

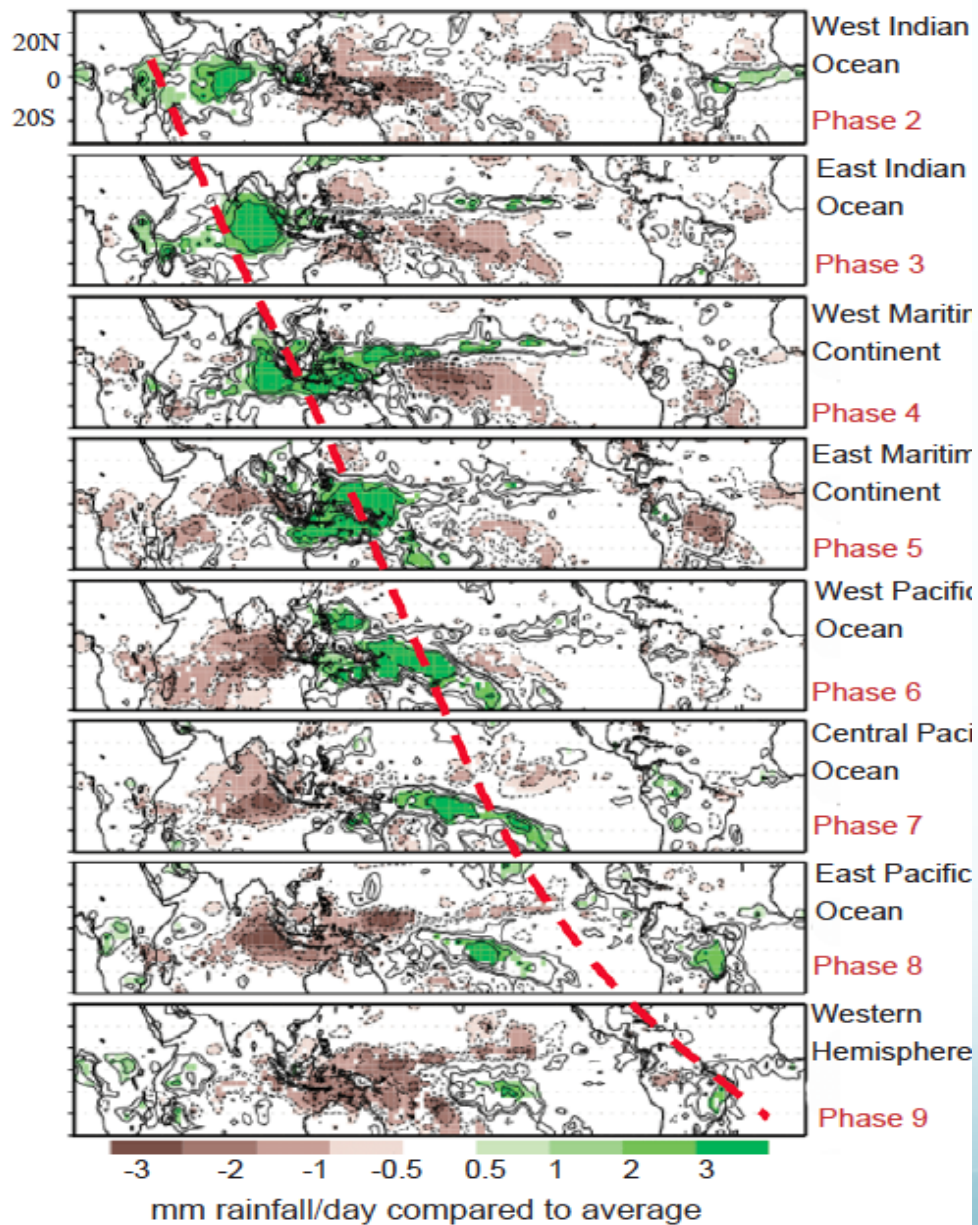
How the MJO Influences the Equatorial Tropospheric Ozone 1st Results

