Global gravity wave activity:

comparison of SABER measurements and spatial ray modeling

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The $SABER$ team

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Gravity Waves

- SPARC gravity wave initiative: lead Kevin Hamilton

- Questions now solved?

- GWs are main driving force in MLT

- GWs contribute to QBO ($\sim$50%), Brewer Dobson Circulation

- Observational constraints still unsufficient

- GW representation in AGCM strongly simplified and unrealistic

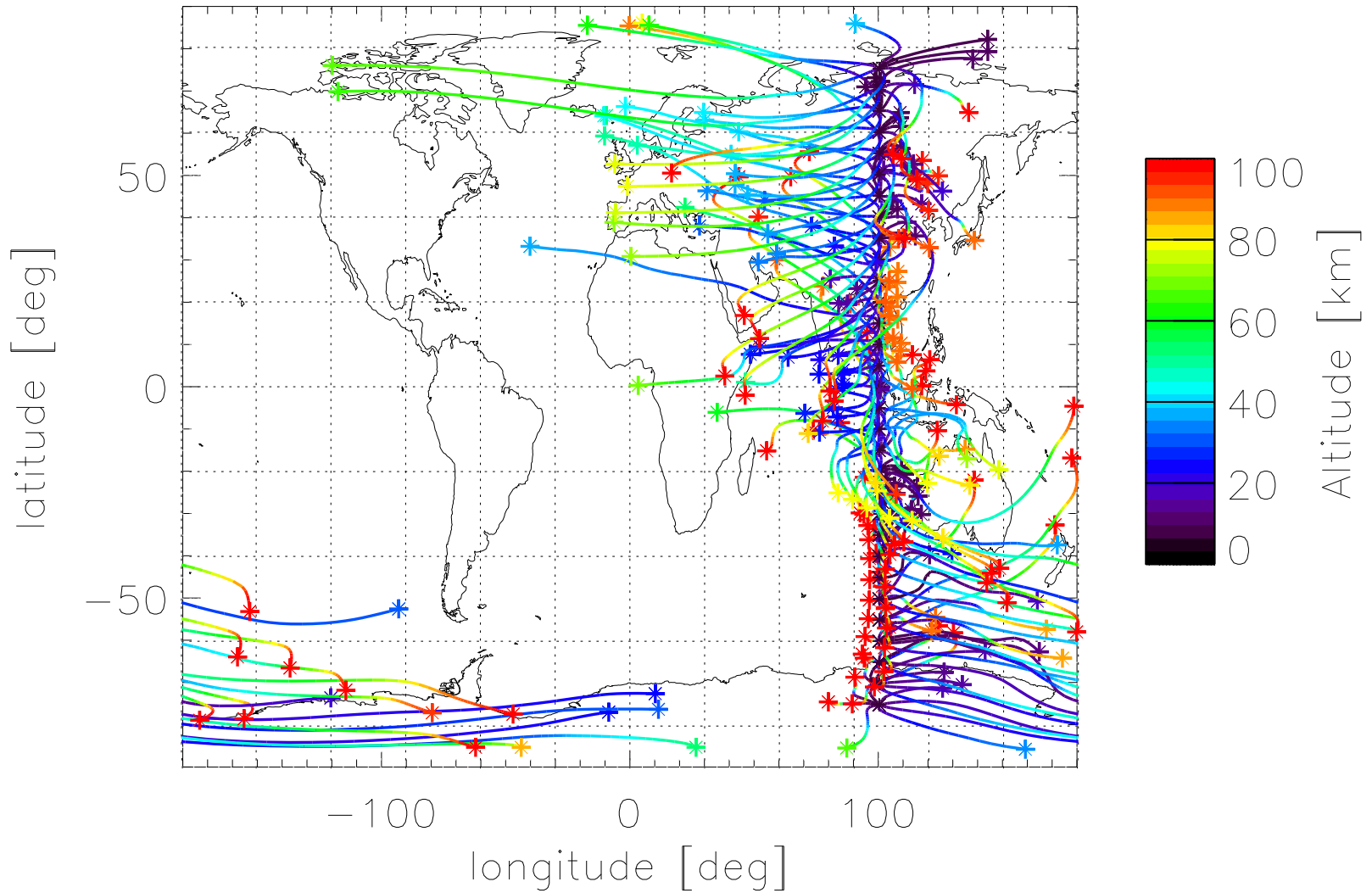- Are these physical shortcomings important?

Sensitivity
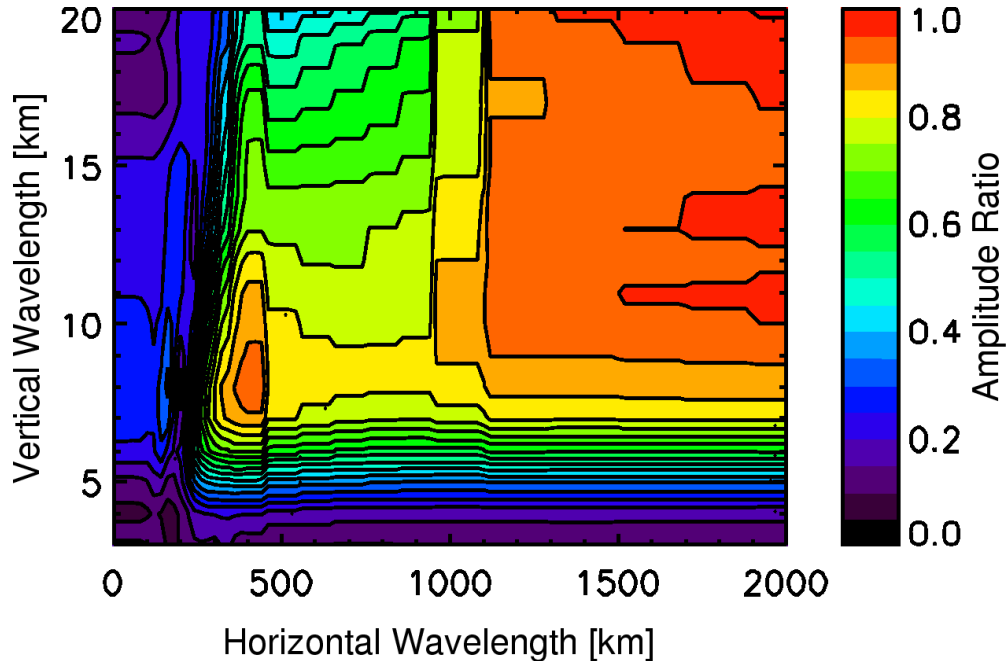
(CRISTA simulation)

- At favorable angles λ_x=100 km are realistic!

