The SABER gravity wave climatology compared with global ray-tracing modeling

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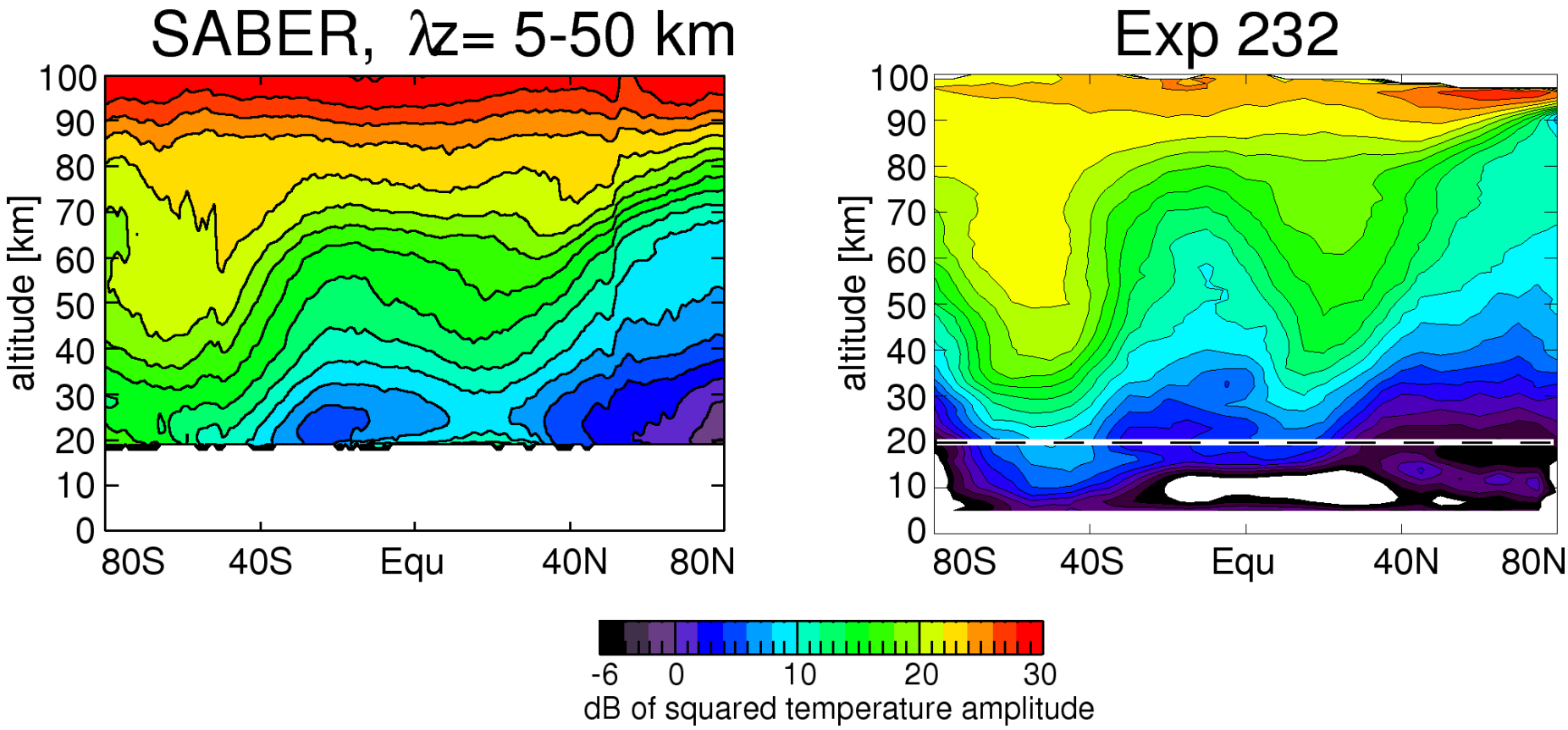
Compose spectra of single components

- Homogeneous and isotropic source distribution.
- Each **S**pectral **C**omponent **E**xperiment defined by
  - phase speed
  - horizontal wavelength
  - launch amplitude
- “Spectrum” composed by weighted mean of SCEs

To compose the spectrum: Tuning based on SABER July zonal mean
and CRISTA momentum flux

For details: *Preusse et al., JGR, 2009*

Result of Tuning



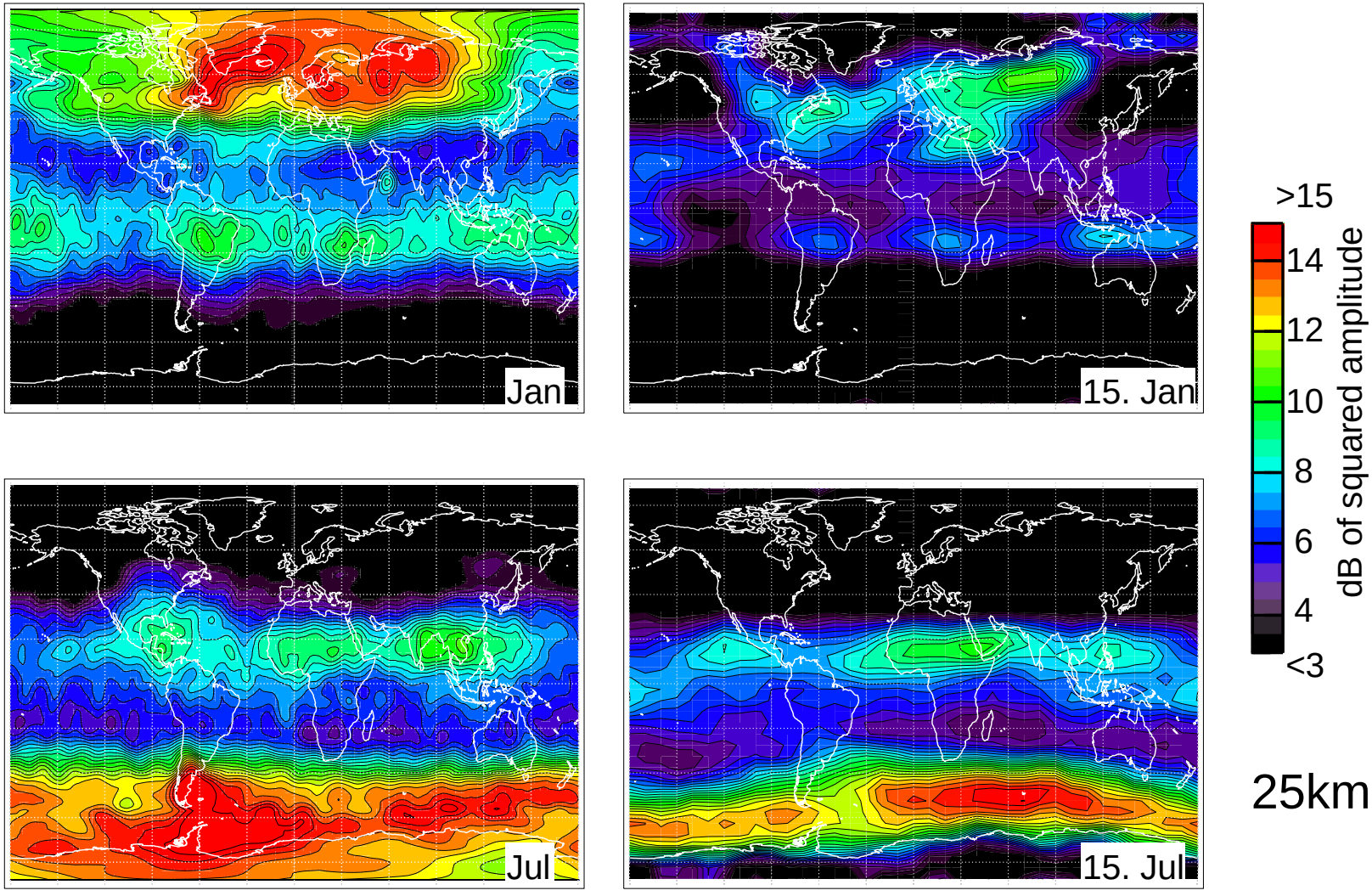
In total 14 SCEs.

