

Effects of increased vertical resolution on the simulation of mean climate and the QBO



NCAR

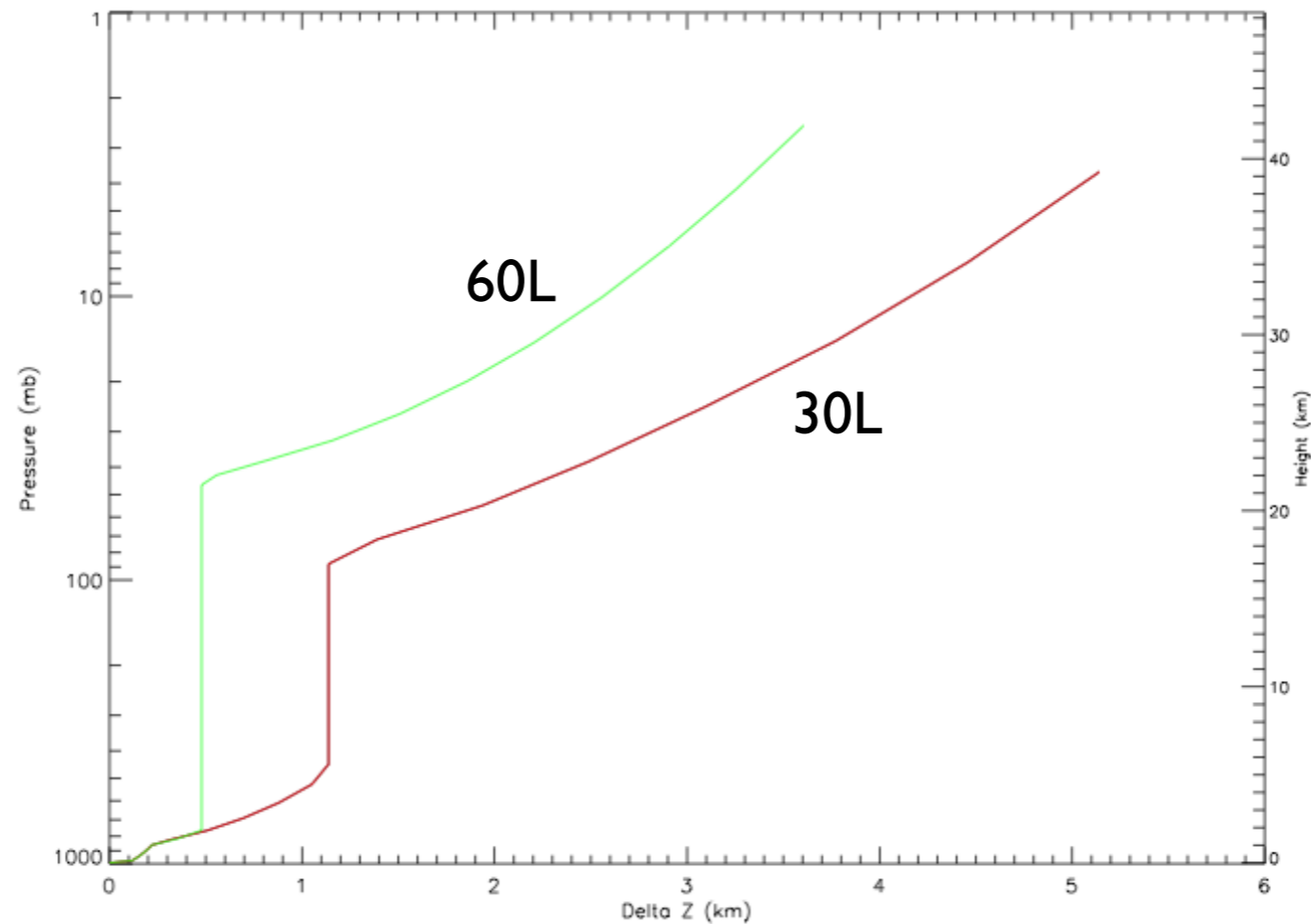
ESSL's Climate & Global Dynamics

CGD

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June 19, 2013

60L vs 30L model:



