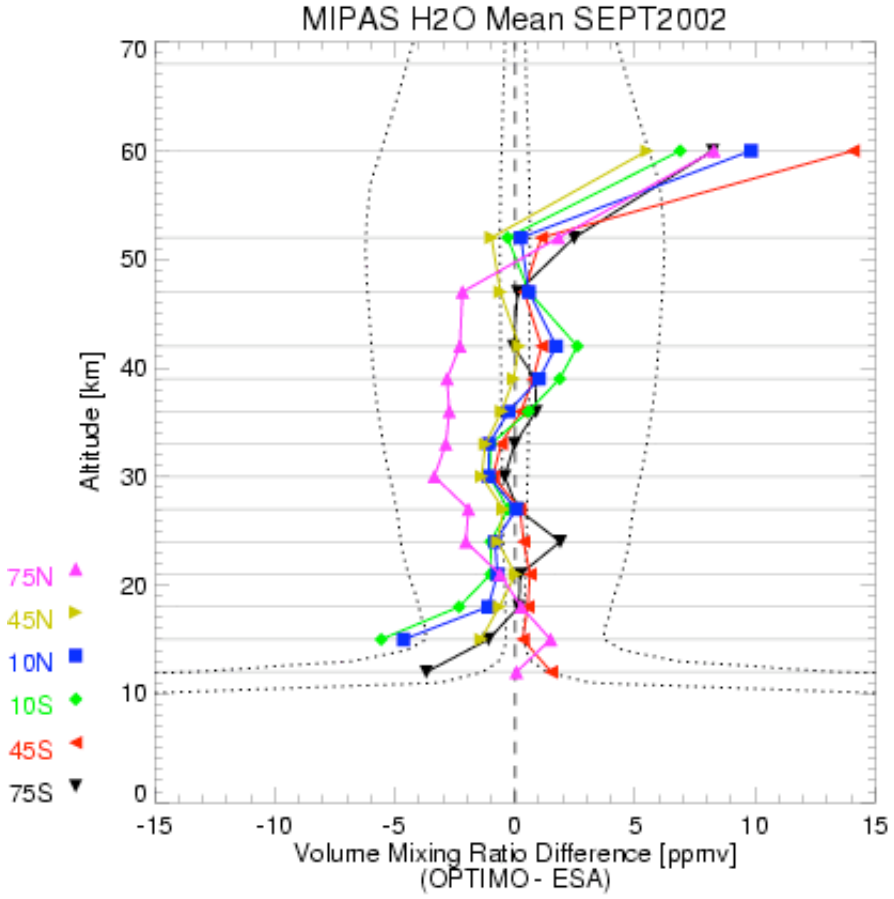

O_3

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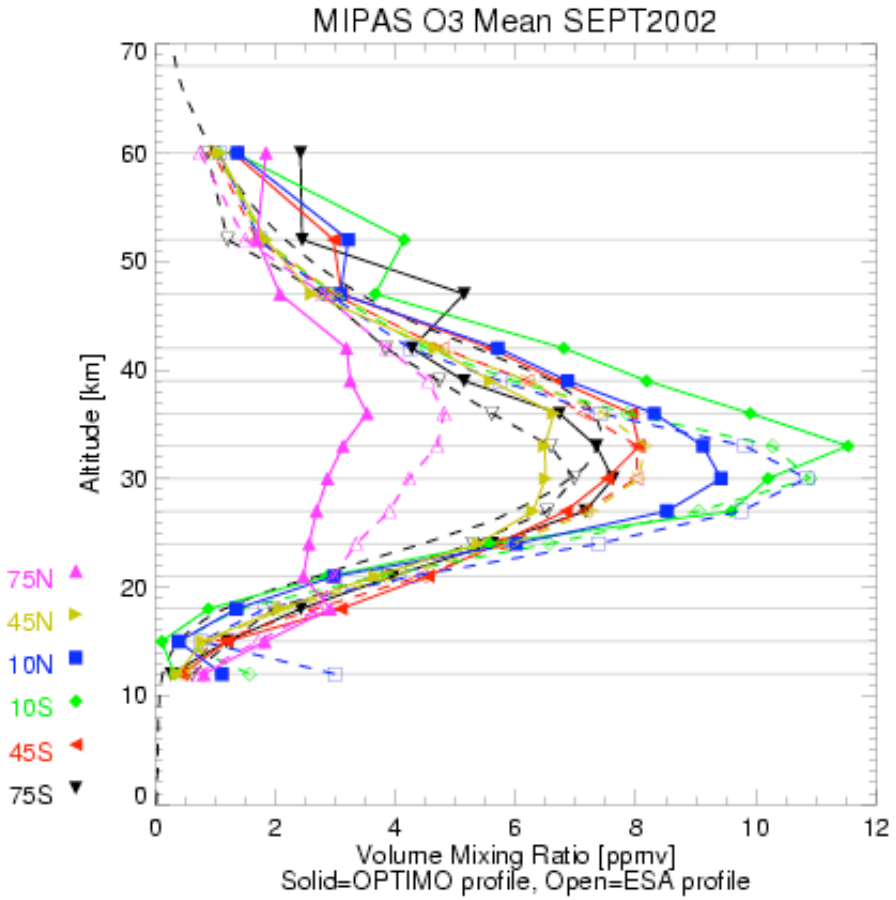