- Detrending by 0-6 wavenumber Kalman filter

Waves with horizontal wavelength λ_h between 100 km and several 1000 km.
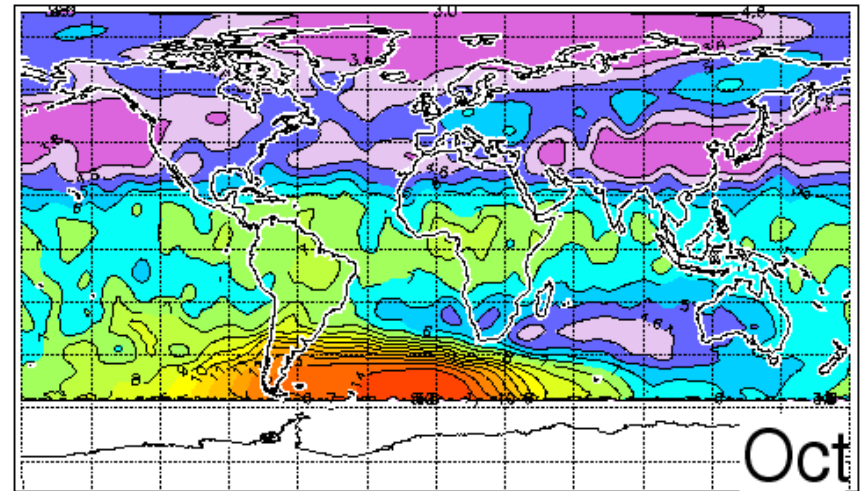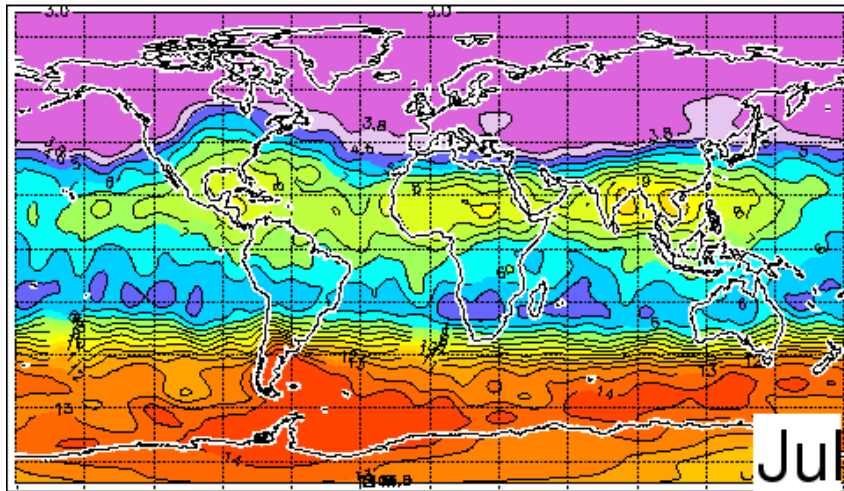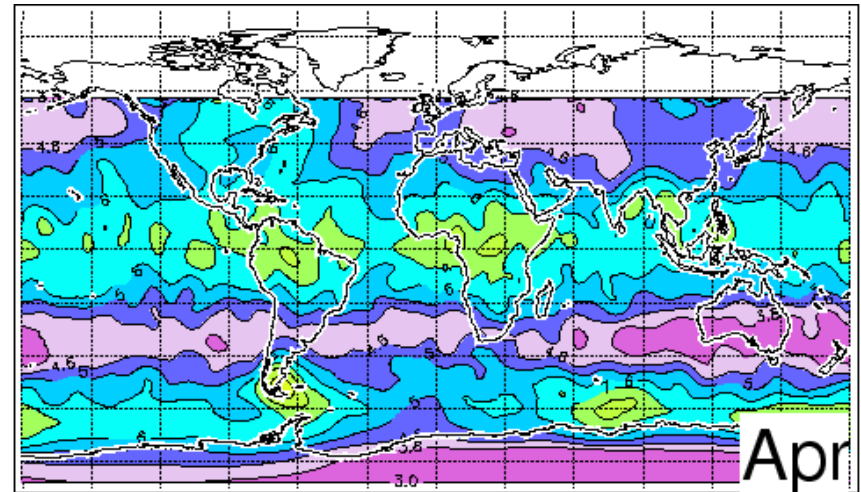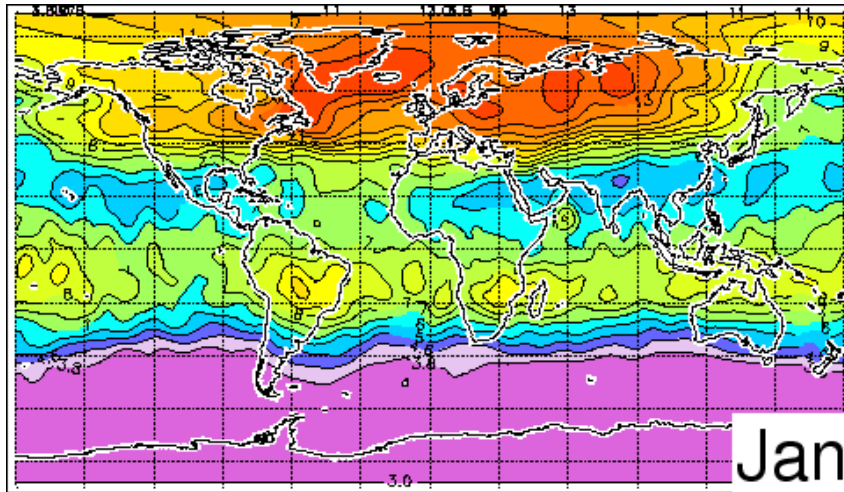
GROGRAT

xlon

200km horizontal wavelength

GROGRAT: *new* launch details

- homogeneous and isotropic launch distribution
- launch level: 5 km altitude

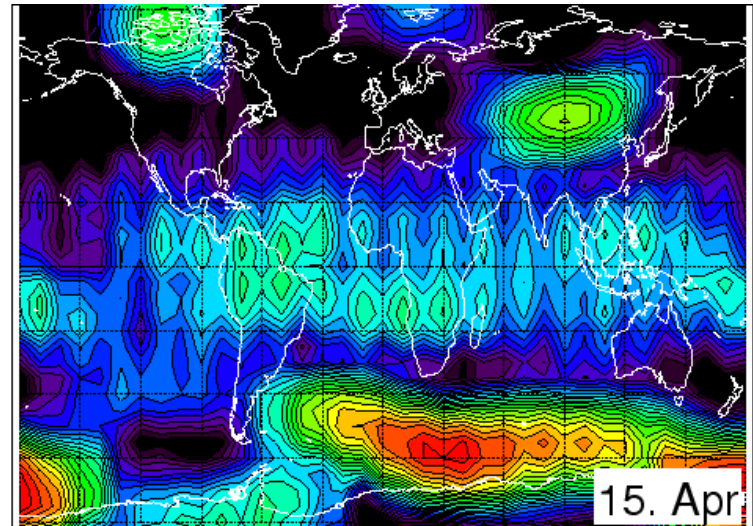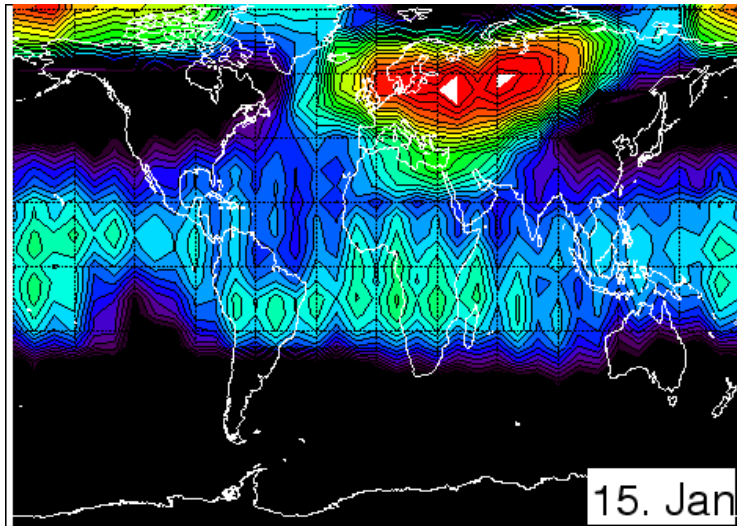| horizontal wavel. [km]	phase speed [ms^{-1}]	amplitude [ms^{-1}]	intermittency factor	
background	–	0.5	5.0	
200	3	6.0	5.5	saturated
200	10	20.0	1.8	saturated
200	31	0.2	2.0	
200	40	0.1	3.0	
200	50	0.2	2.0	
200	51	0.05	15.0	New! very small
1000	30	1.0	2.0	
1500	30	1.0	7.0	
2000	30	1.0	2.0	
3000	30	6.0	2.0	LS: tropical confined
6000	30	30.0	1.0	LS: tropical confined

