Impact of Sudden Stratospheric Warming Event on the TTL and Deep Convective Activity

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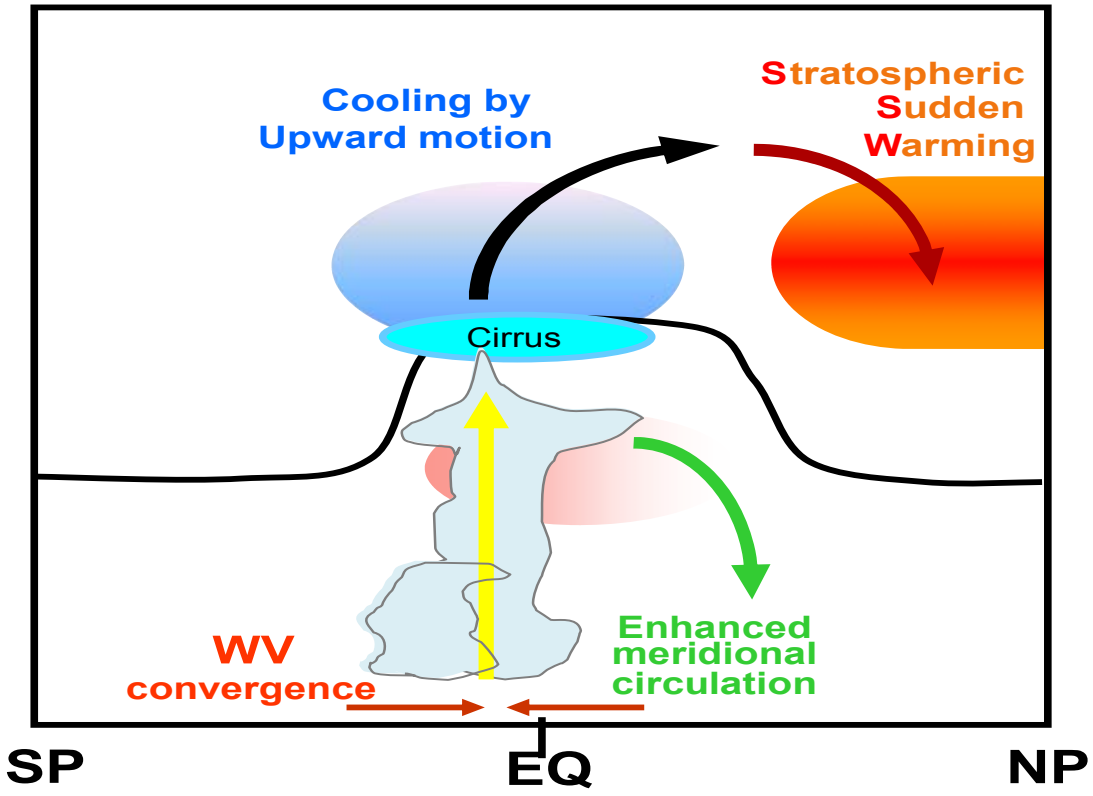
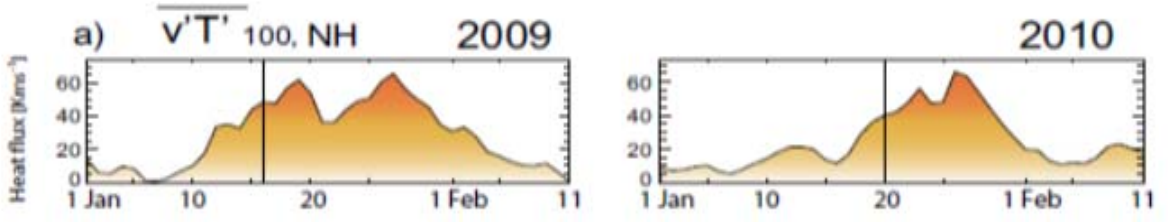
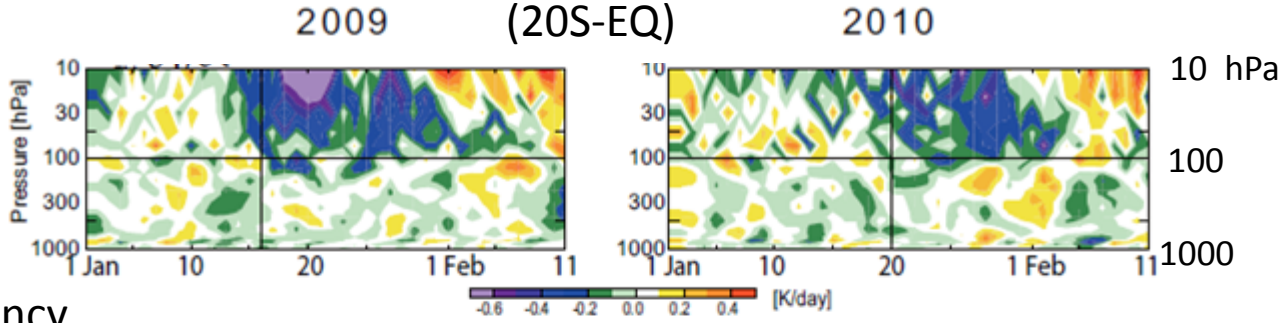
i) Eguchi et al.
ii) Kodera et al.
ACP, 2015



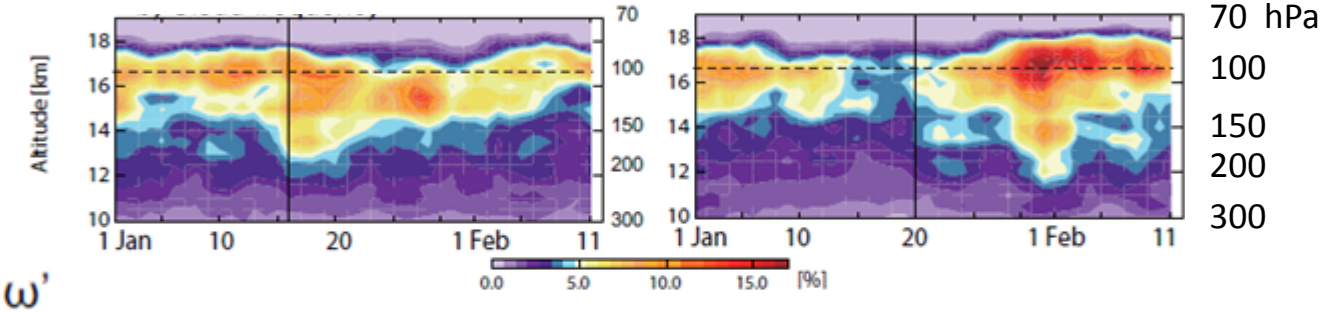
Kodera et al.
(2015, ACP)