We can constraint a limited number of free parameters of a given GW model.

Seasonal variations

SABER

GROGRAT

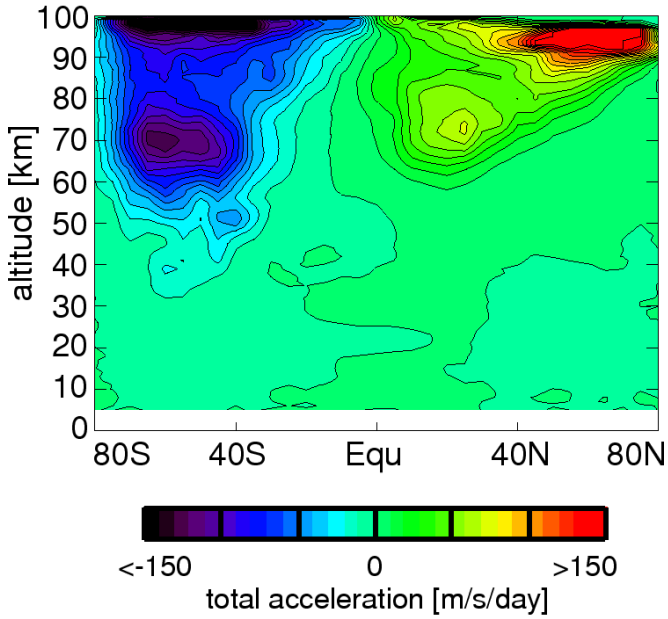


Determine launch spectrum by LSF of ZM $\Rightarrow$

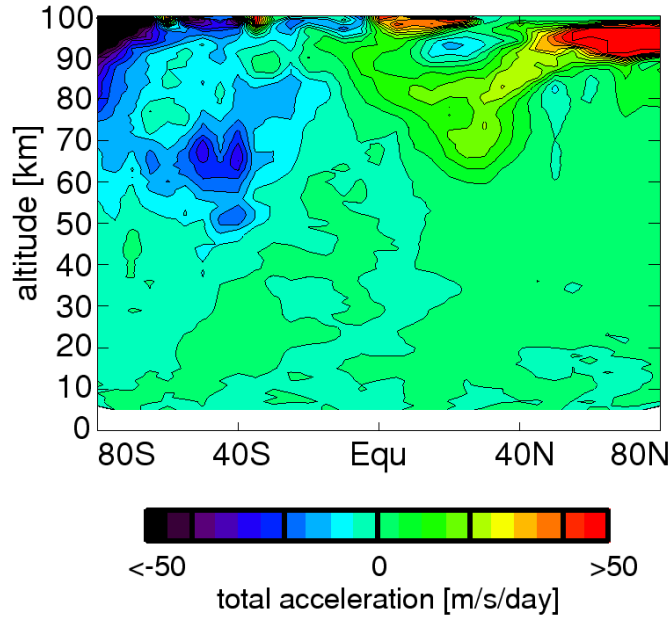