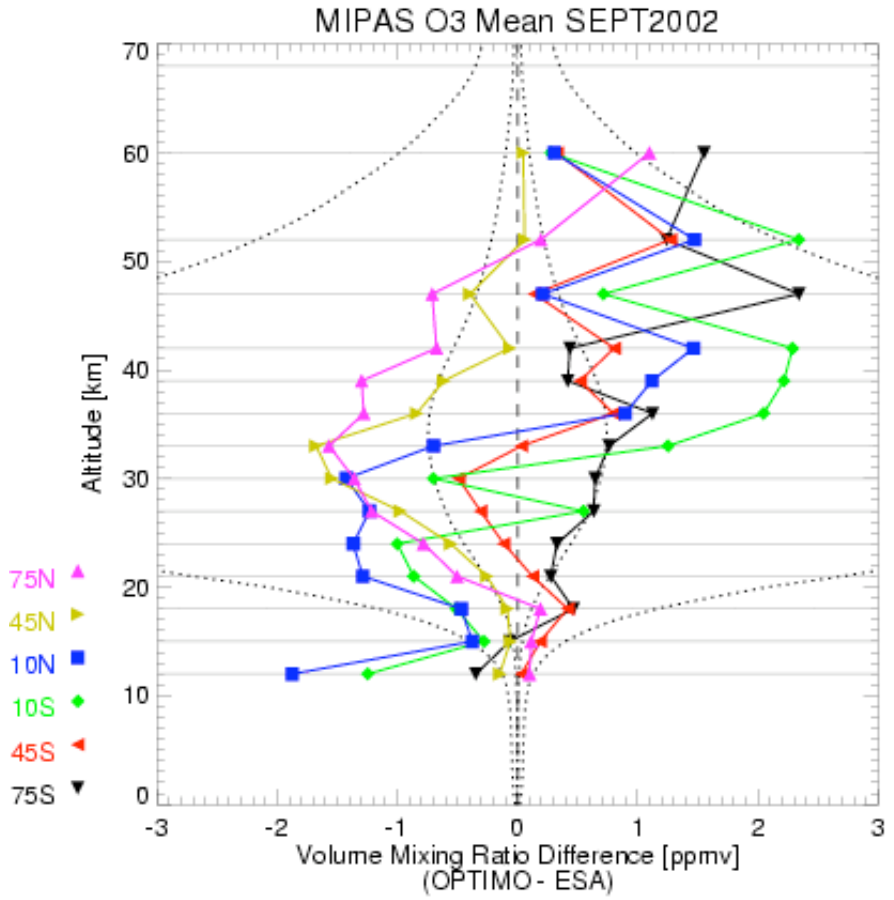

Summary and further work

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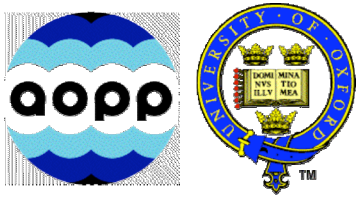