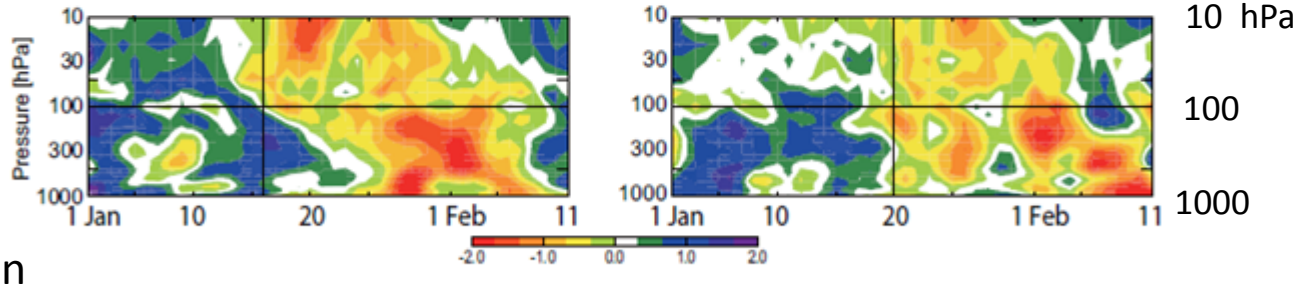
∂T/∂t



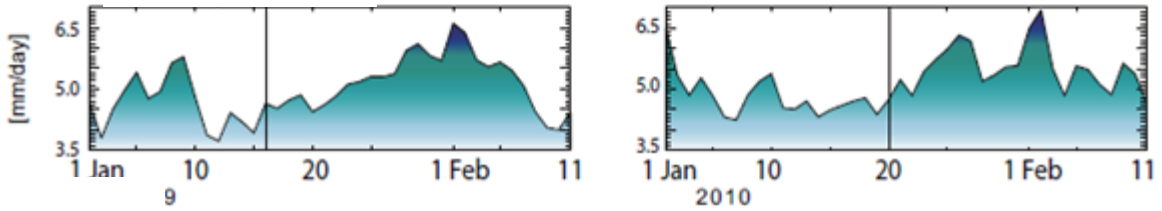
Cloud frequency

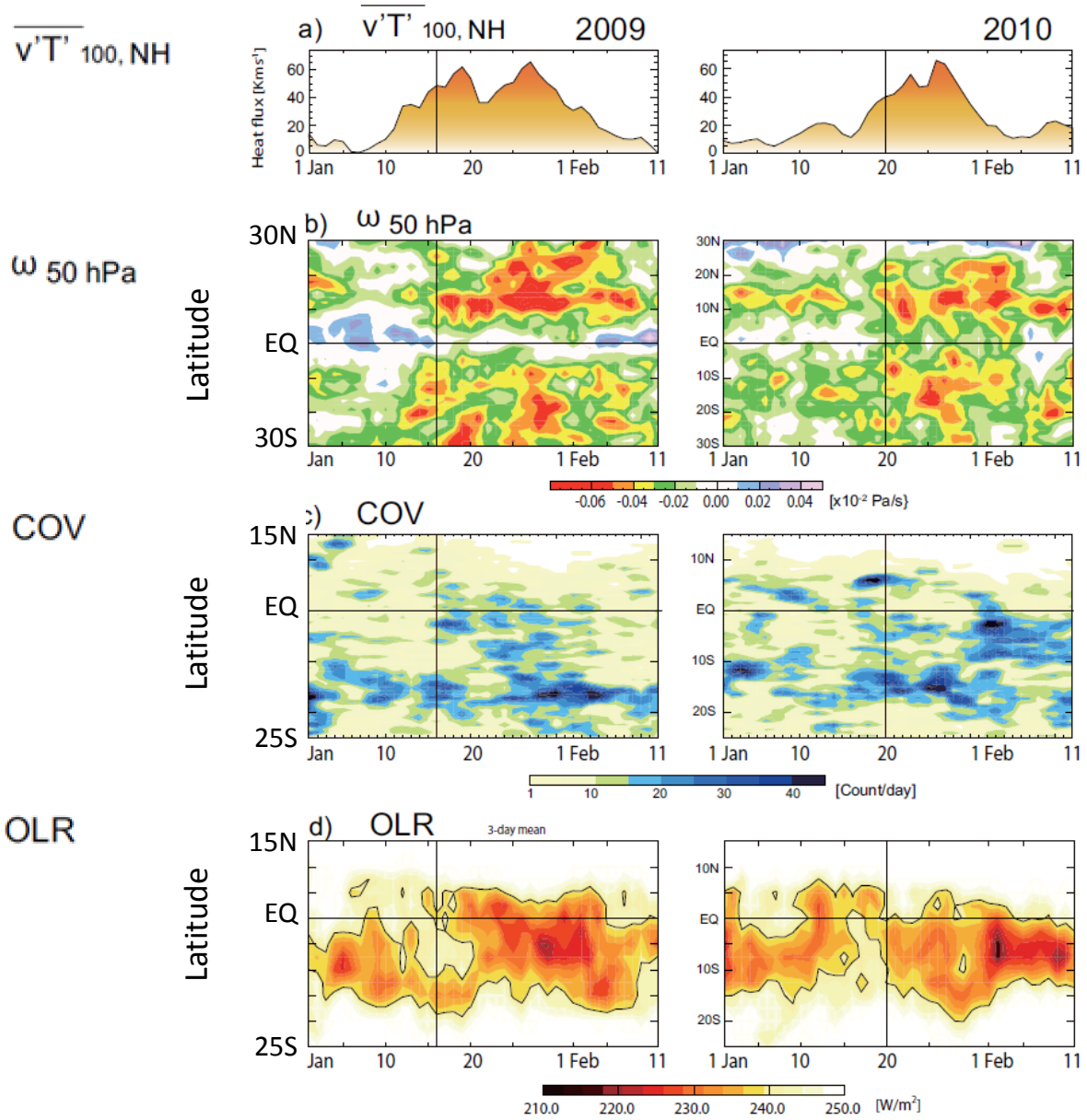


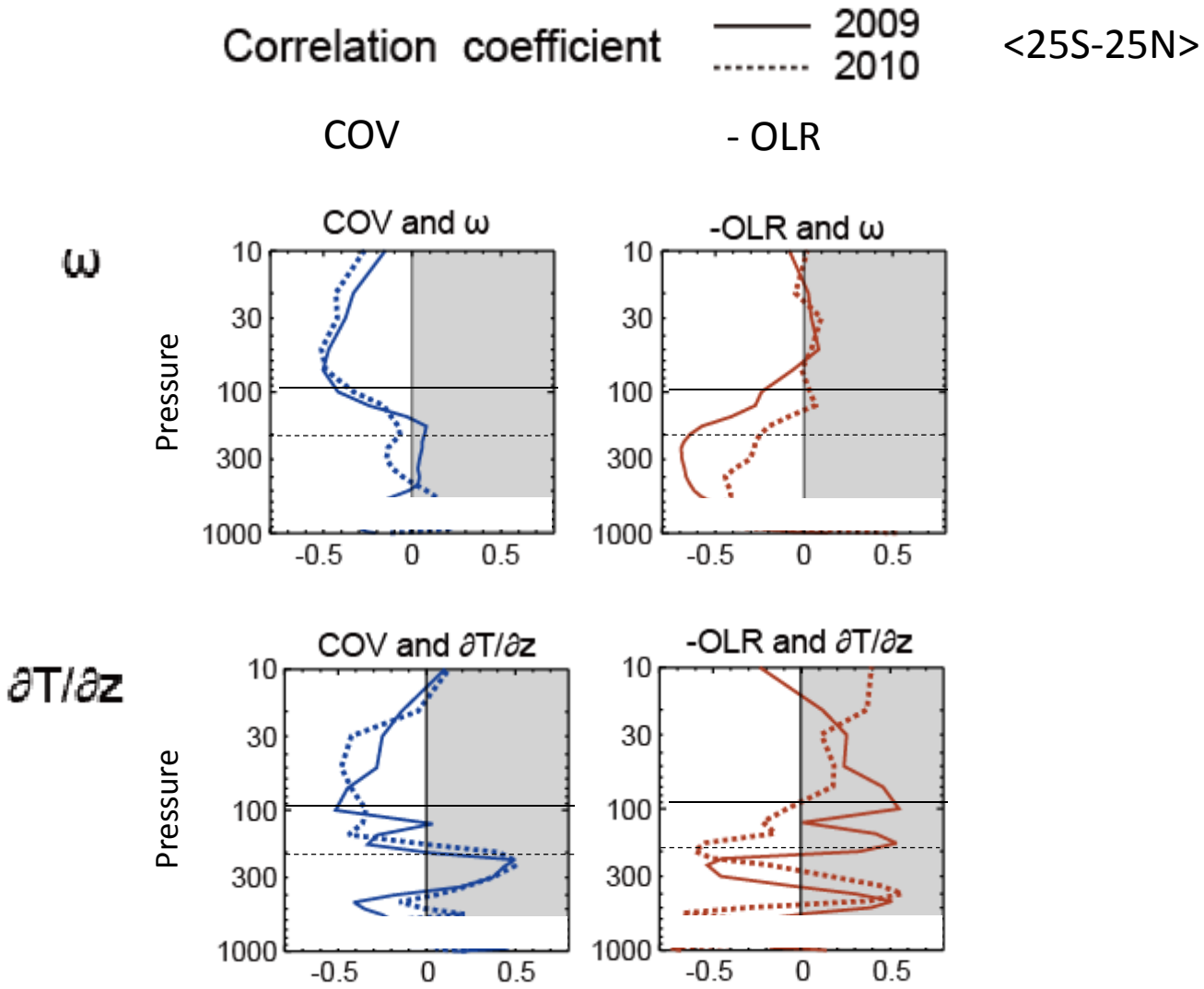
Normalized ω'



Precipitation



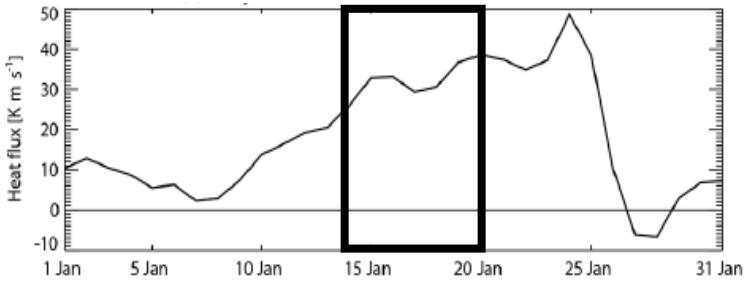

$\overline{v'T'}$ 100, NH
a) $\overline{v'T'}$ 100, NH
2009
2010
Heat flux [Kms^{-1}]
60
40
20
0
1 Jan
10
20
1 Feb
11
ω 50 hPa
b) ω 50 hPa
Latitude
30N
EQ
30S