January requires more slow GWs

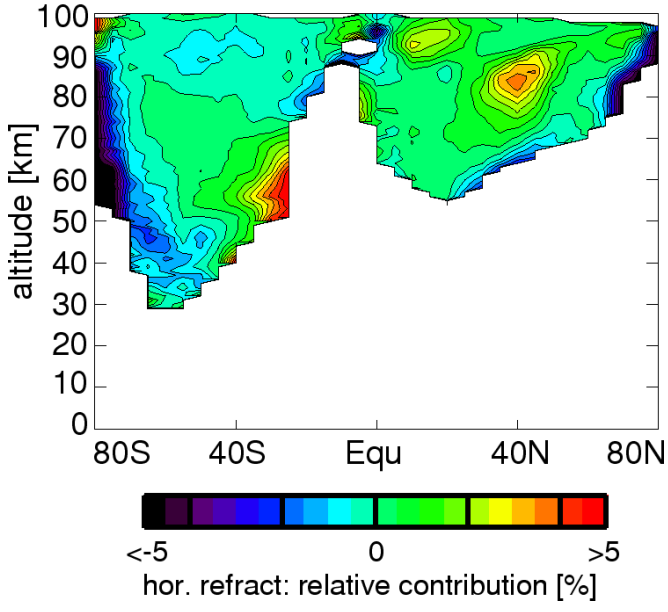
Inferred: Acceleration

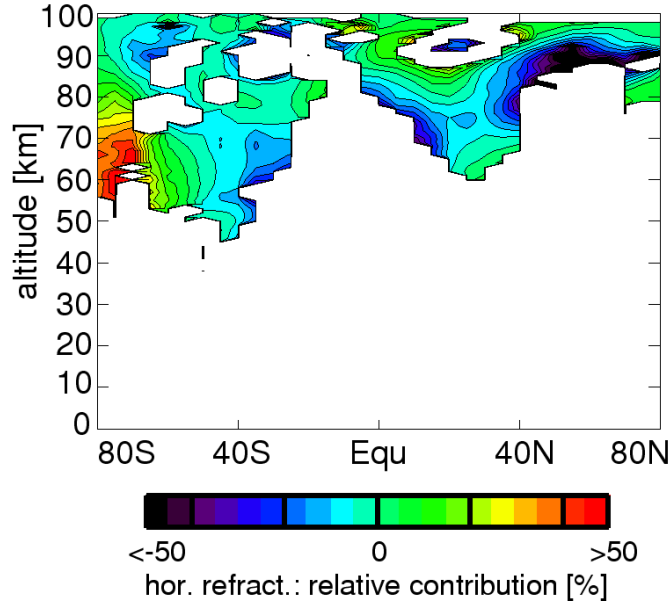
Zonal Acceleration



Meridional Acceleratio

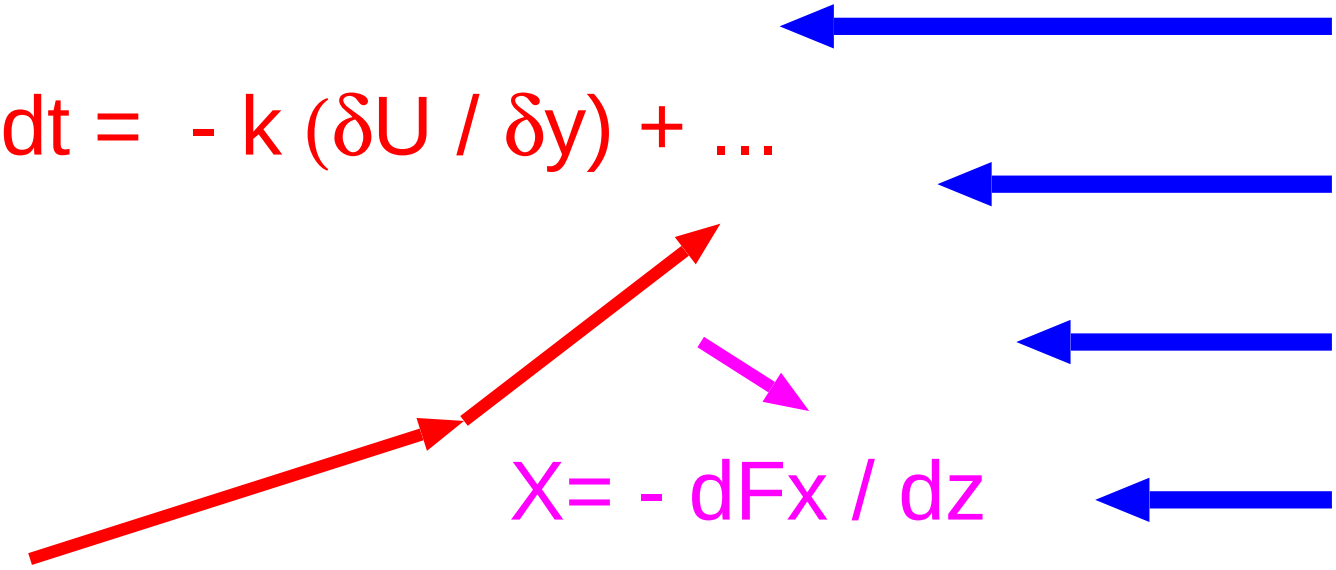




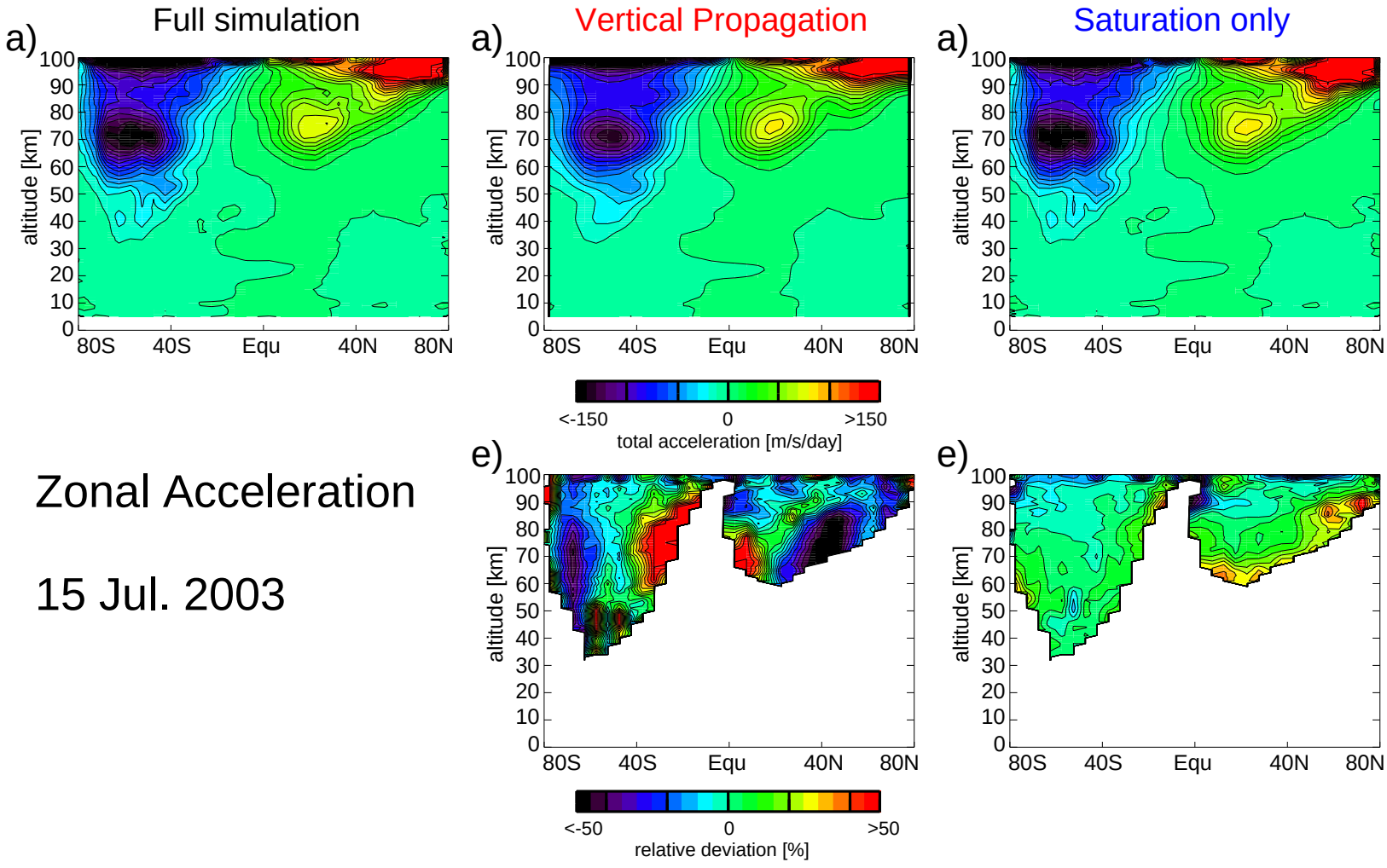