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MJO Rainfall



MJO:

-Largest Element Tropical
Intraseasonal variability (30-90 days)

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The importance of the MJO

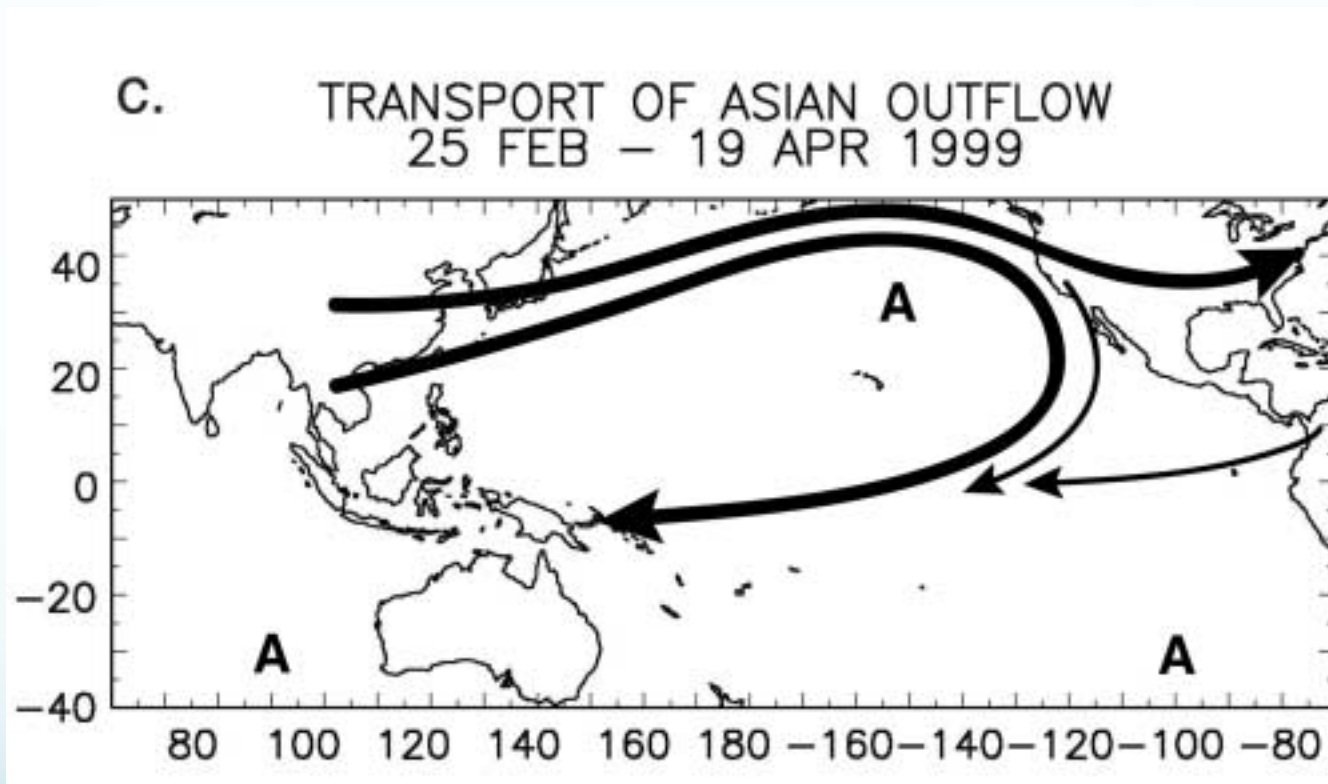
Interacts with El Niño

Influences the intensity and the break periods of Asian and Australian monsoons

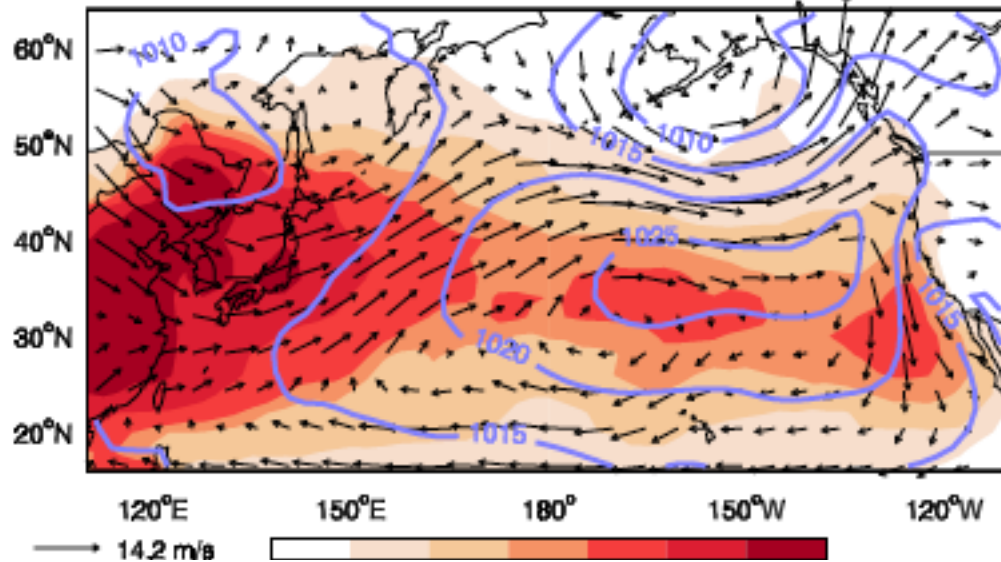