20N
10N
10S
20S
-0.06 -0.04 -0.02 0.00 0.02 0.04 [x10^{-2} Pa/s]
COV
c) COV
15N
25S
1
10
20
30
40
[Count/day]
OLR
d) OLR
3-day mean
210.0 220.0 230.0 240.0 250.0 [W/m^2]


Correlation coefficient
2009
2010
<25S-25N>
COV
- OLR
ω
COV and ω
-OLR and ω
∂T/∂z
COV and ∂T/∂z
-OLR and ∂T/∂z
Pressure
10
30
100
300
1000
-0.5
0
0.5

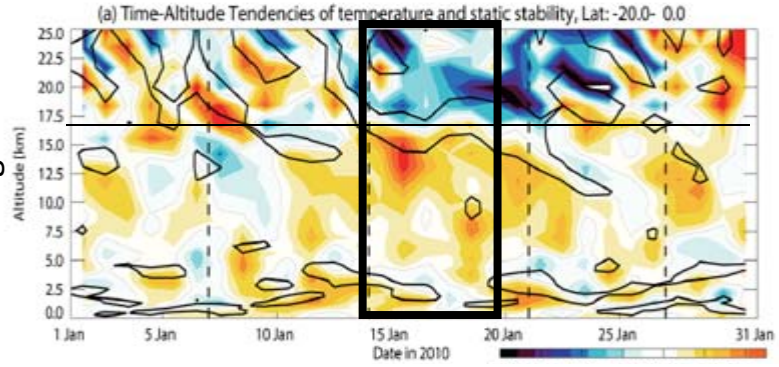
SSW event in a non-hydro model

Eguchi et al. (2015, ACP)