Remote recoil

$dl / dt = - k (\delta U / \delta y) + ...$



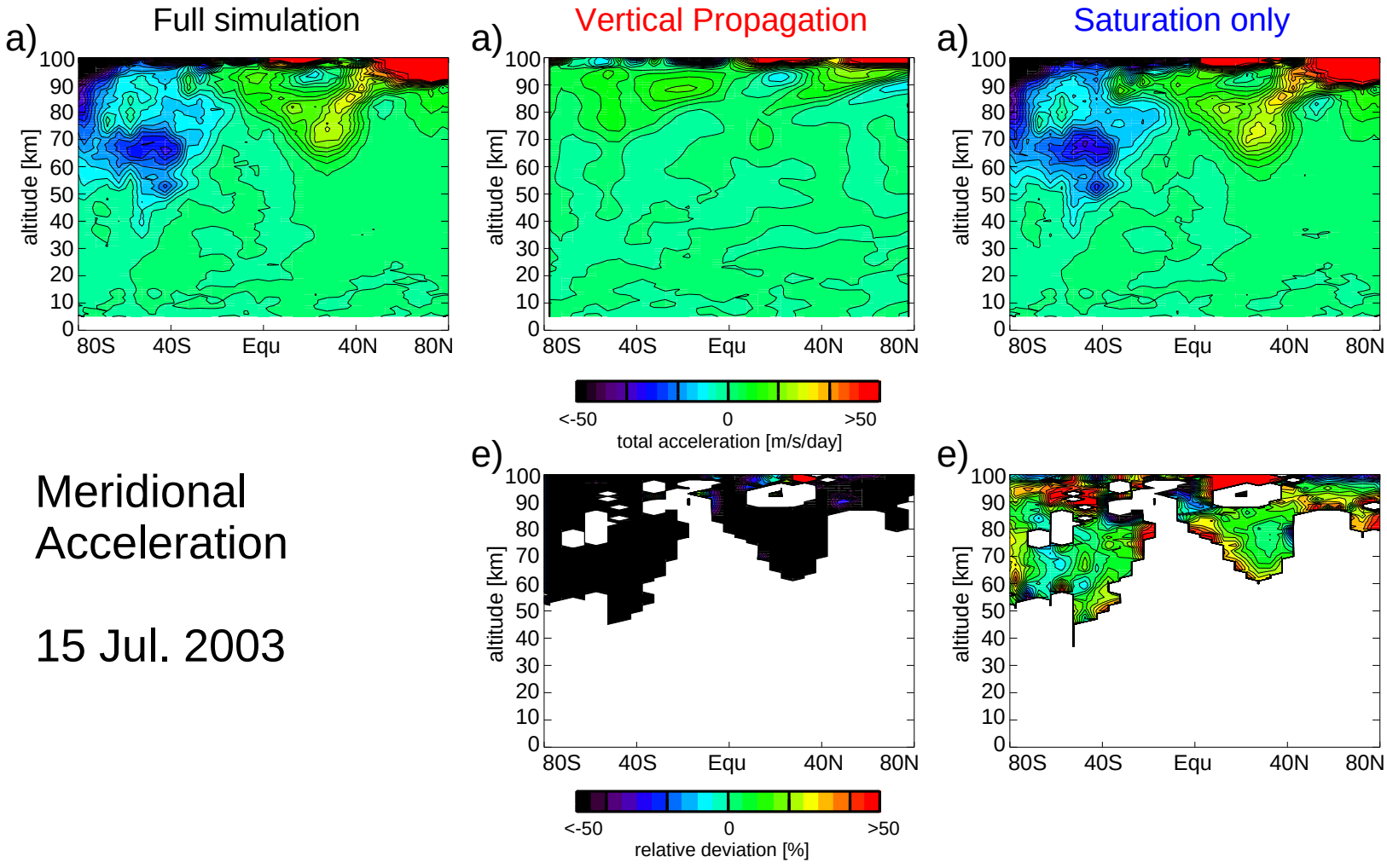
Simplifications → x-Accel.



Zonal Acceleration

15 Jul. 2003

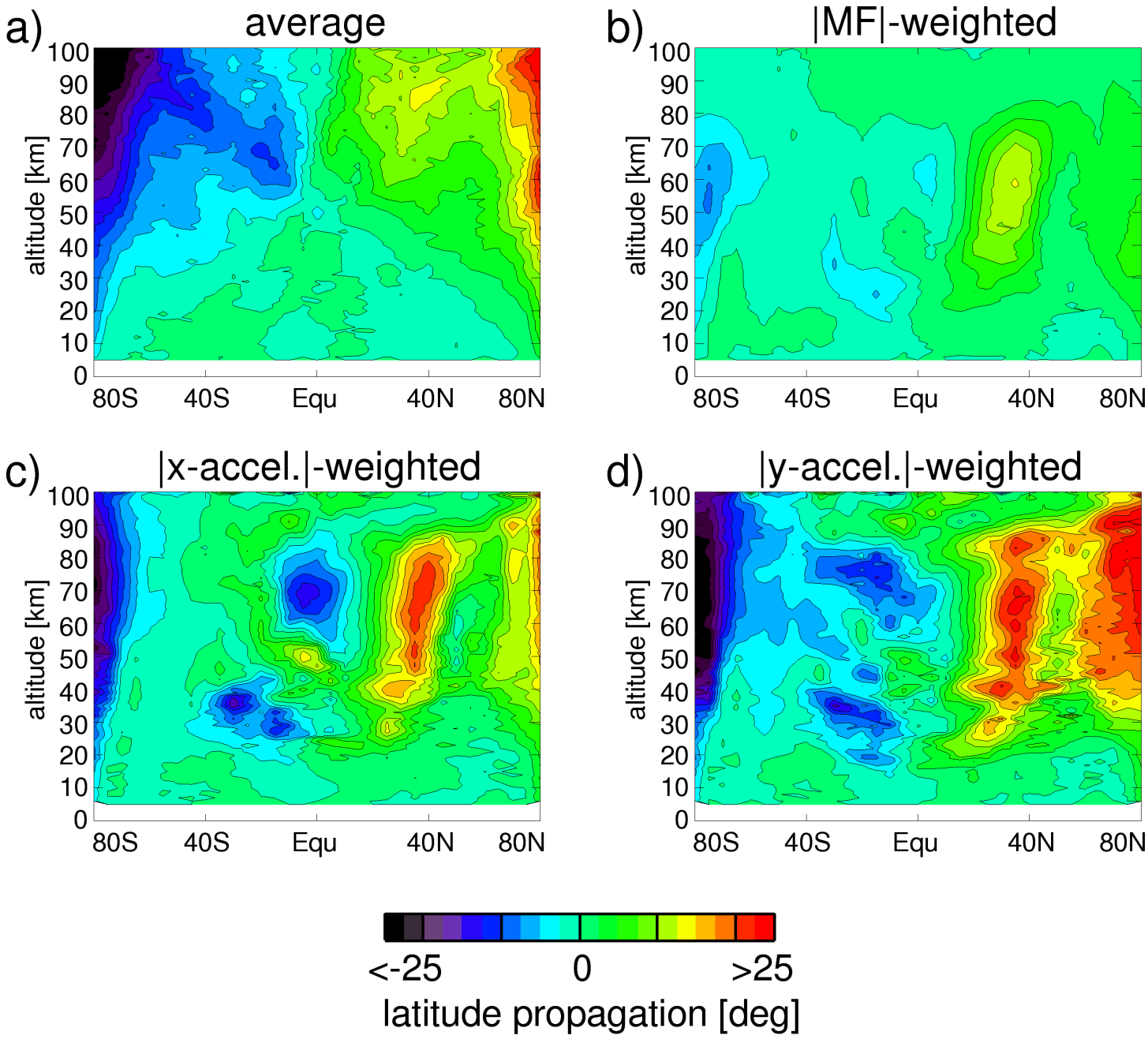
Simplifications → y-Accel.