In principle not in practice there should be a better coverage

- ❖ Reasonable agreement for the mean profile comparison
- ❖ Exception of pressure (max 6% difference) not explained

- ❖ Problem for the single profile comparison:
  - large oscillations, related to the non-linearity issue
  - it could be solved using regularization

Further investigations of the differences:

- regularization of the profiles
- real AILS
- microwindows for the joint retrieval of p, T, H_2O and O_3

Joint Microwindows

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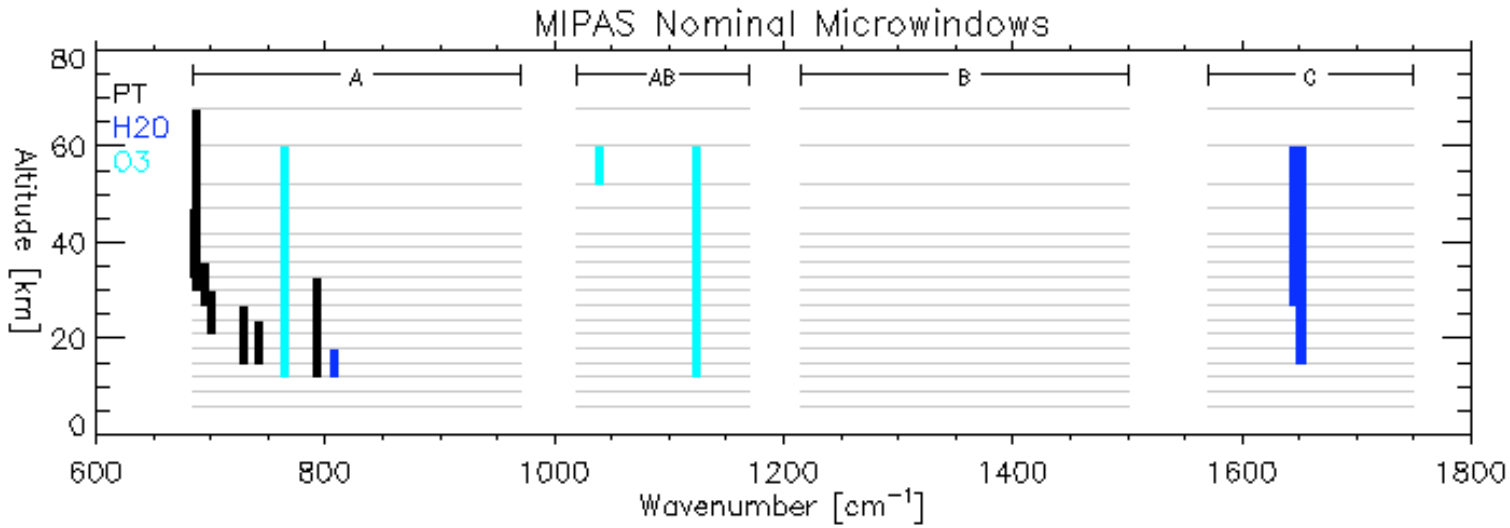
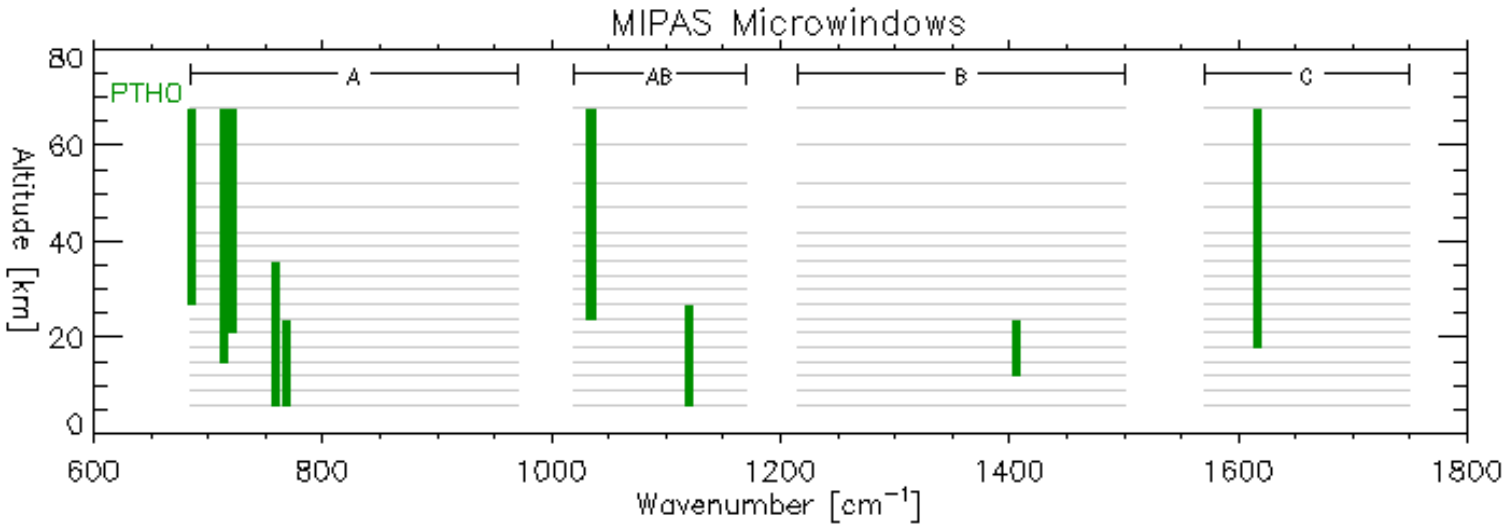