SABER

2002-2006   <3   dB of squared amplitude   >15   28 km
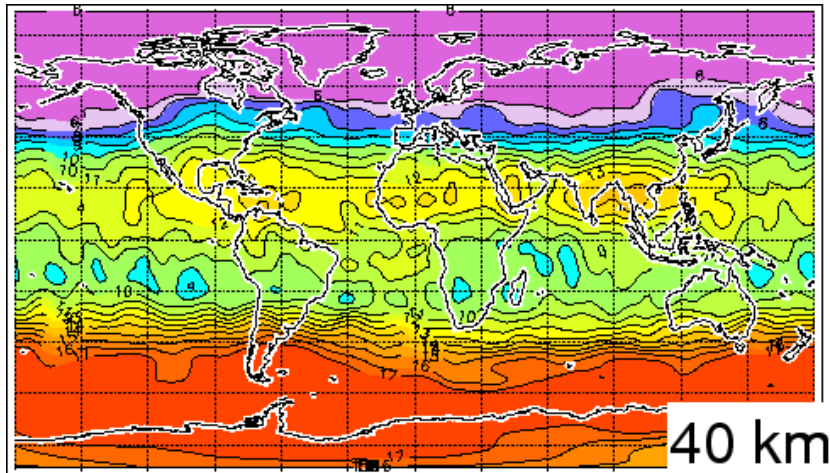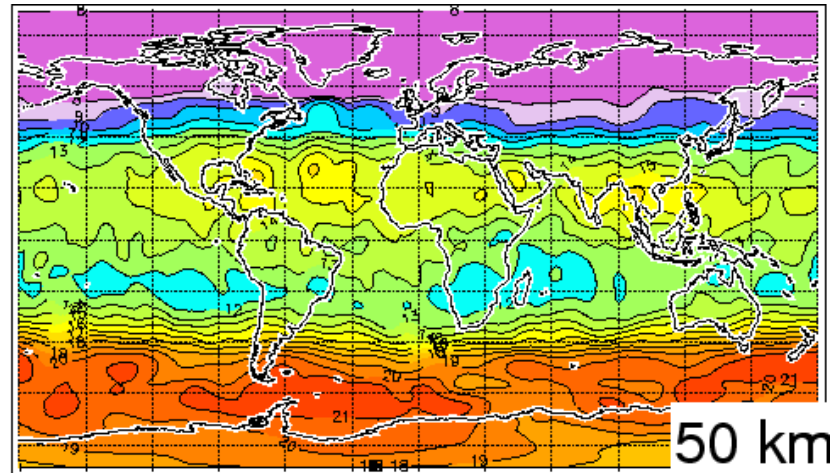
GROGRAT

15. Jan
15. Apr
15. Jul
15. Oct

2003

25km

<3 4 6 8 10 12 14 >15

dB of squared amplitude

SABER: July

SABER

28 km

50 km

GROGRAT

30 km

50 km

dB of squared amplitude

<0   5   10   15   >20

SABER

70 km

90 km

GROGRAT

70 km

95 km
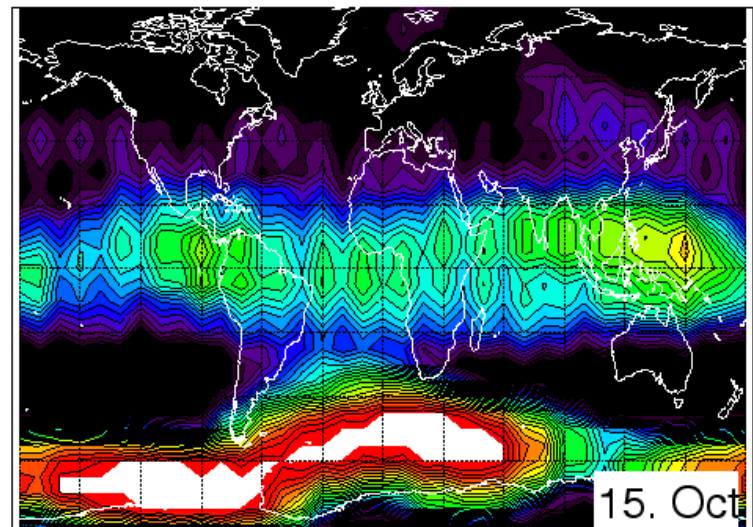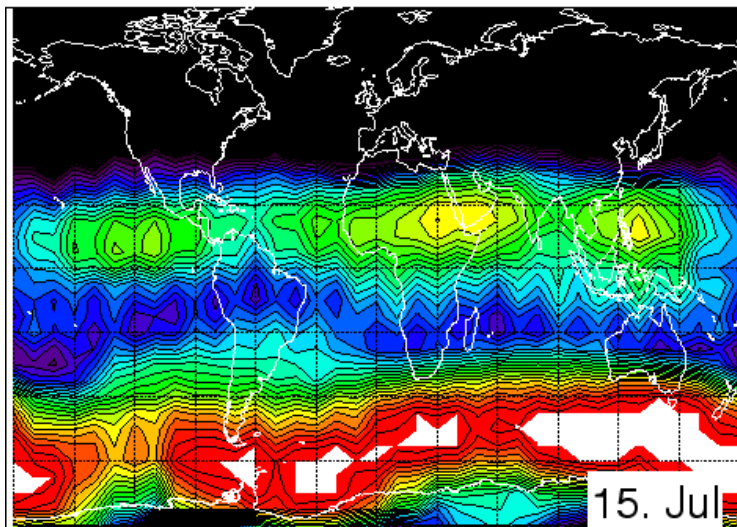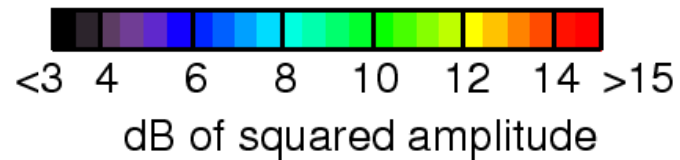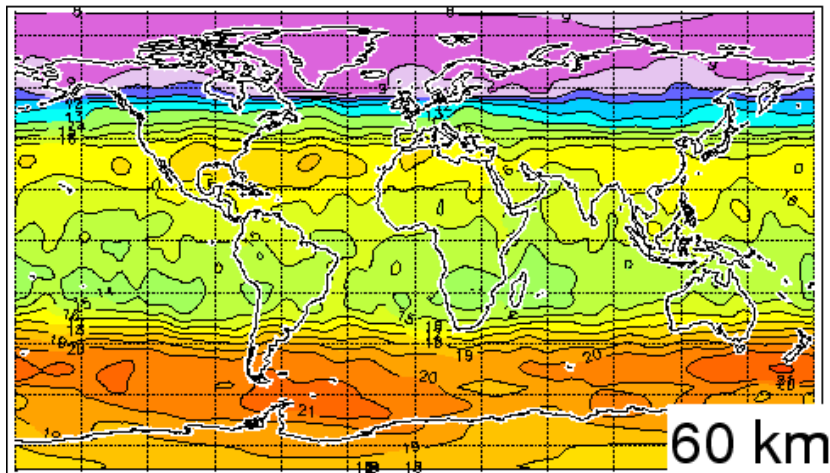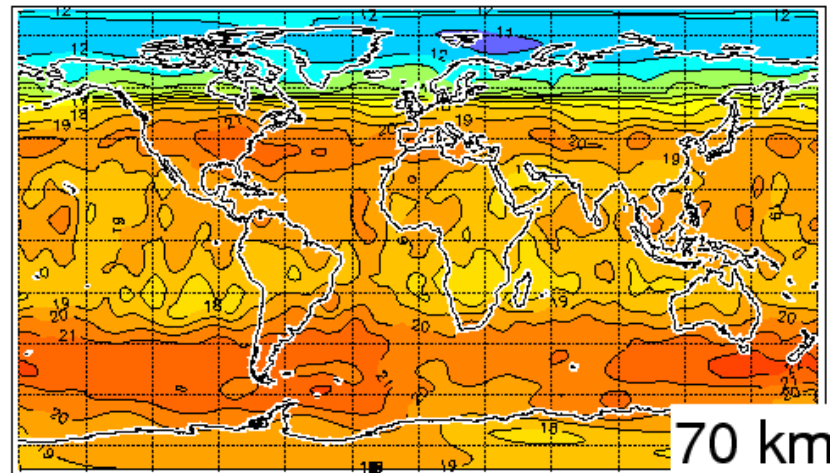
<10   15   20   >25
dB of squared amplitude