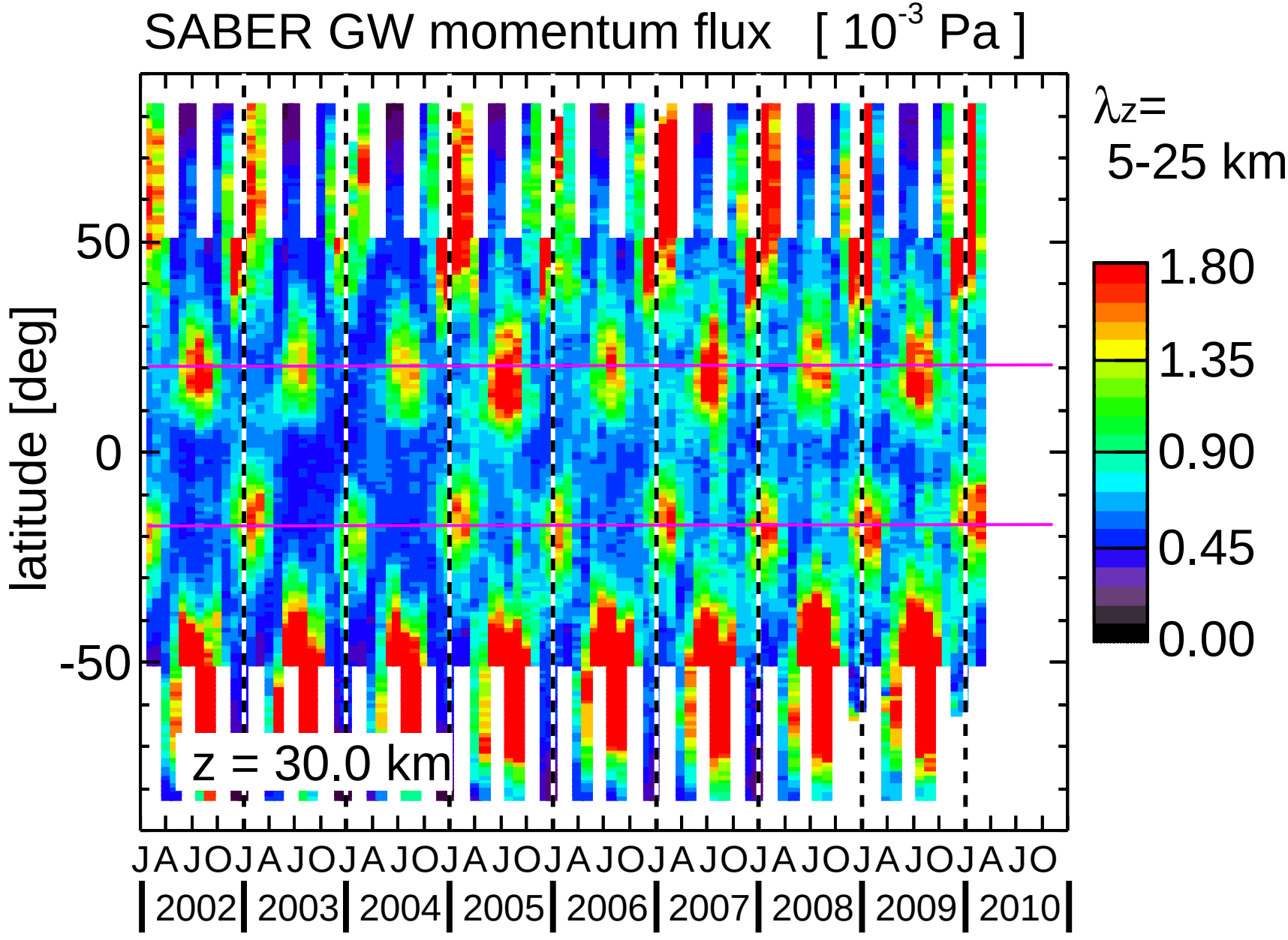
Meridional Acceleration

15 Jul. 2003

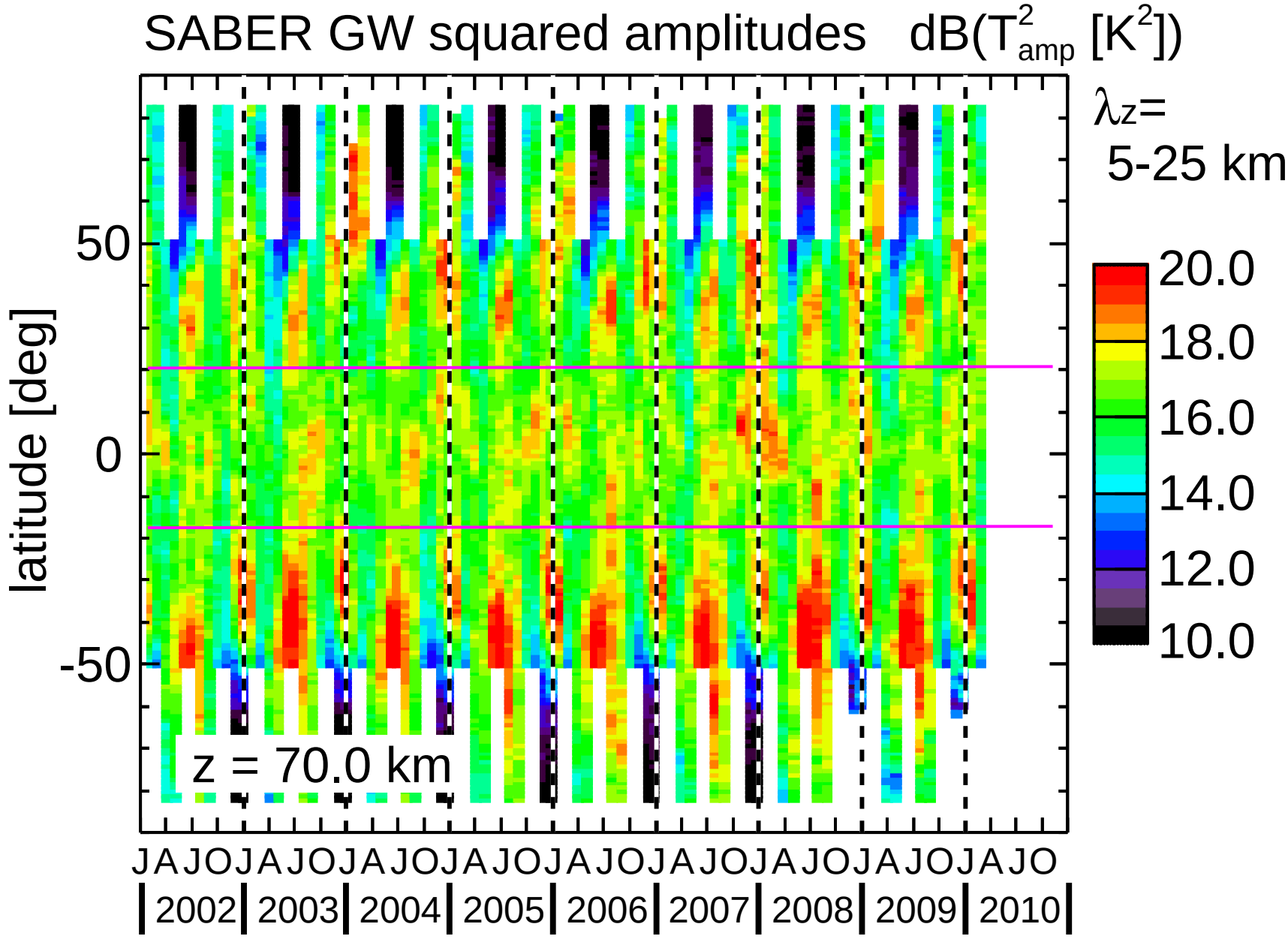
Inferred: Cross-Latitude Propagation