14 MWs
8177 pts
158 bits



10 MWs
3731 pts
186 bits

Problems

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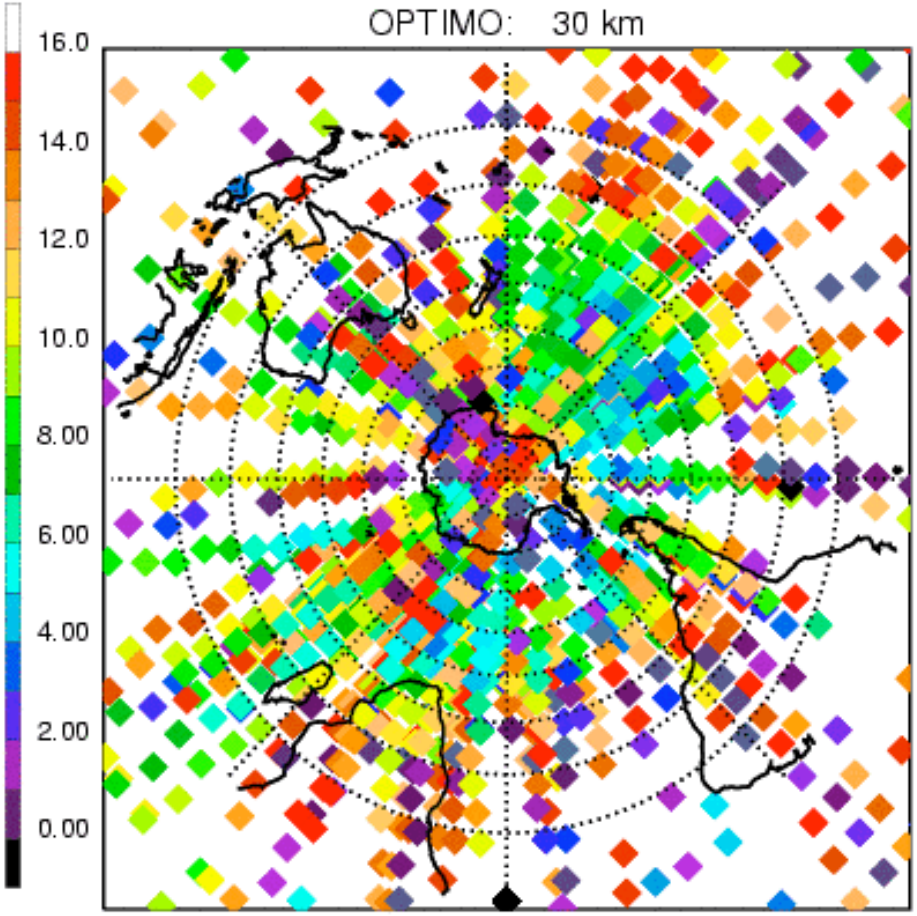
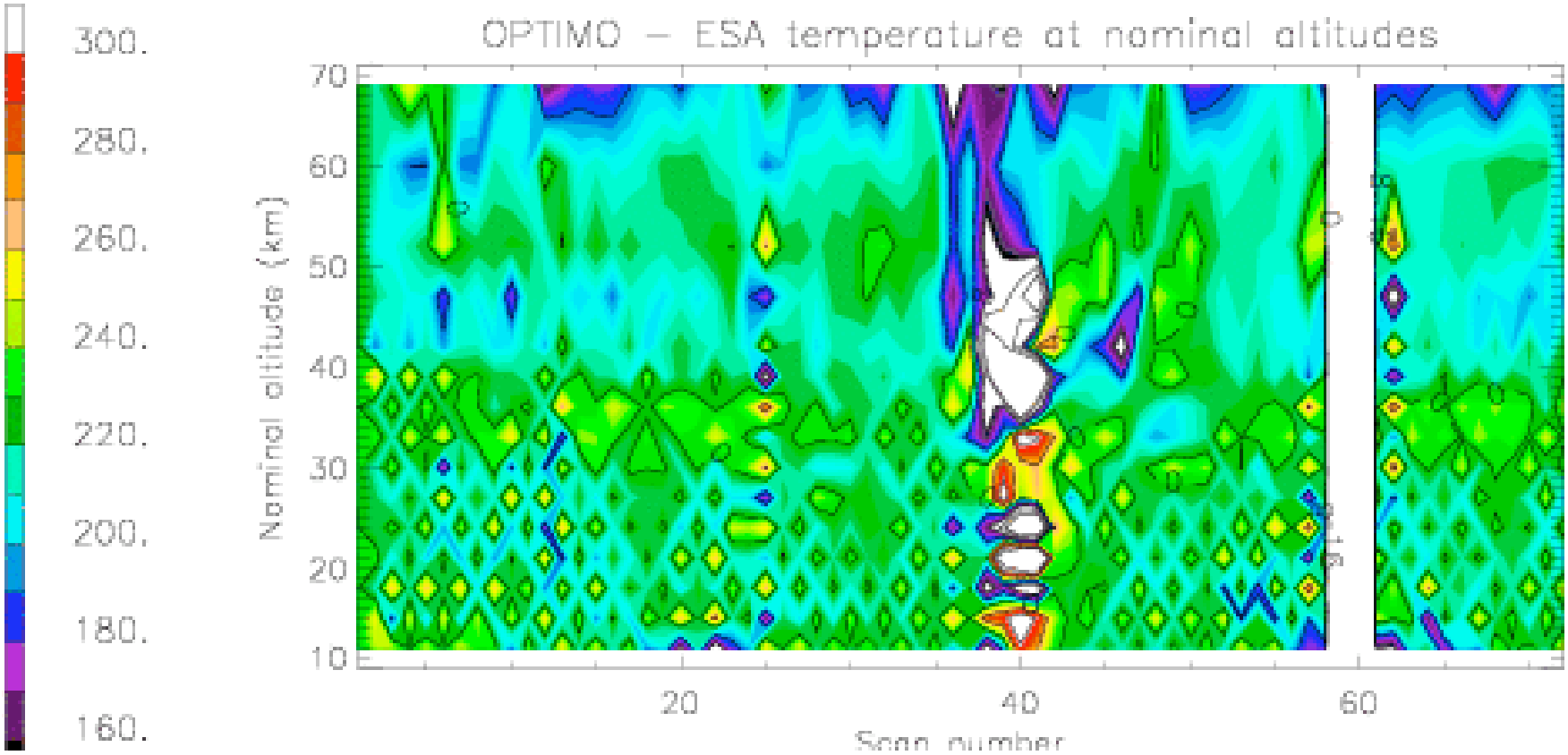


Oscillations might be due to the non linearity issue mentioned by M. Birk


OPTIMO – ESA temperature at nominal altitudes
300.
280.
260.
240.
220.
200.
180.
160.
Nominal altitude (km)
70
60
50
40
30
20
10
20
40
60
Scan number