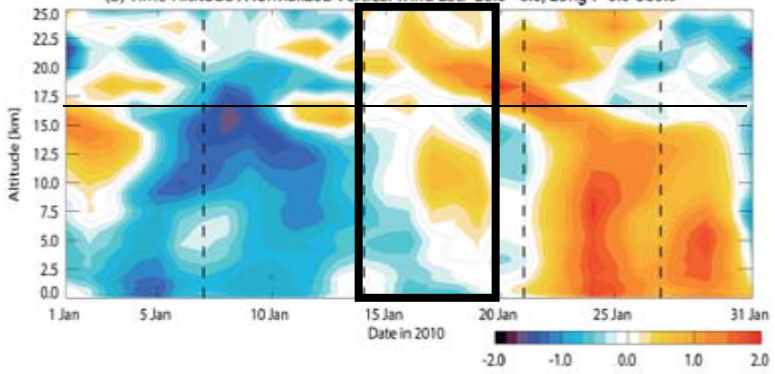
$\overline{v'T'}$ 100, NH <45-75N> 14-20 Jan



$\partial T/\partial t$ <20S-EQ>



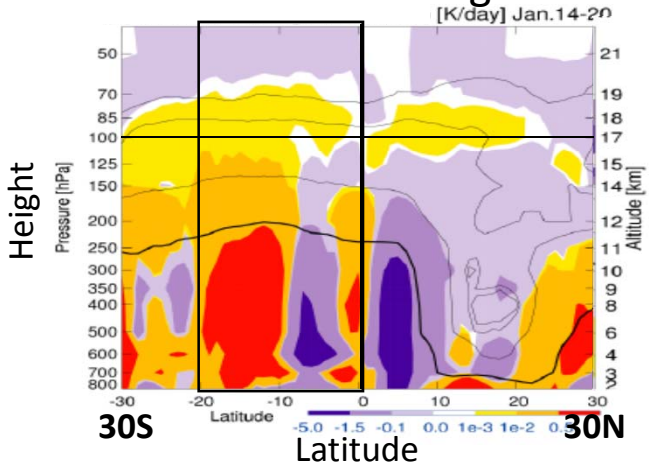
W'