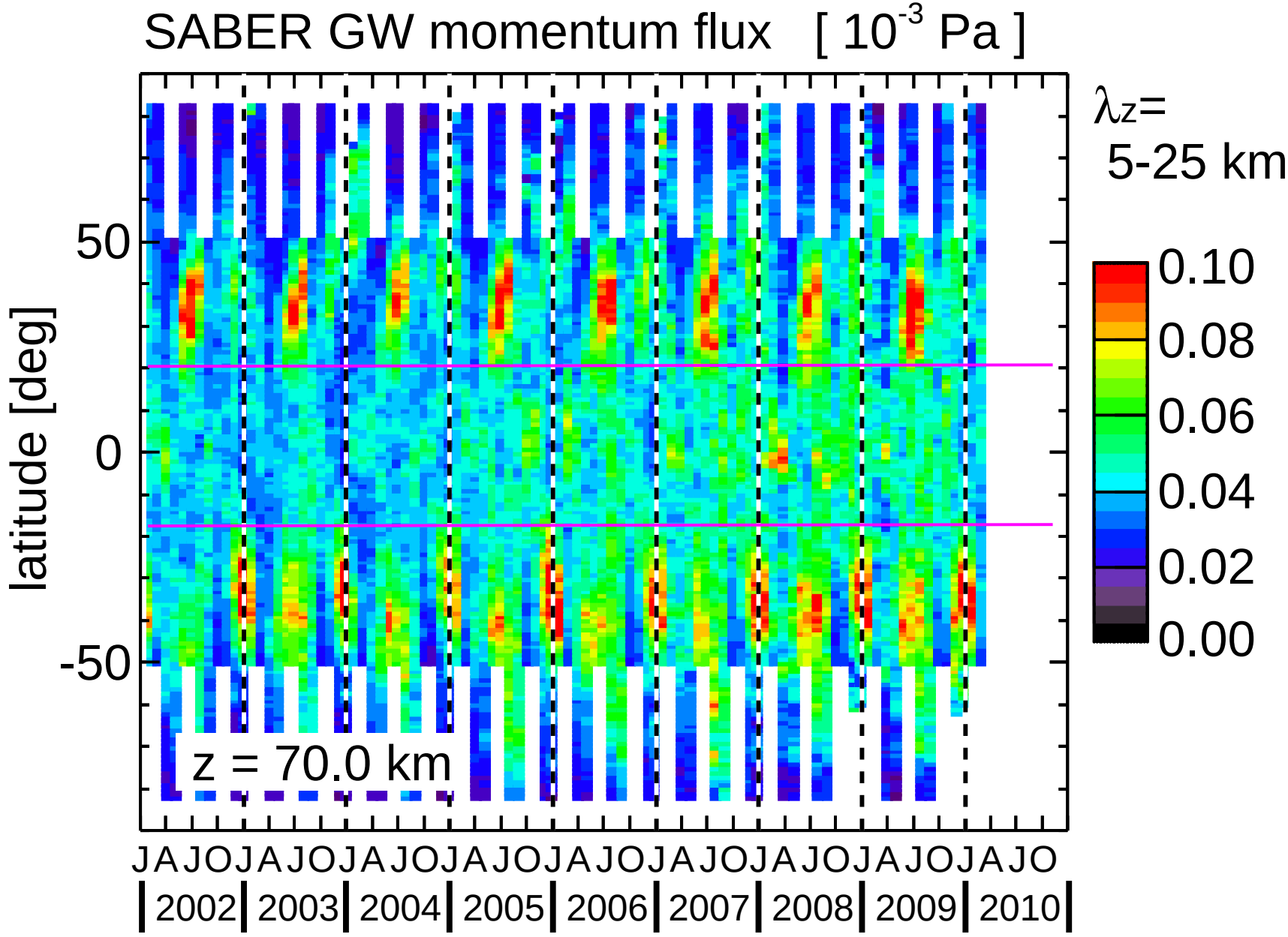
SABER: almost 10 years



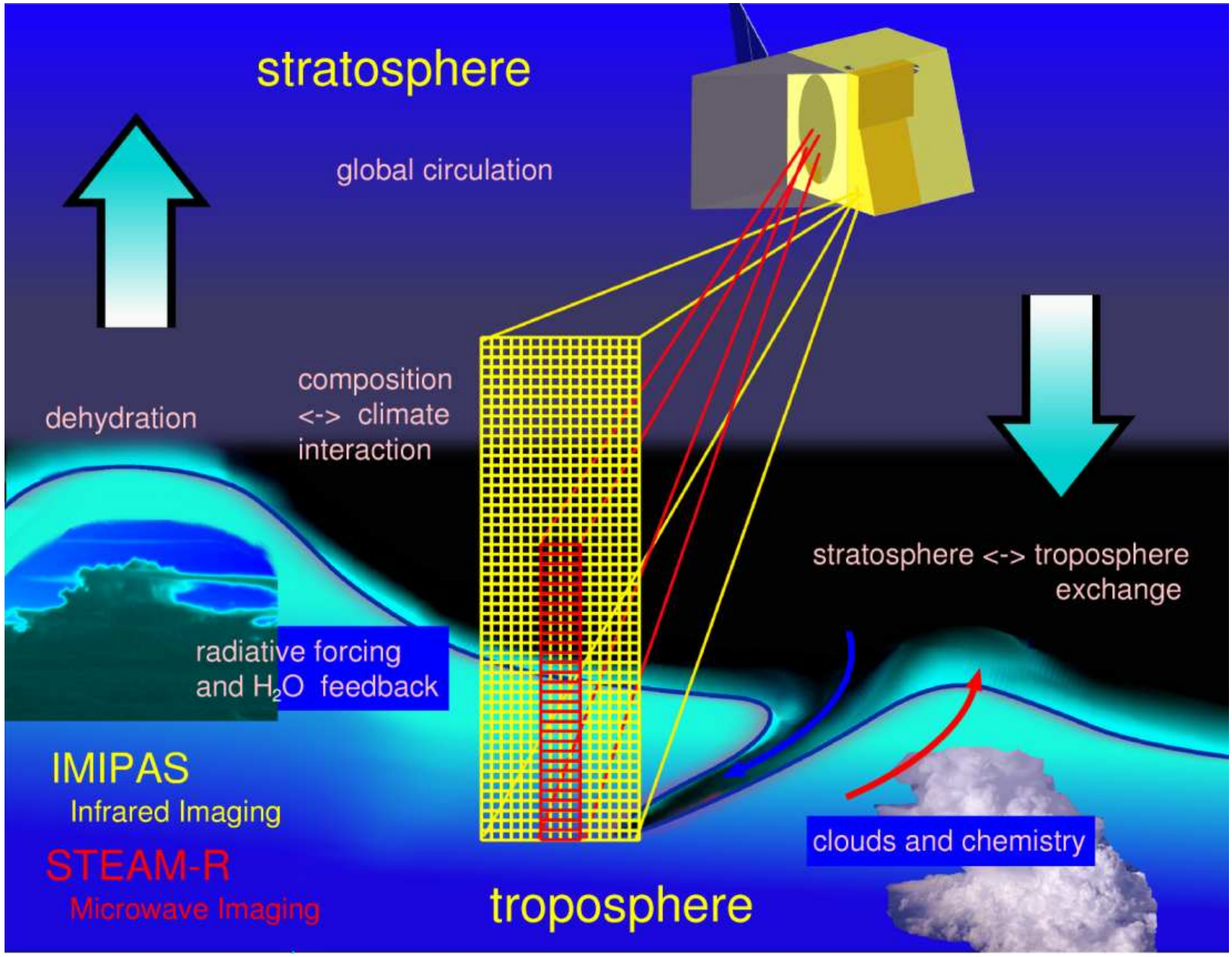
SABER: variance → SAO?