30L model: ~ **1200 m** resolution in troposphere/lower stratosphere

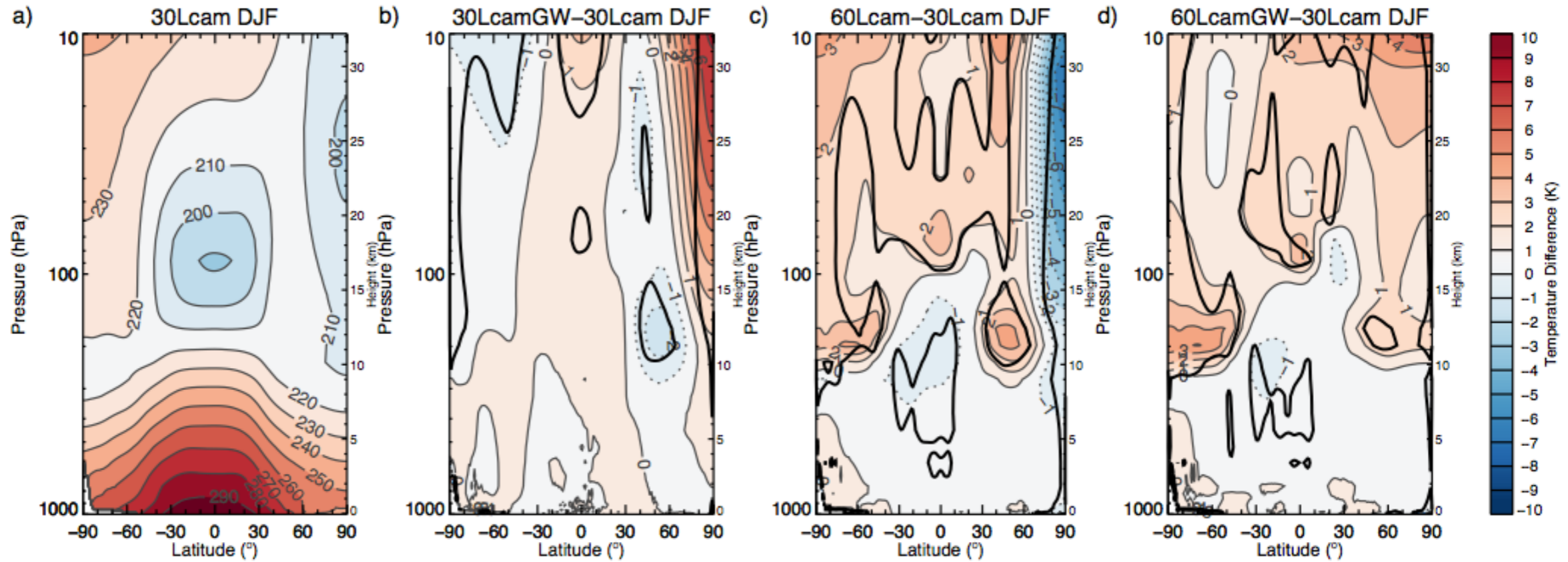
60L model: ~ **500 m** resolution in troposphere/lower stratosphere

Models to Compare:

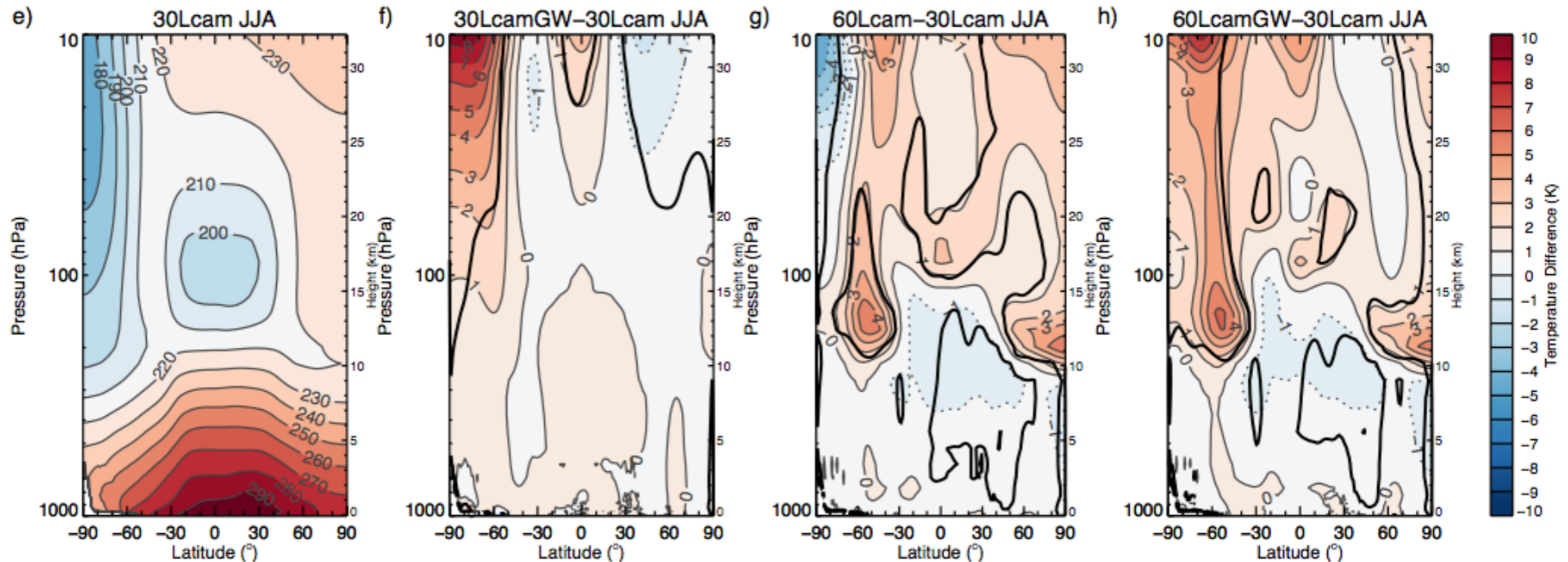
- **30L:** 30-level CAM5-SE ne30 (Control)
- 60L: 60-level CAM5-SE ne30
- 30LGW: 30-level CAM5-SE + WACCM GWs
- **60LGW:** 60-level CAM5-SE + WACCM GWs

Temperature:

DJF

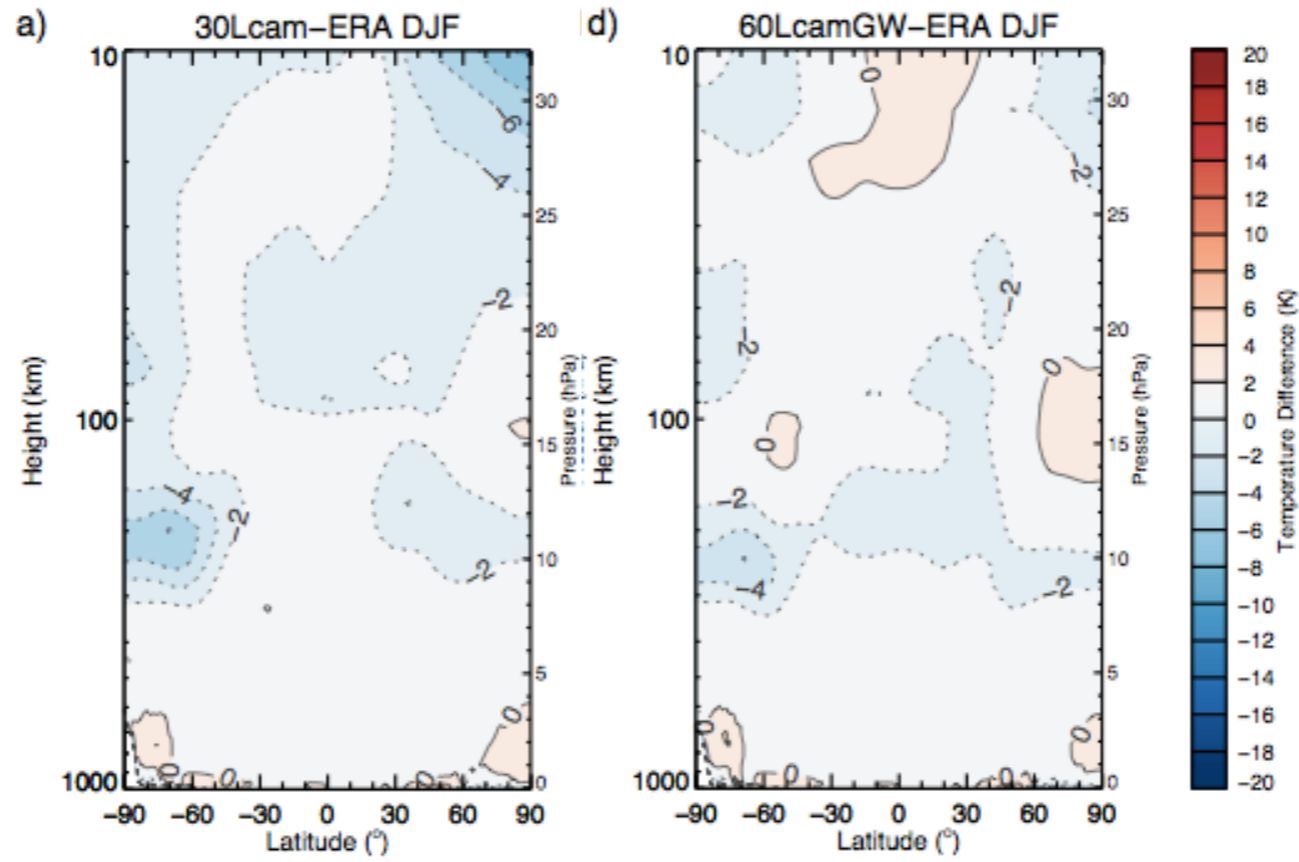


JJA