Affects tropical cyclones as well as high latitude weather patterns

But little attention was paid to the MJO's interaction with the chemical components of the global climate system, such as ozone and aerosols.

Transport of Pollution to the Tropics



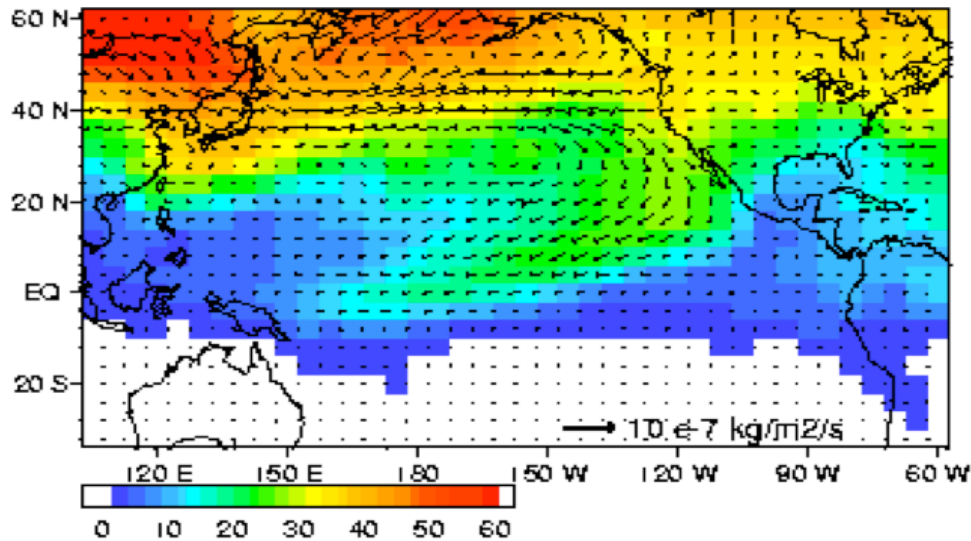
Enhanced ozone production rate from Asian emissions at 800 hPa



Zhang et al.,
INTEX-B ozone production
rate

Layer 2 (0.4 km)