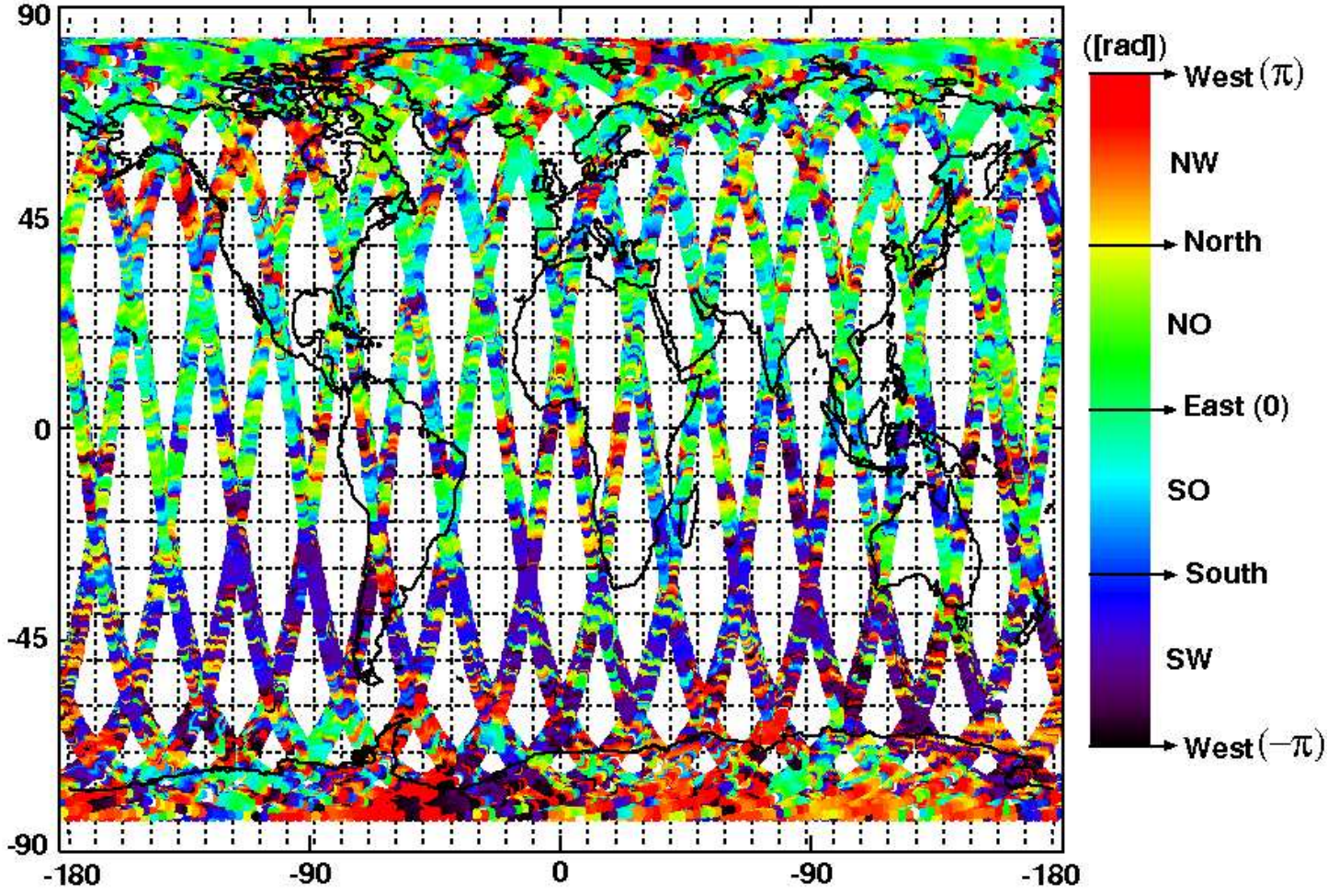
SABER: |MF| → AO?


SABER GW momentum flux [10-3 Pa]
λz=
5-25 km
0.10
0.08
0.06
0.04
0.02
0.00
latitude [deg]
50
0
-50
z = 70.0 km
JAJOJAJOJAJOJAJOJAJOJAJOJAJOJAJOJAJOJAJO
2002
2003
2004
2005
2006
2007
2008
2009
2010

PREMIER Phase-A, ESA GW-study



Preliminary: propagation direction



Northern Hemisphere (NH) summer: GWs preferentially propagate opposite to westerlies on SH and opposite to easterlies on NH

Summary

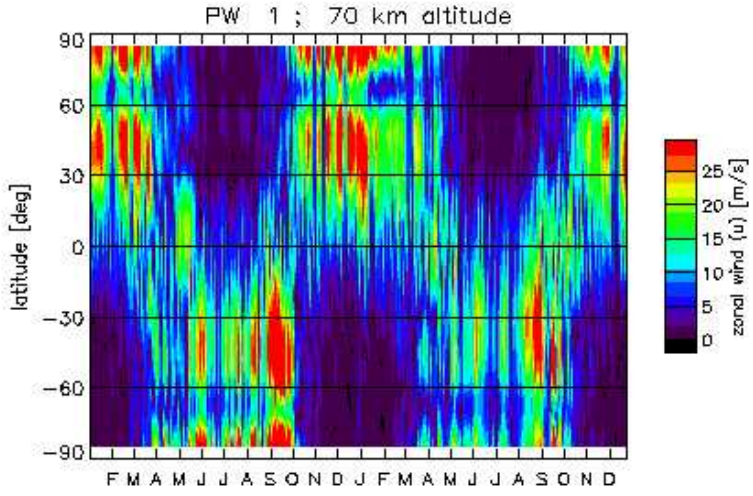
- Current satellites cannot fully characterize GWs
- Climatologic data sets of GW $|MF|$ from SABER, HIRDLS
- Synergetic use of satellite data and global GW model $\Rightarrow$ Tuneable parameters of given model
- Annual cycle variations not fully described $\rightarrow$ incorporate physical sources
- Modeling $\Rightarrow$
  - Horizontal refraction (remote recoil) important for meridional acceleration
  - Noteable influence on GW-PW interaction
- Future (hopefully) PREMIER