<20 22   24   26   28 >30
dB of squared amplitude
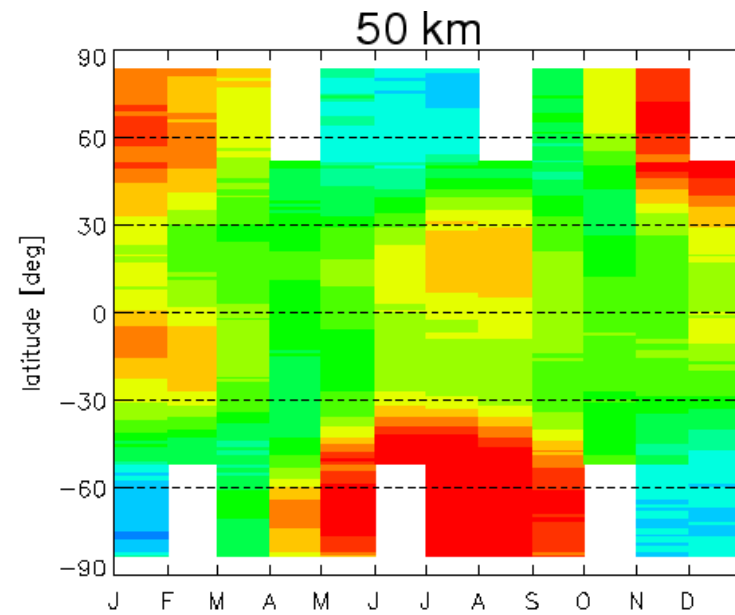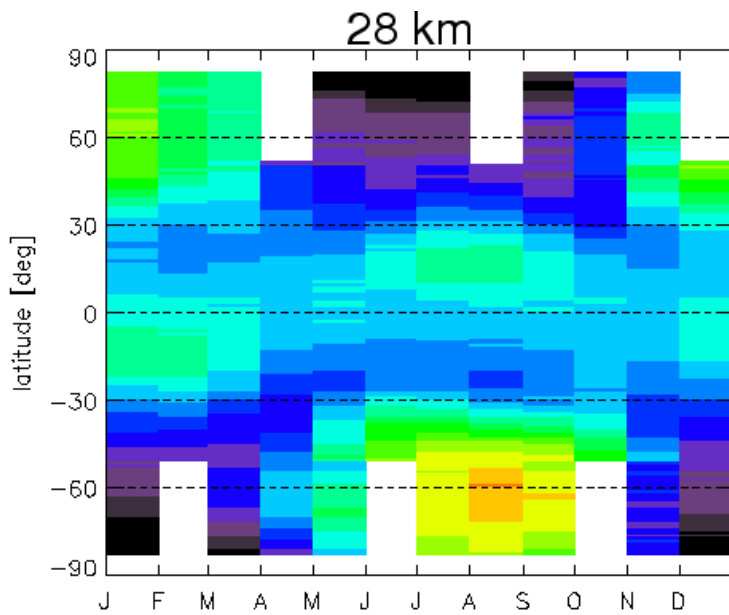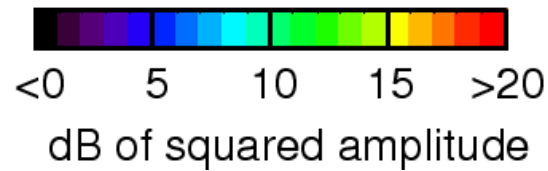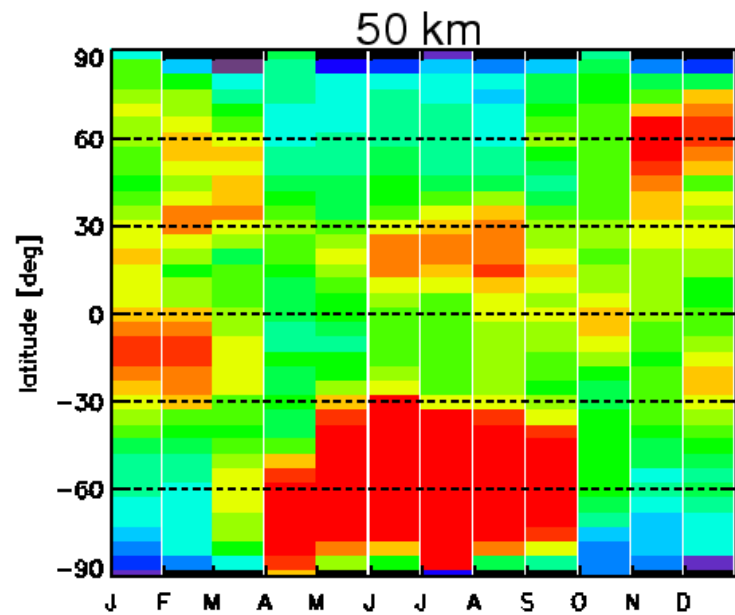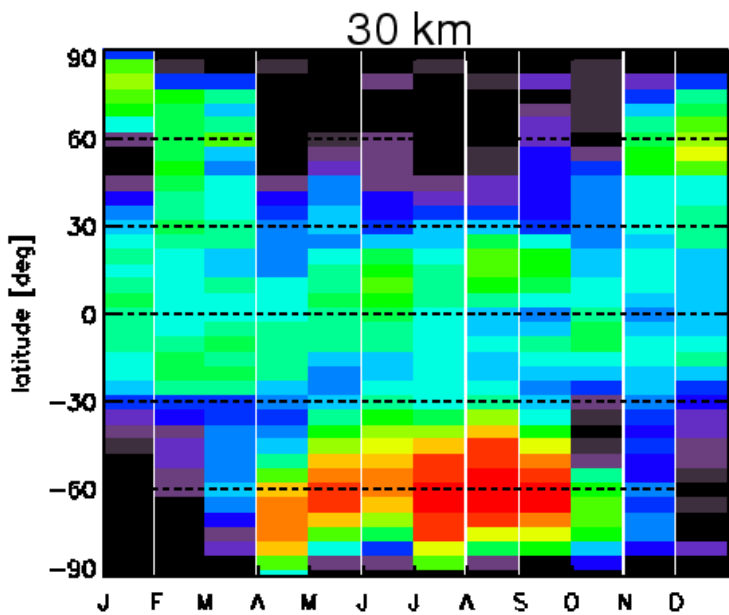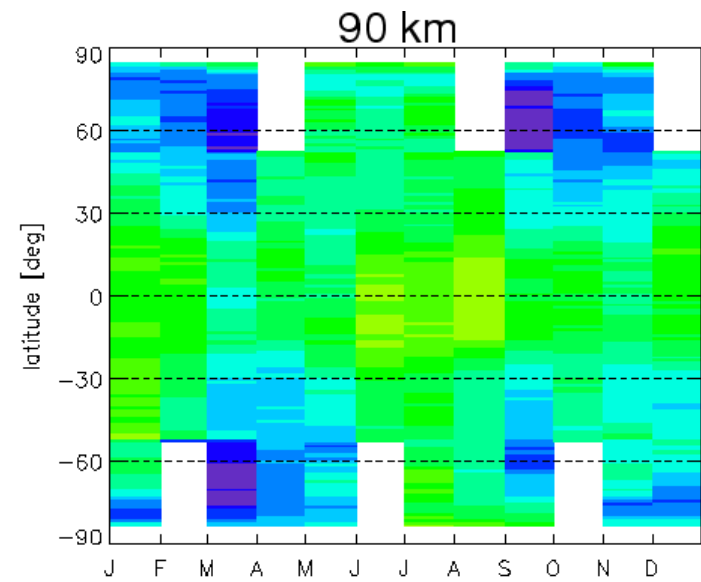