European Fuel

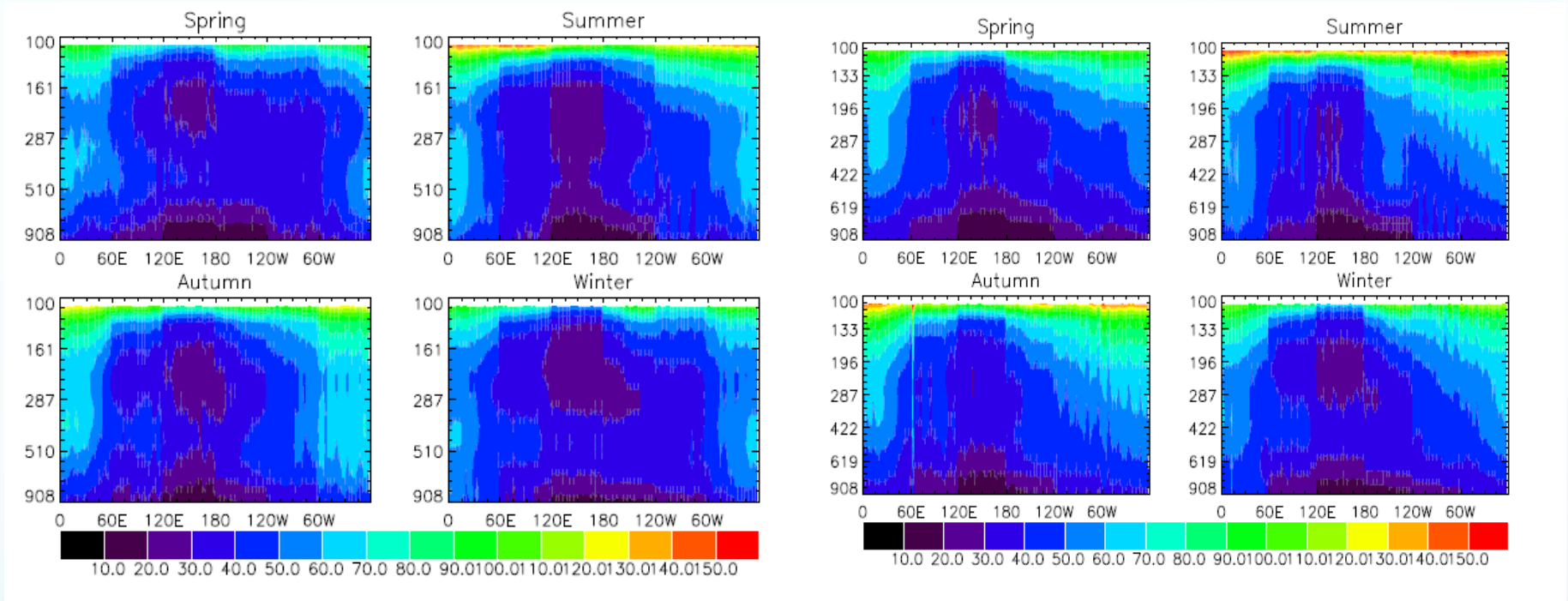


Staudt et al. (2000)

Questions

- What is the impact of convection on this “river of pollution”
 - Does convection increase/decrease ozone?
 - Impact of convection on upper troposphere?
 - Impact of lightning NO_x/STE?