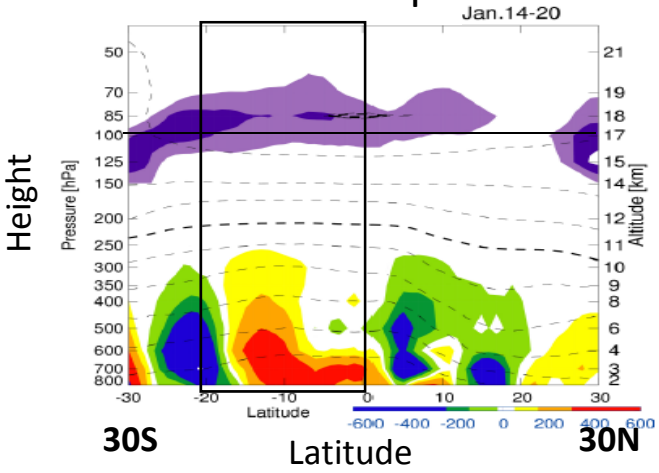
Day in 2010

14-20 Jan mean

Diabatic heating



Water vapor



Model SSW impact: Longitudinal structure

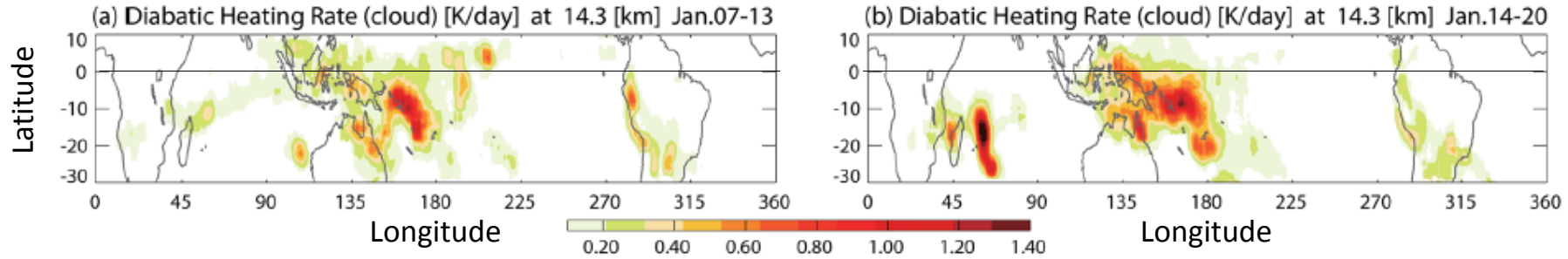
before onset

7- 13 Jan

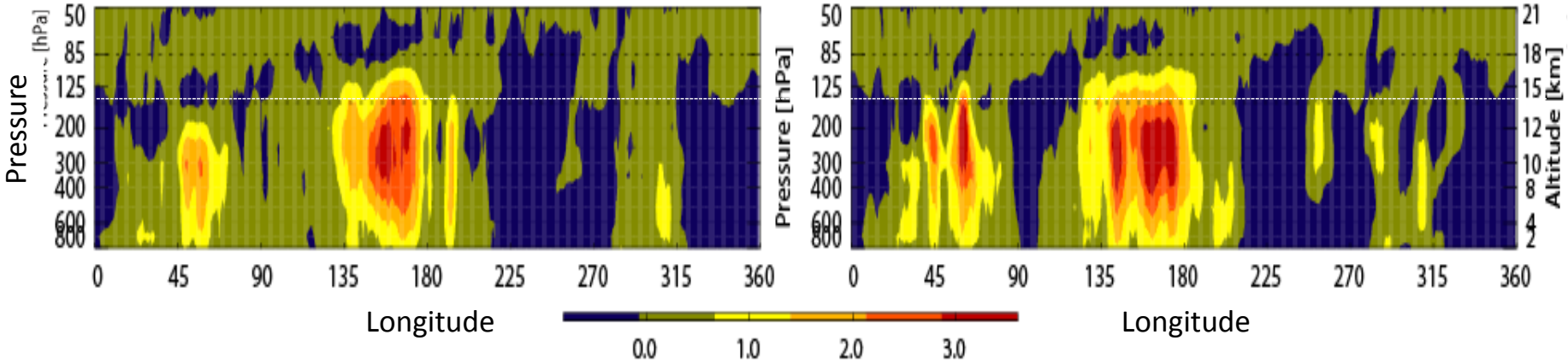
after onset

14-20 Jan

Diabatic heating rate at 14.3 km

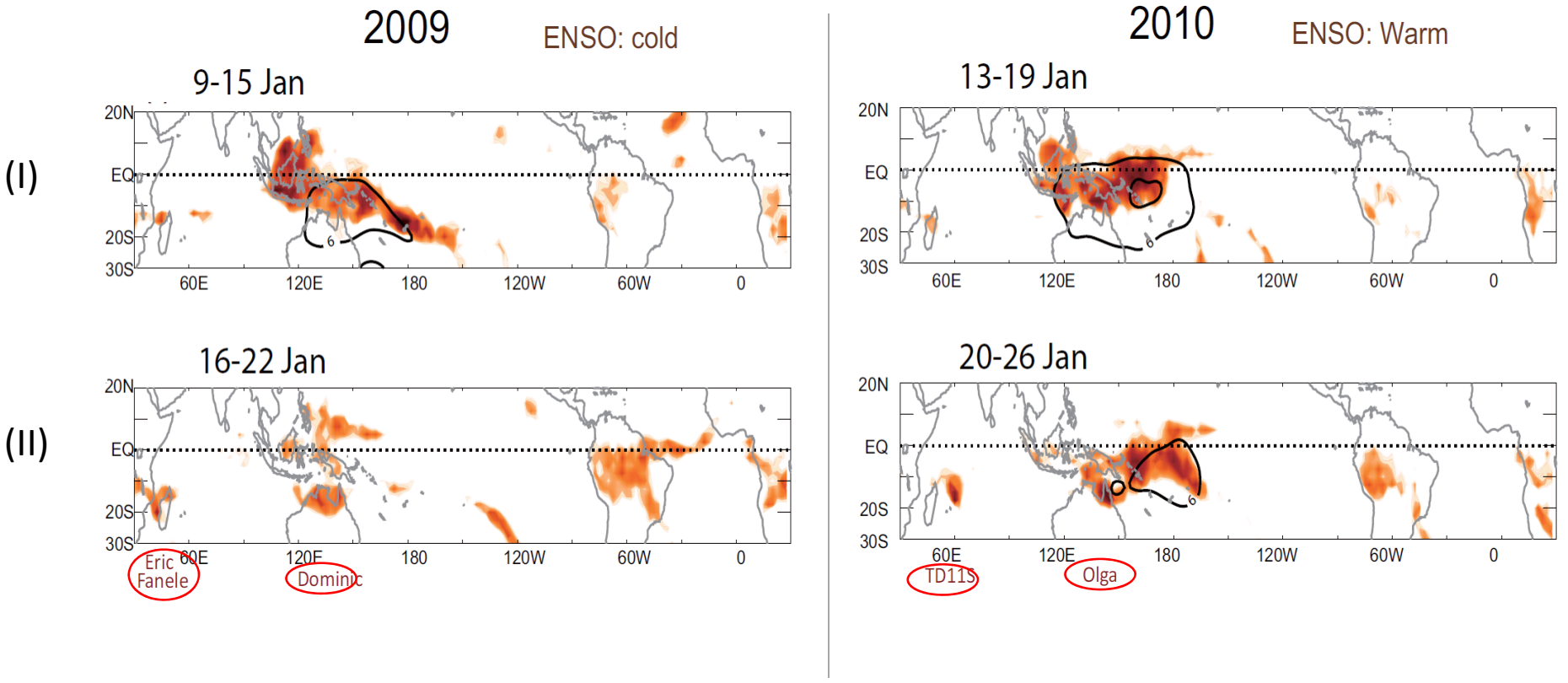


W' (20S-EQ)



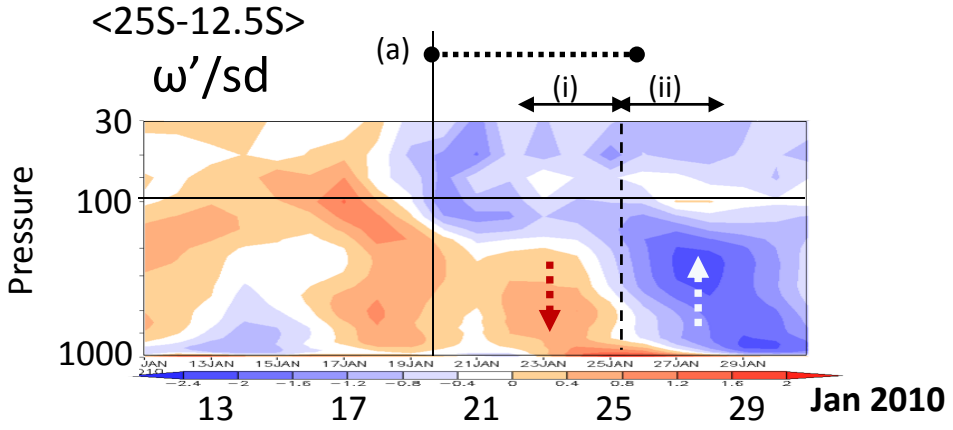
Observed SSWs

OLR and Velocity potential at 925 hPa

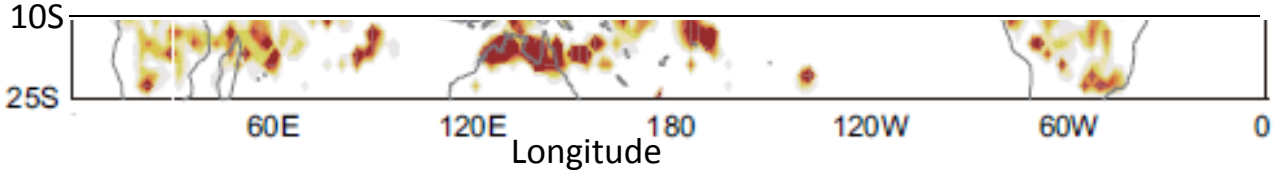


Convective active zone expands over a wide longitudinal areas in the SH 10-20S

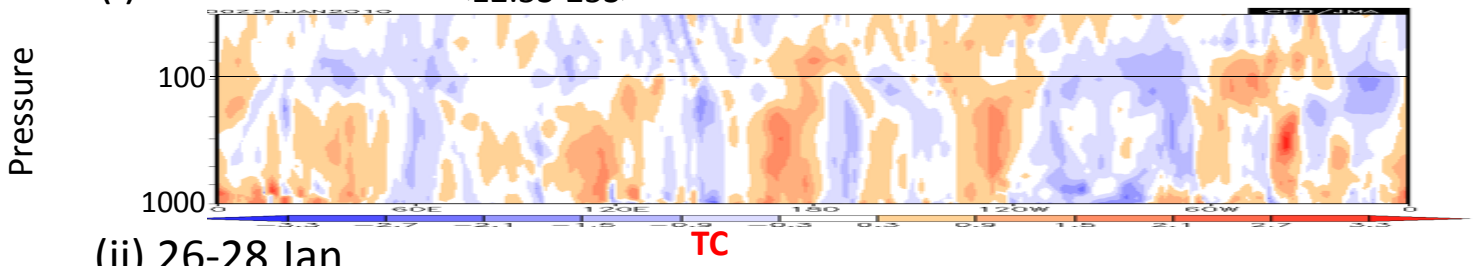
2010 SSW case:



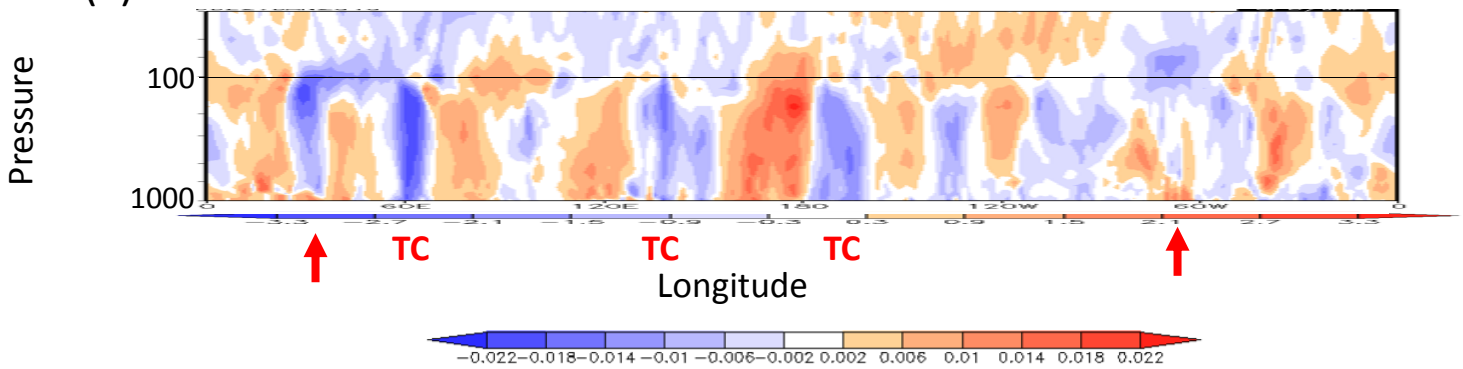
a) 20-26 Jan COV



b) (i) 23-25 Jan ω <12.5S-25S>



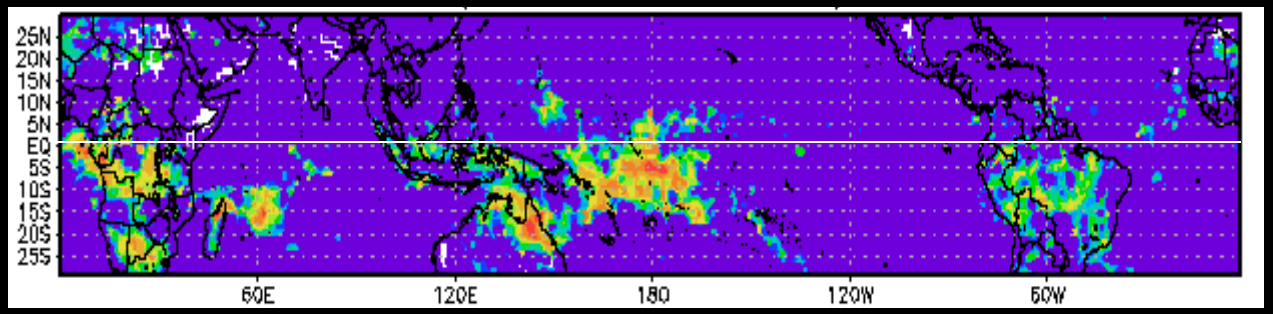
(ii) 26-28 Jan



MODIS Cloud top pressure

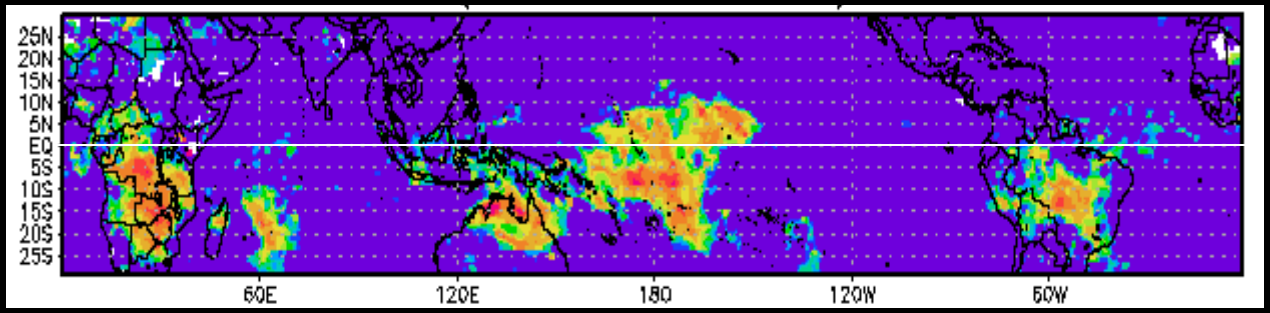
TERRA Night pass

23-25 Jan 2010



TC

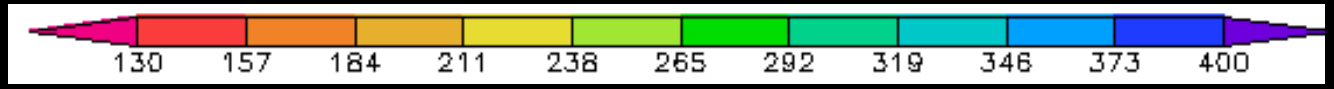
26- 28 Jan



CO **TC** **TC** **TC** **Flood**

TC Olga: 22 – 30 Jan

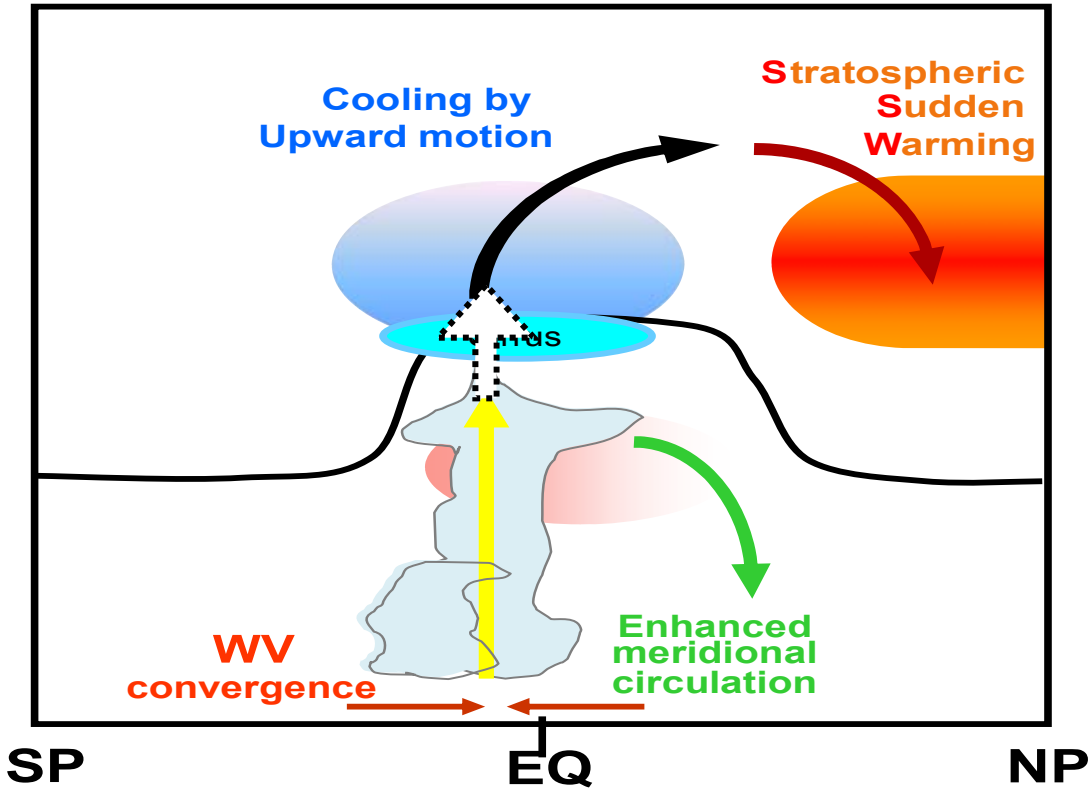