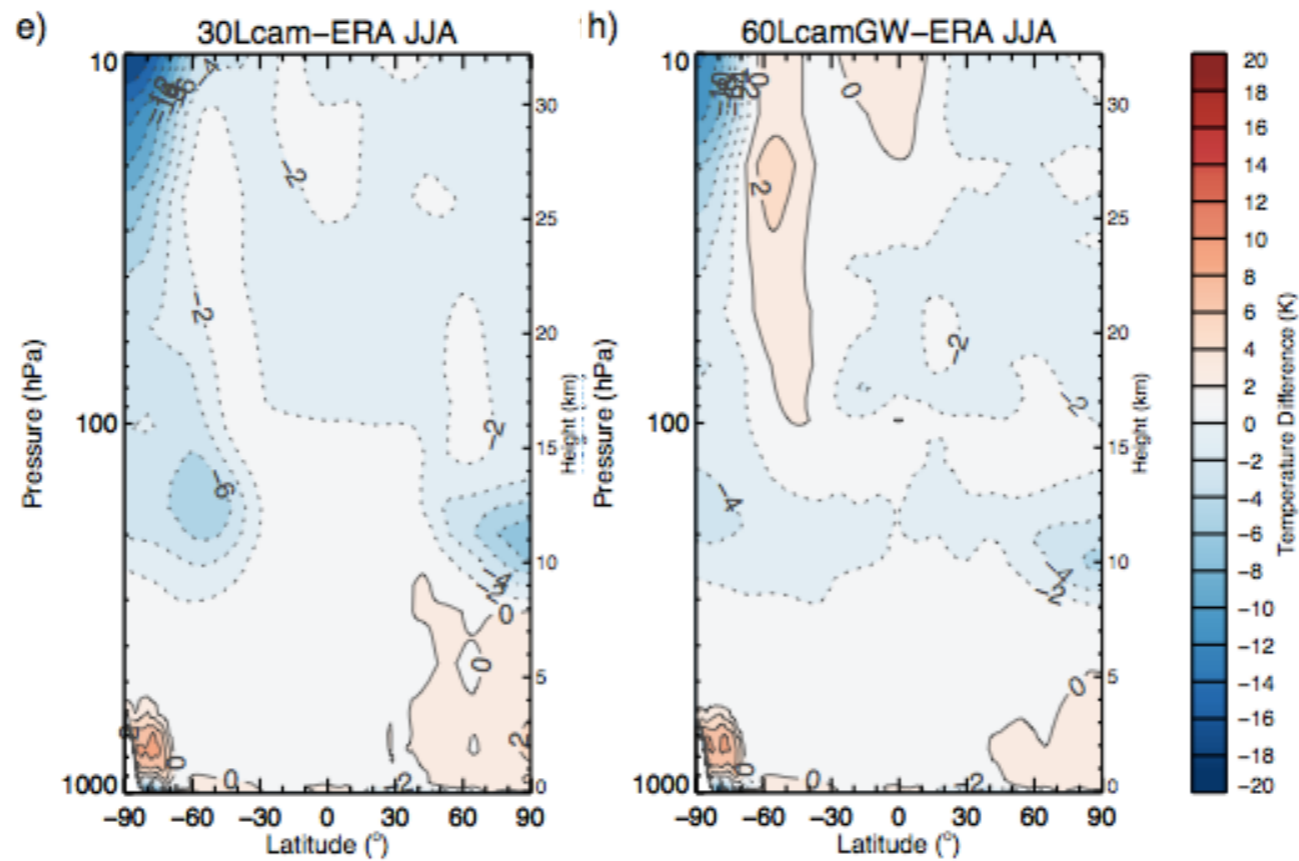


Temperature Biases

DJF