Climatology



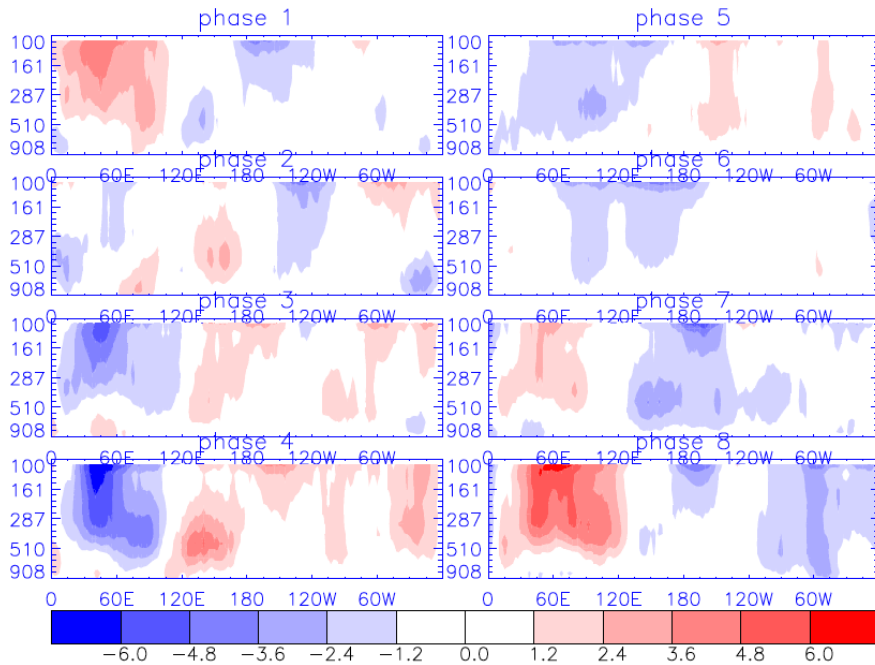
TES 04-08 ozone (10S to 10N average)

CESM 04-08 ozone (10S to 10N average)

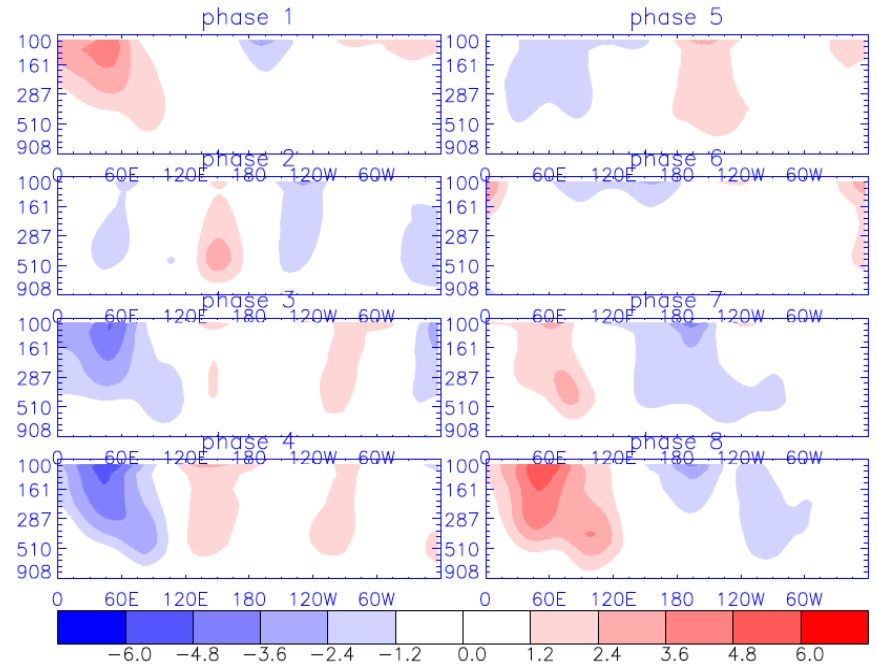
Over the warm pool, ozone concentration is less.

The model underestimates ozone in the lower troposphere and overestimates ozone in the upper troposphere.