TS11: 26– 30 Jan **TC Nisha:** 27 – 31 Jan



Poster

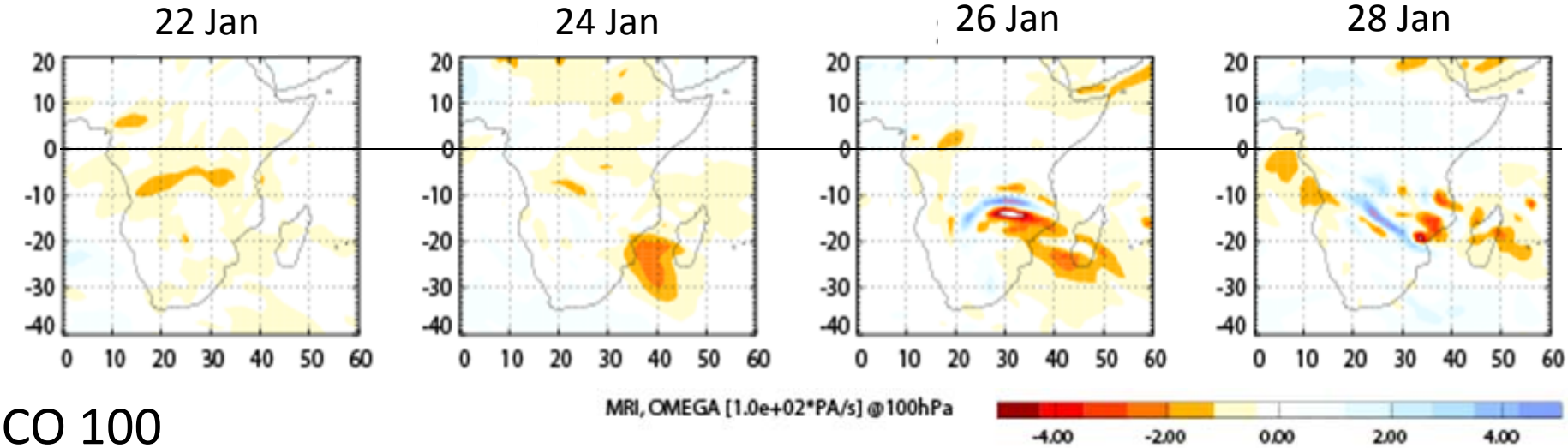
Rapid Transport of CO from Troposphere to Stratosphere via Tropical Convection During SSW in January 2010

N. EGUCHI[1], K. KODERA[2,3], R. UEYAMA[4], H. TAKASHIMA[5], and M. Deushi[6]

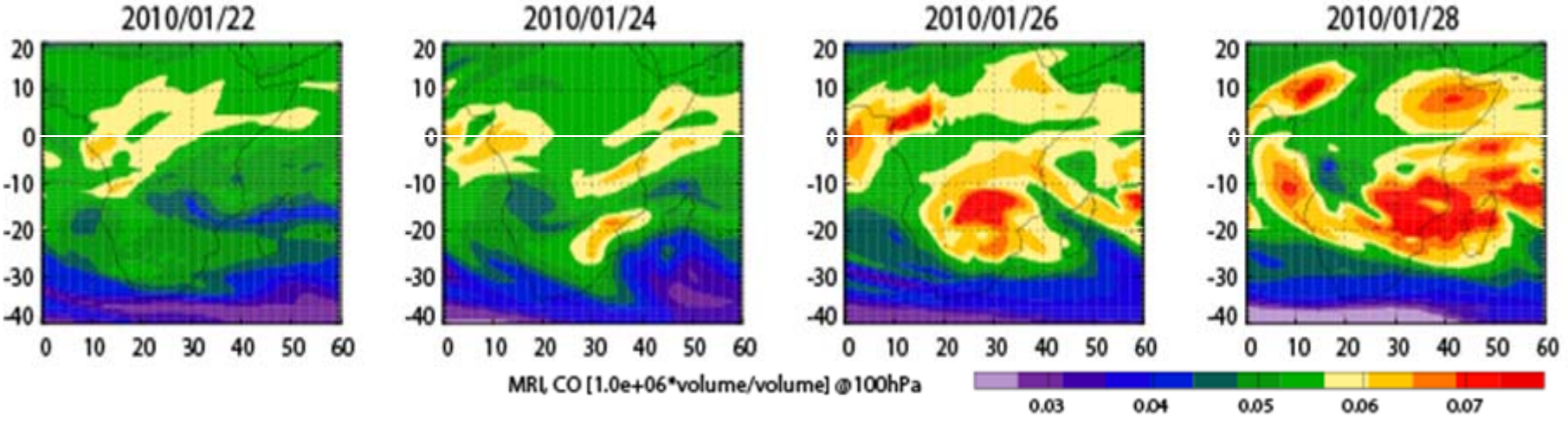


MRI Chemical transport model simulation (JRA55 horizontal winds)