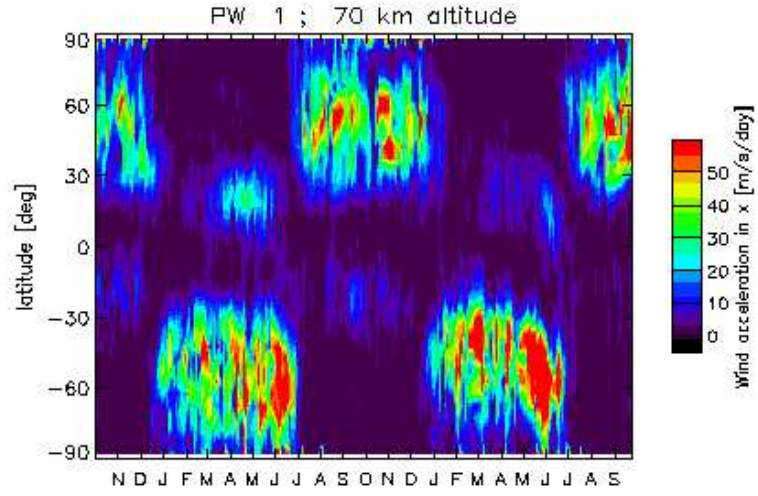
PWs filter GWs → GWs force PWs

TIME-GCM: PW amplitude

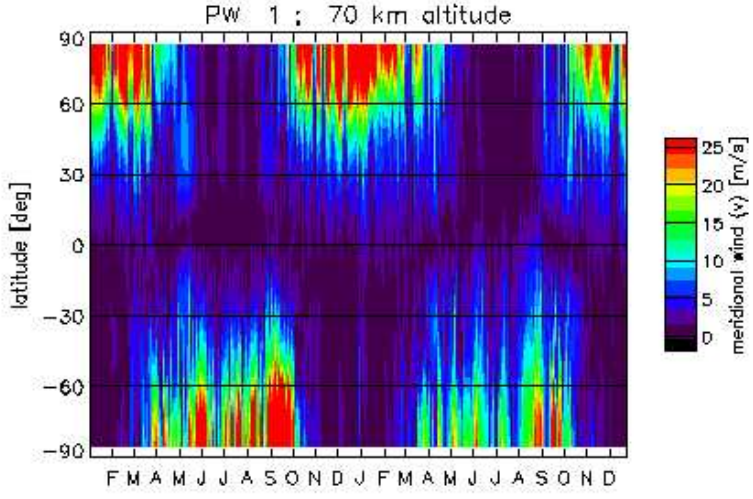
GROGRAT: GW acceleration

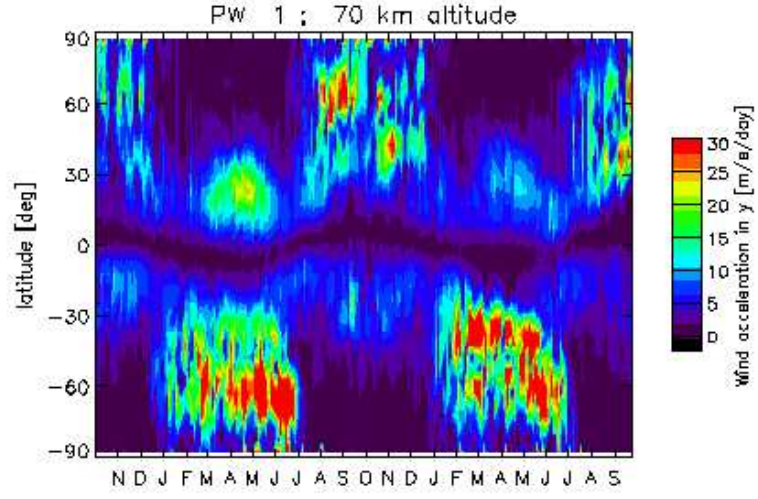
zonal





meridional



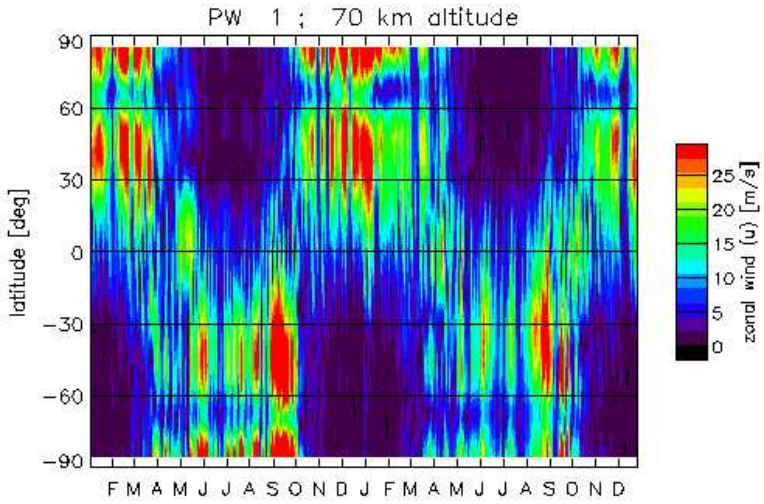


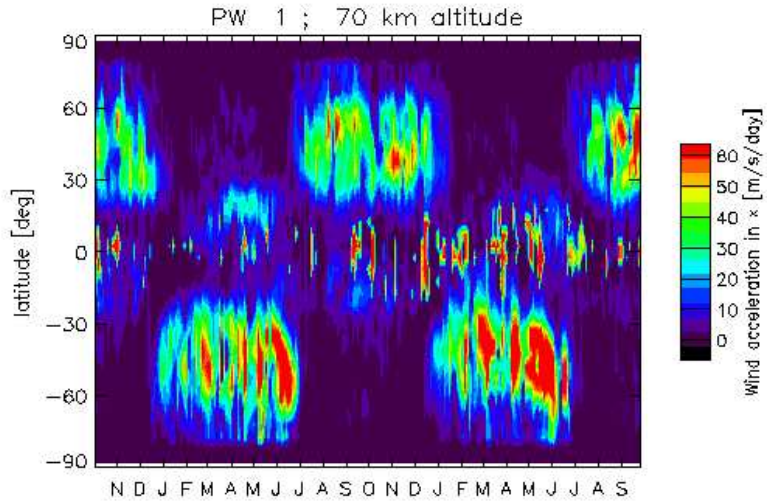
Purely vertical propagation

TIME-GCM: PW amplitude

GROGRAT: GW acceleration

zonal





meridional