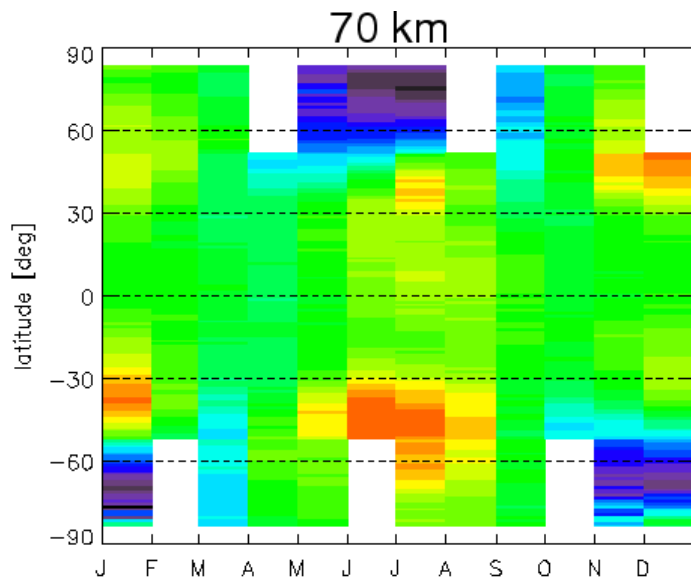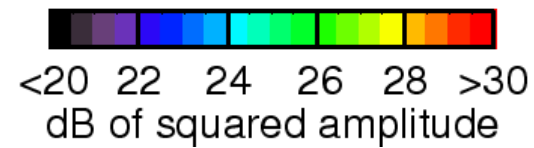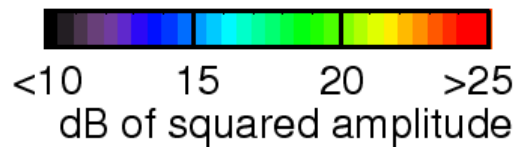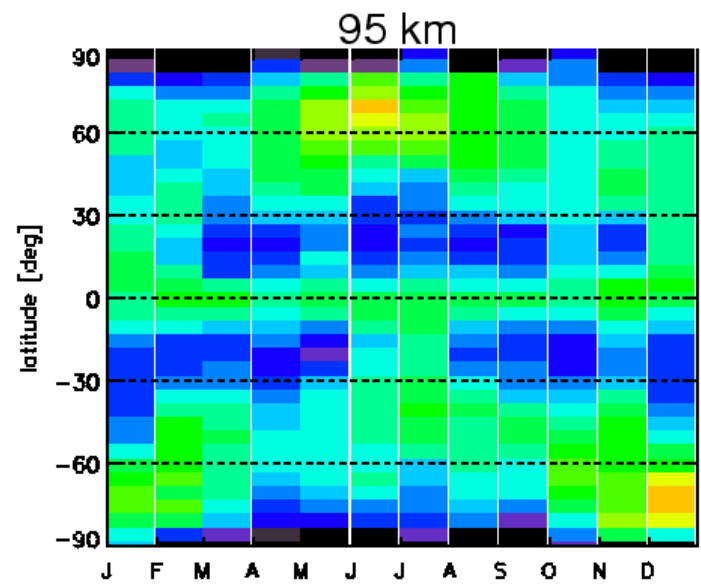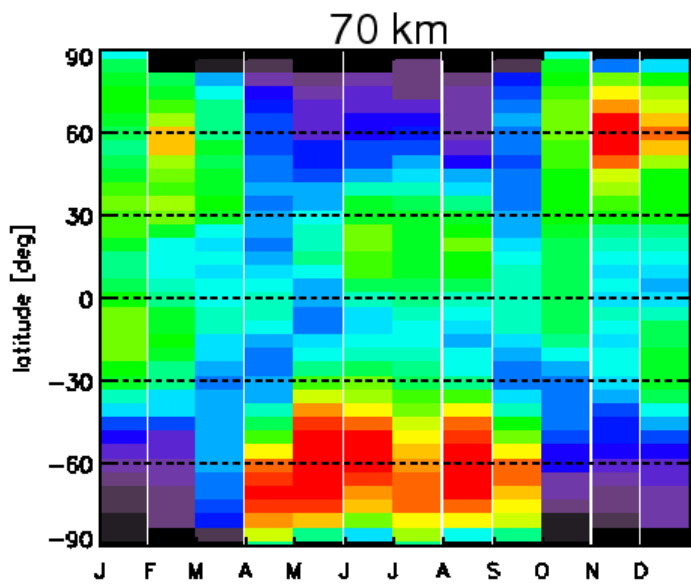
July: λ_z distribution
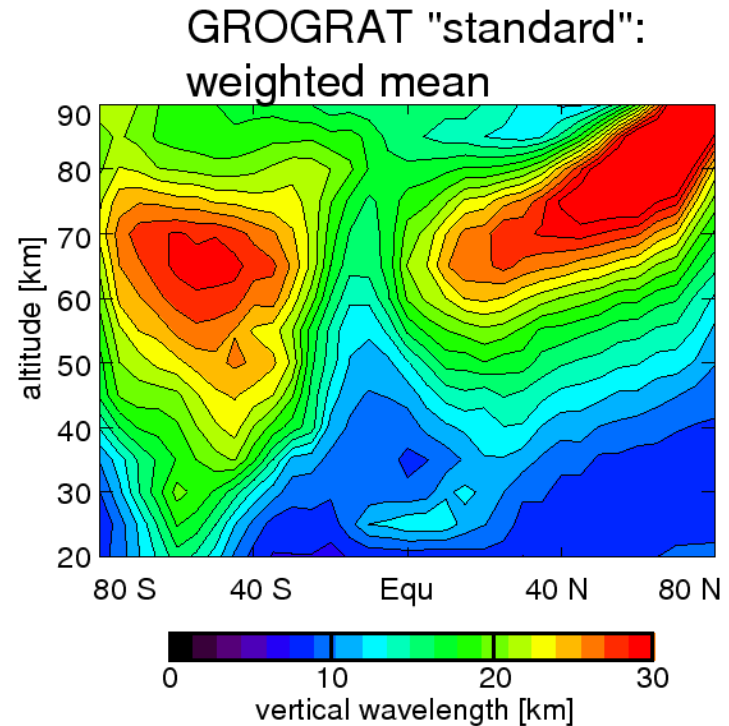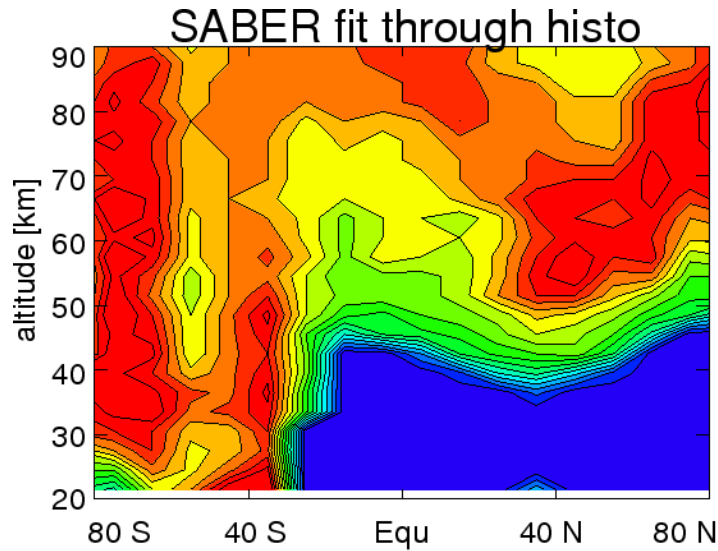
Oblique wave propagation