MJO composite

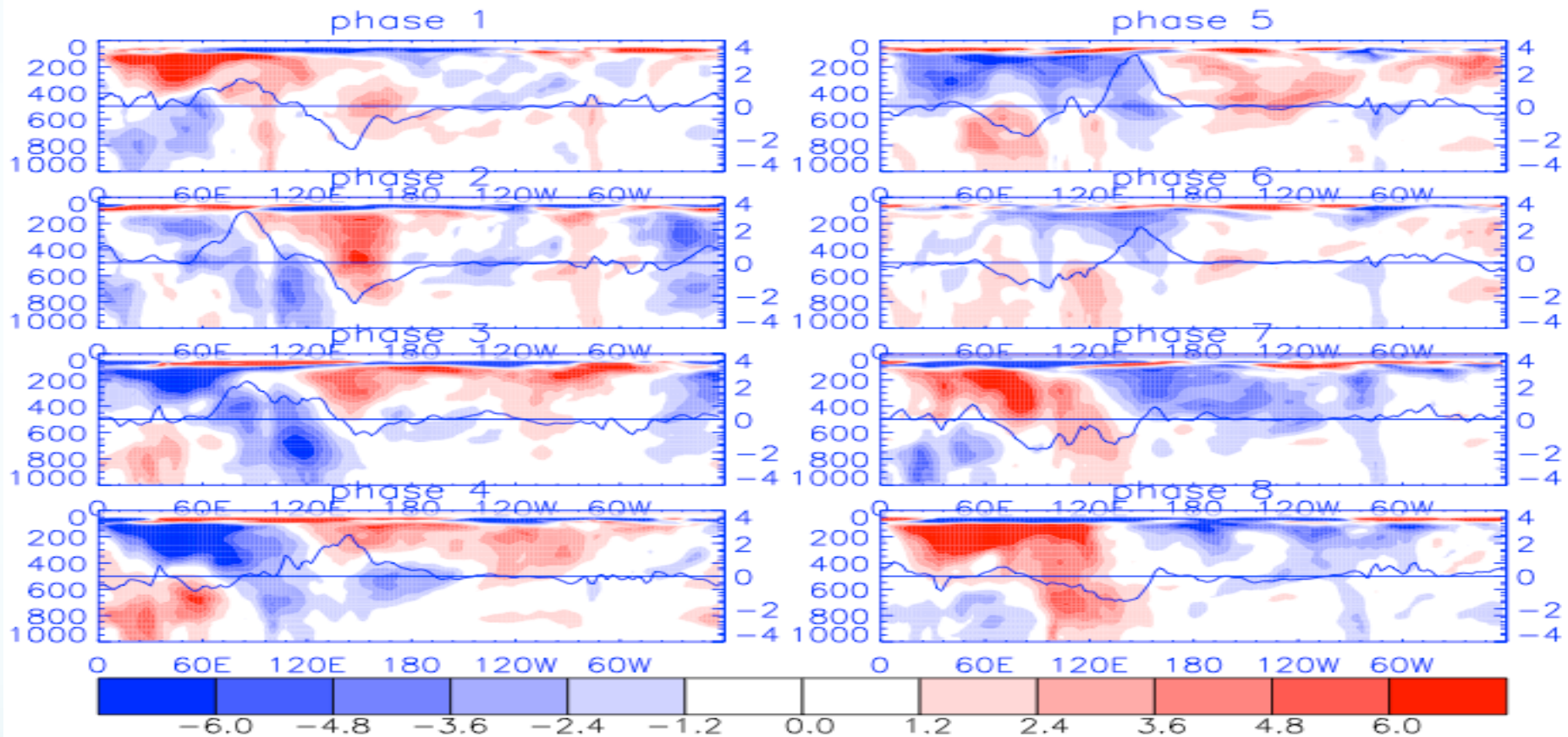


TES 04-08 the MJO-filtered ozone (10S to 10N average)



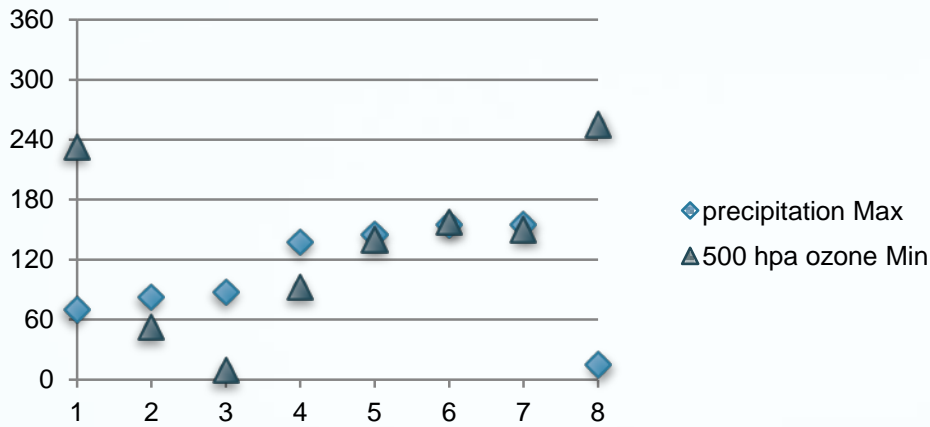
CESM 04-08 the MJO-filtered ozone (10S to 10N average)