ω 100



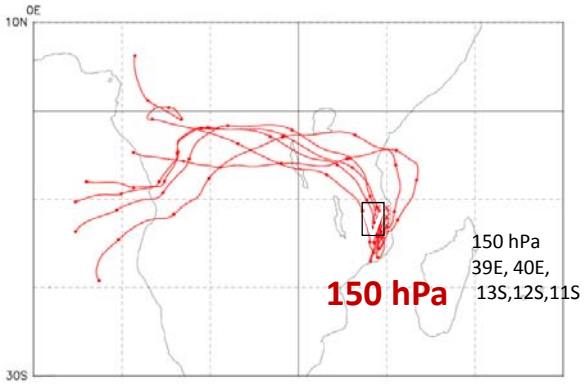
CO 100

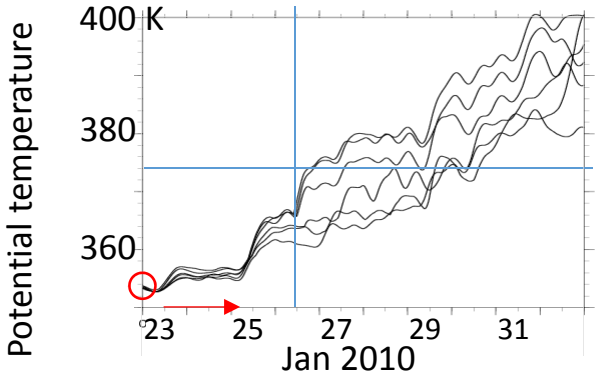


The NIPR trajectory model study using ECMWF interim winds

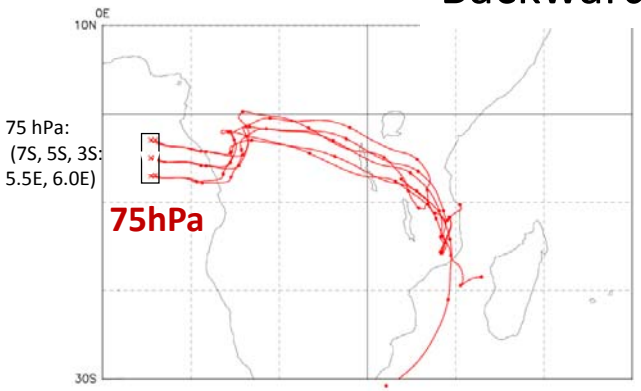
t=0: 00Z 23 Jan 2010
t=240: 00Z 2 Feb 2010

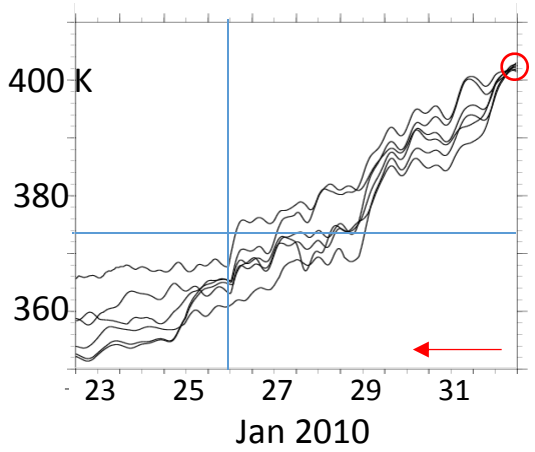
Forward





Backward

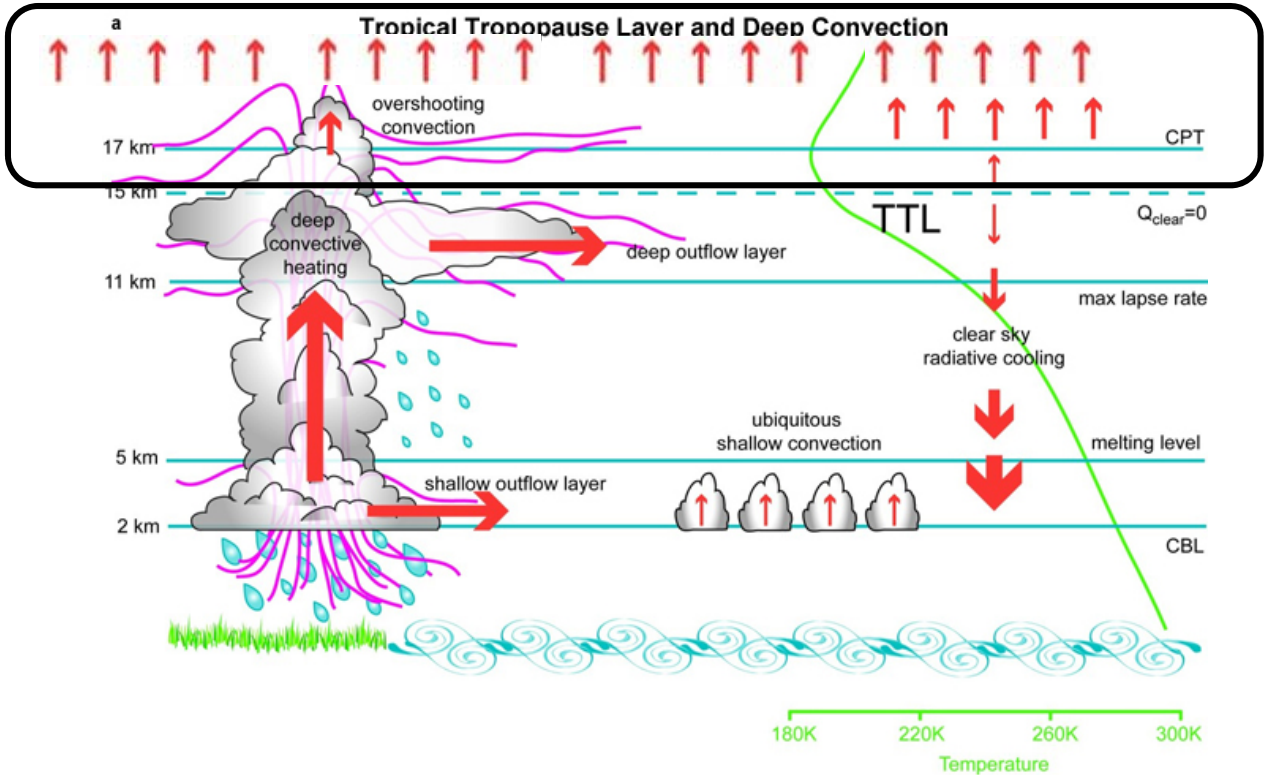




The NIPR trajectory model (Tomikawa and Sato, 2005; http://firp-nitram.nipr.ac.jp) was used.

Concluding remark:

We need to study local and global vertical velocity variation together.



SPARC: D. Pendlebury