variance weighted   momentum flux weighted

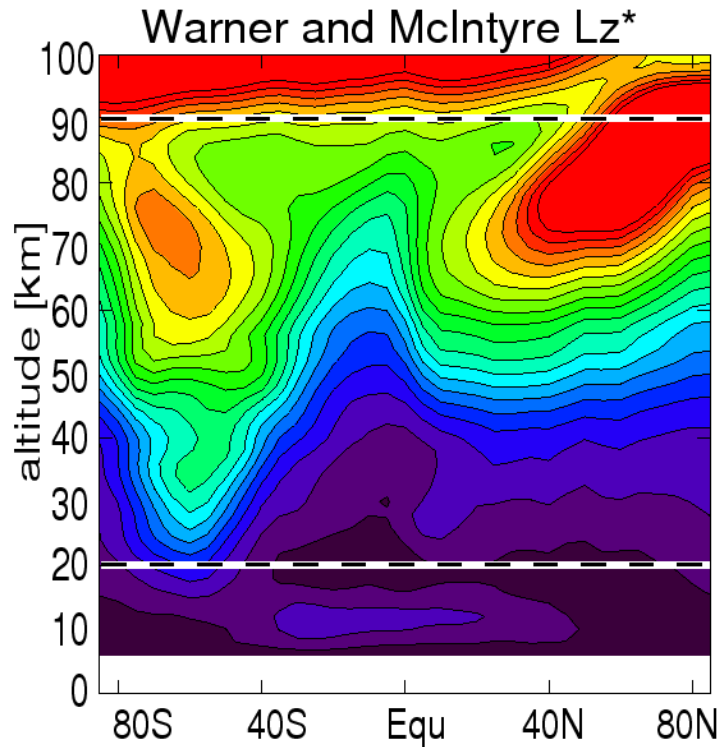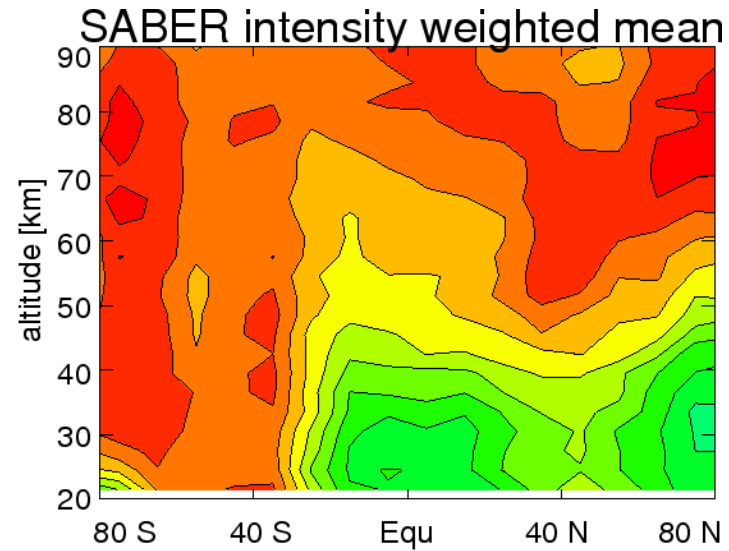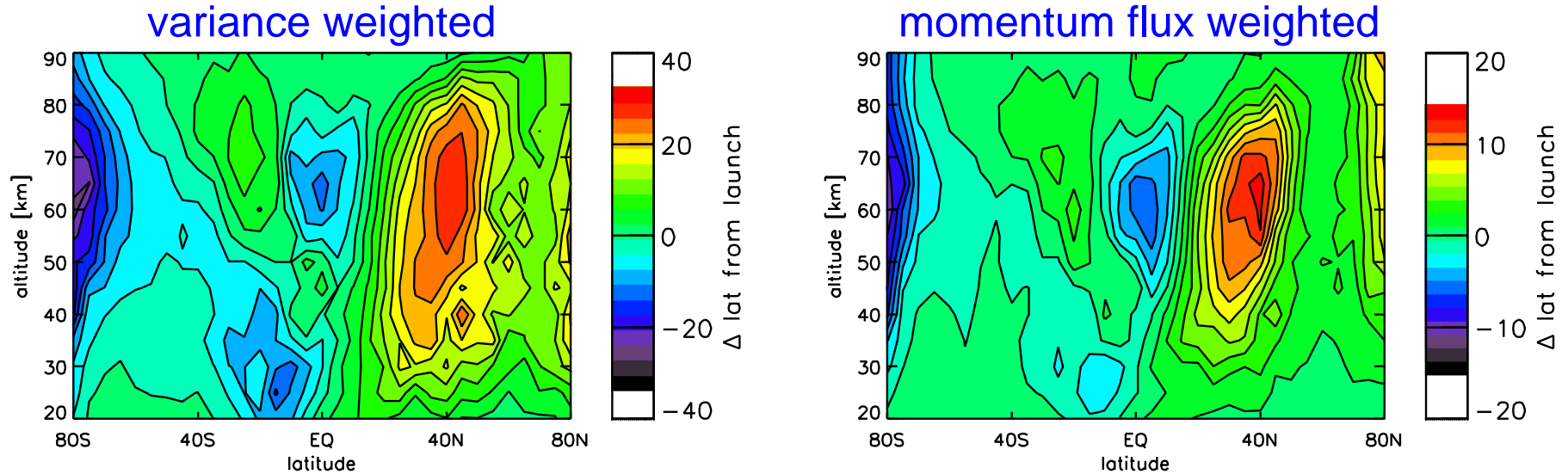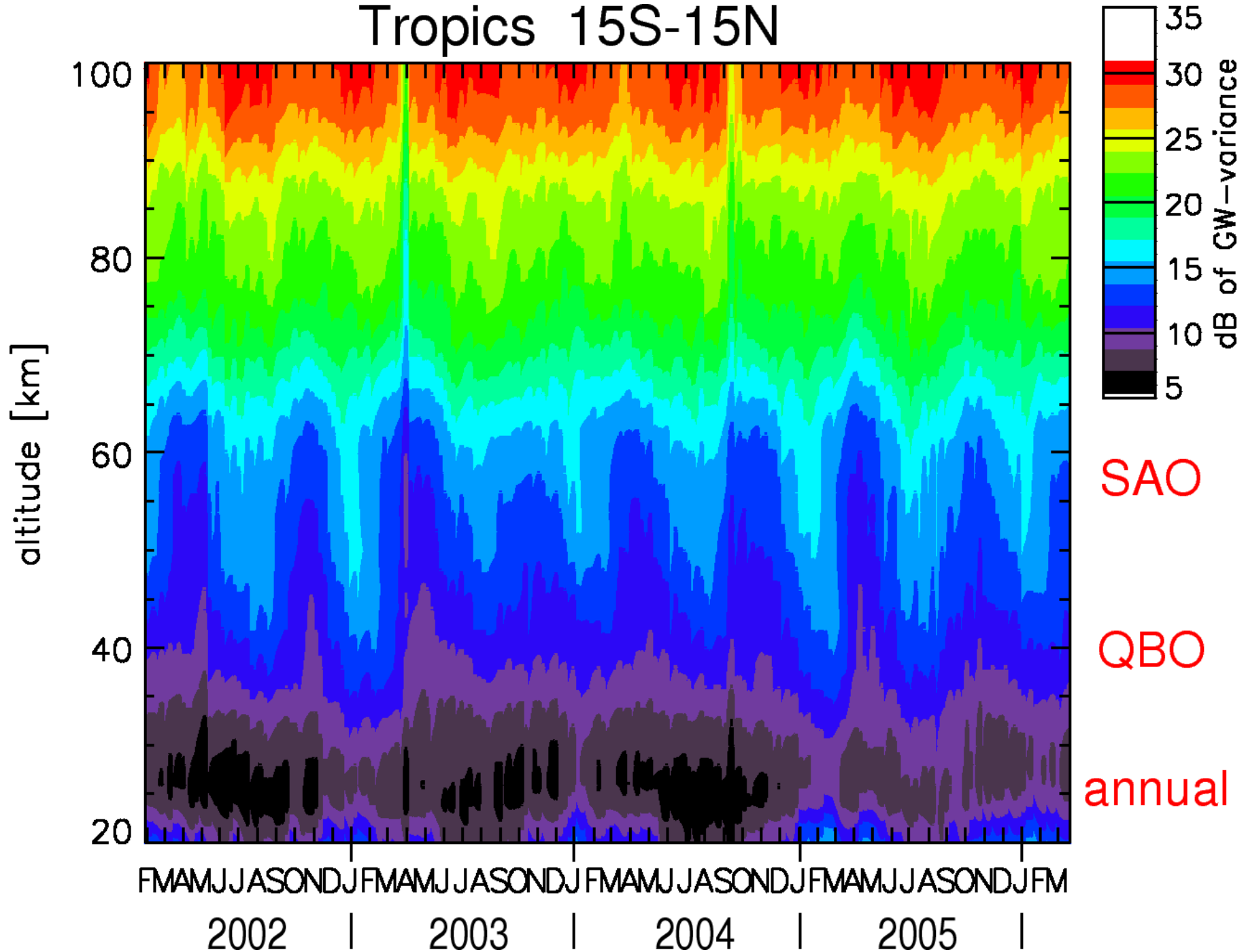- Nett effect in meridional propagation

- Lateral boundary effects due to GROGRAT (no cross-pole propagation)

- Longer horiz. wavelengths propagate larger distances

- Longer horiz. wavelengths carry less momentum

Tropics 15S-15N

SUMMARY

- GROGRAT homogeneous launch distribution well reproduces observed GW variances

- Further tuning ongoing

- Though sources are unphysical (convective forcing, polar vortex) ...