The correlation coefficients ranges from 0.66 to 0.88 for eight phases between observation and model results.



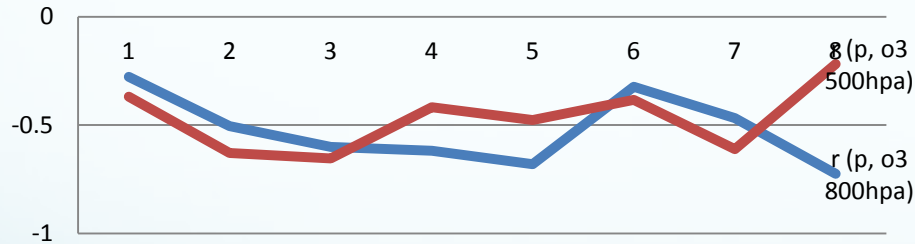
CESM 2004-2008 5S to 5N average MJO signal

- Enhanced convection moves from the west to the east
- Convection during the MJO events reduces equatorial tropospheric ozone



MJO moving pattern

Locations of enhanced convection and 500 hpa ozone Min are very close for phase 2-7



correlation coefficient for phases

Convection and ozone are anti-correlated



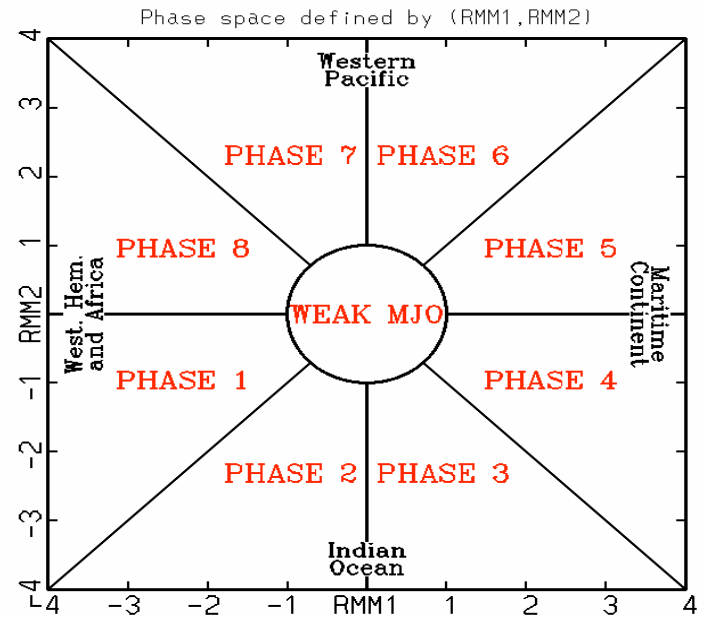
Future work

- Run the model again with a new “tag” mechanism to find out the driving factors for the ozone change
- Perform more data analysis to know better about how the MJO would change the total tropospheric ozone budget

Thanks for attention!

How to get the MJO signal

- Calculate the annual cycle and remove it
- 20-100 day band pass filter
- Sort data to 8 phases
- Phases are defined by CEOF of OLR (outgoing longwave radiation), U850hpa and U200hpa



<http://cawcr.gov.au/bmrc/clfor/cfstaff/matw/maproom/RMM/composites/phasediag.gif>