- ... sufficiently realistic to investigate horizontal propagation and horizontal refraction

- 5 years of data suited for SAO, AC, QBO and "long-term" (*Krebsbach and Preusse, GRL, 2007*)
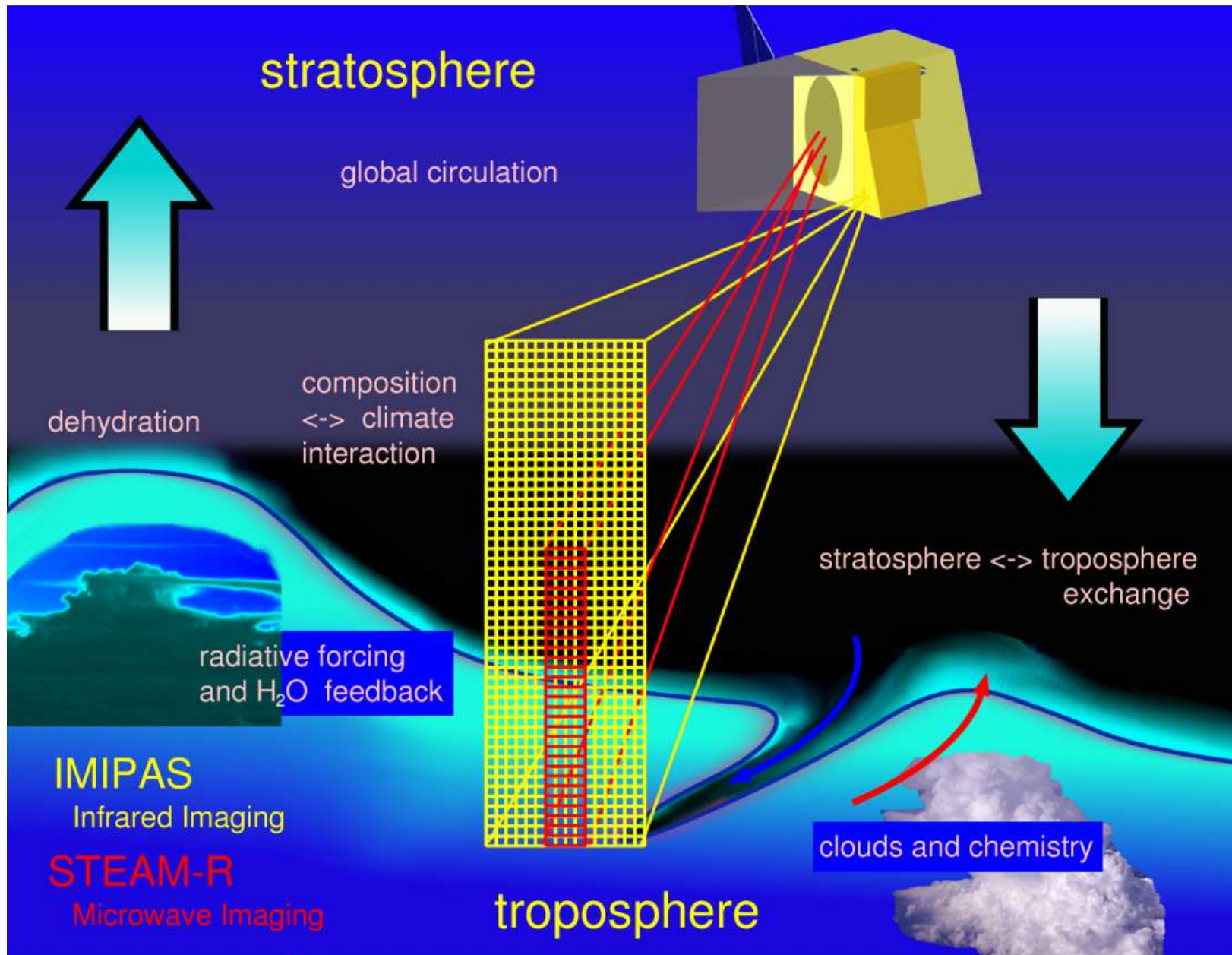
The Dream-Instrument

high vertical and horizontal resolution
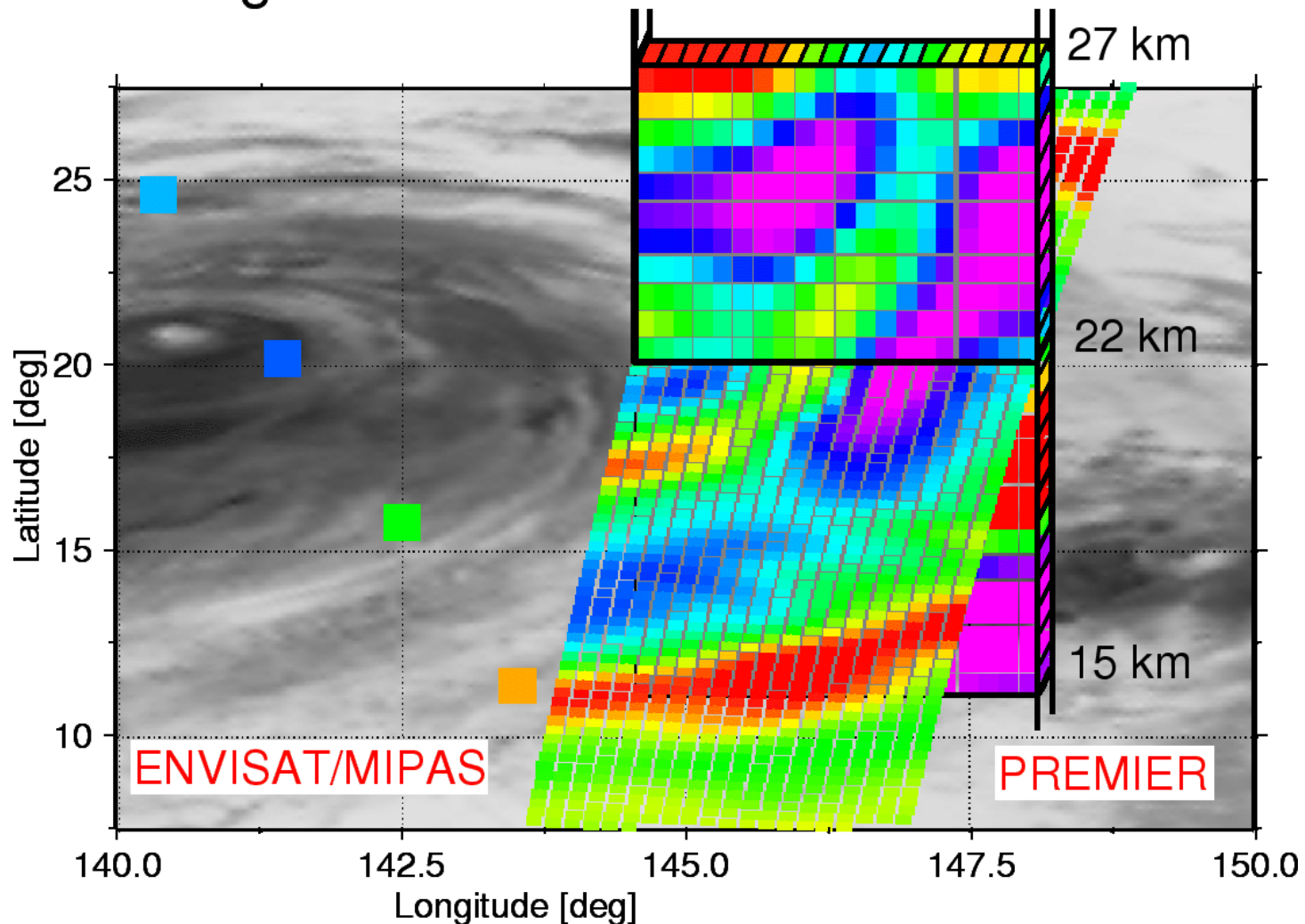
Simulated GWs (MM5 *by Zeyu Chen*) and measured cloud bands

PREMIER Prephase-A!

PREMIER & METOP