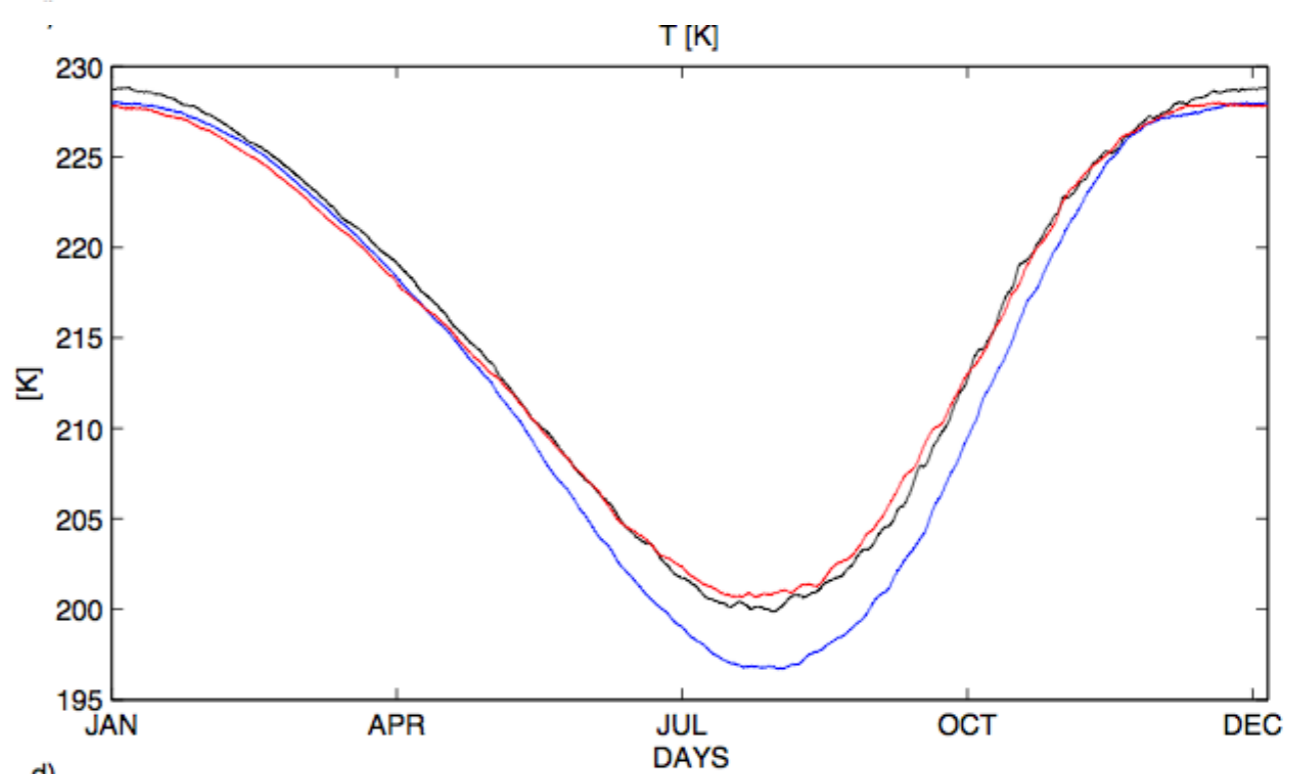
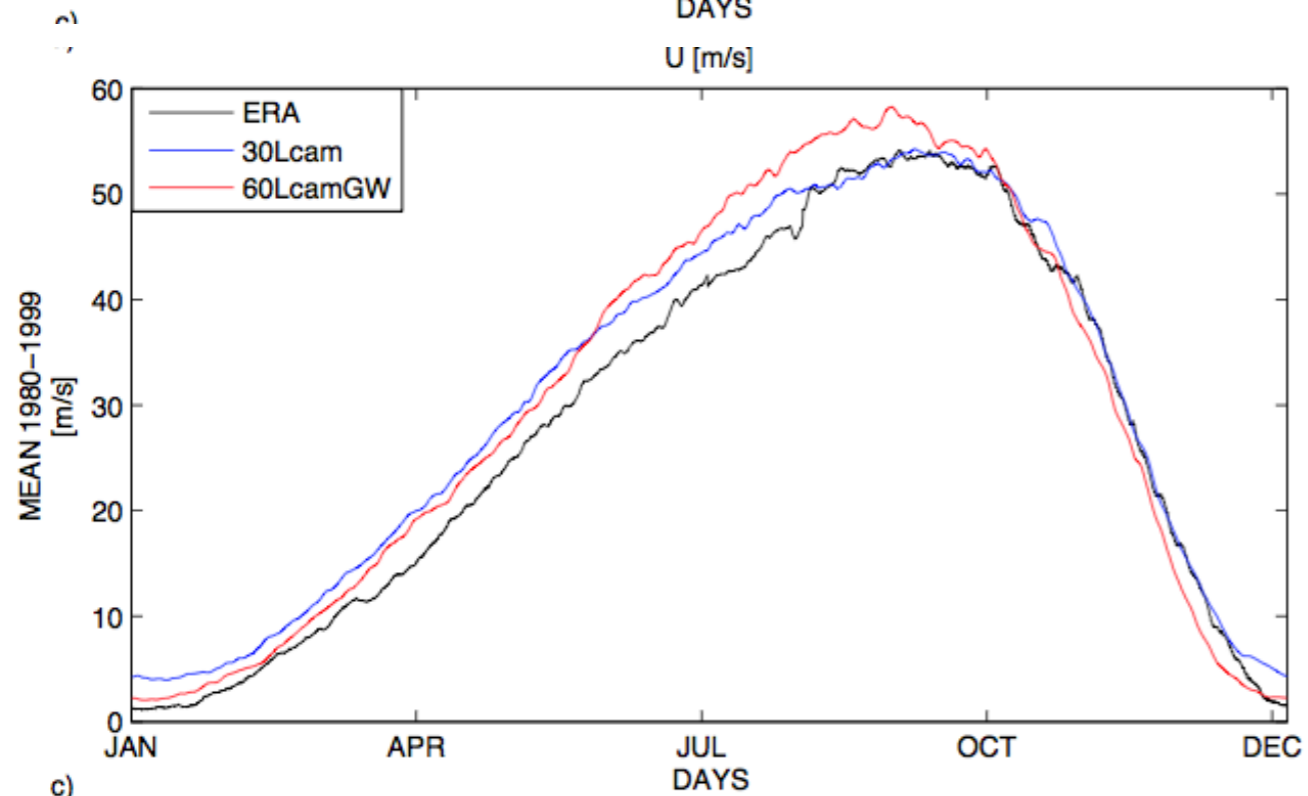
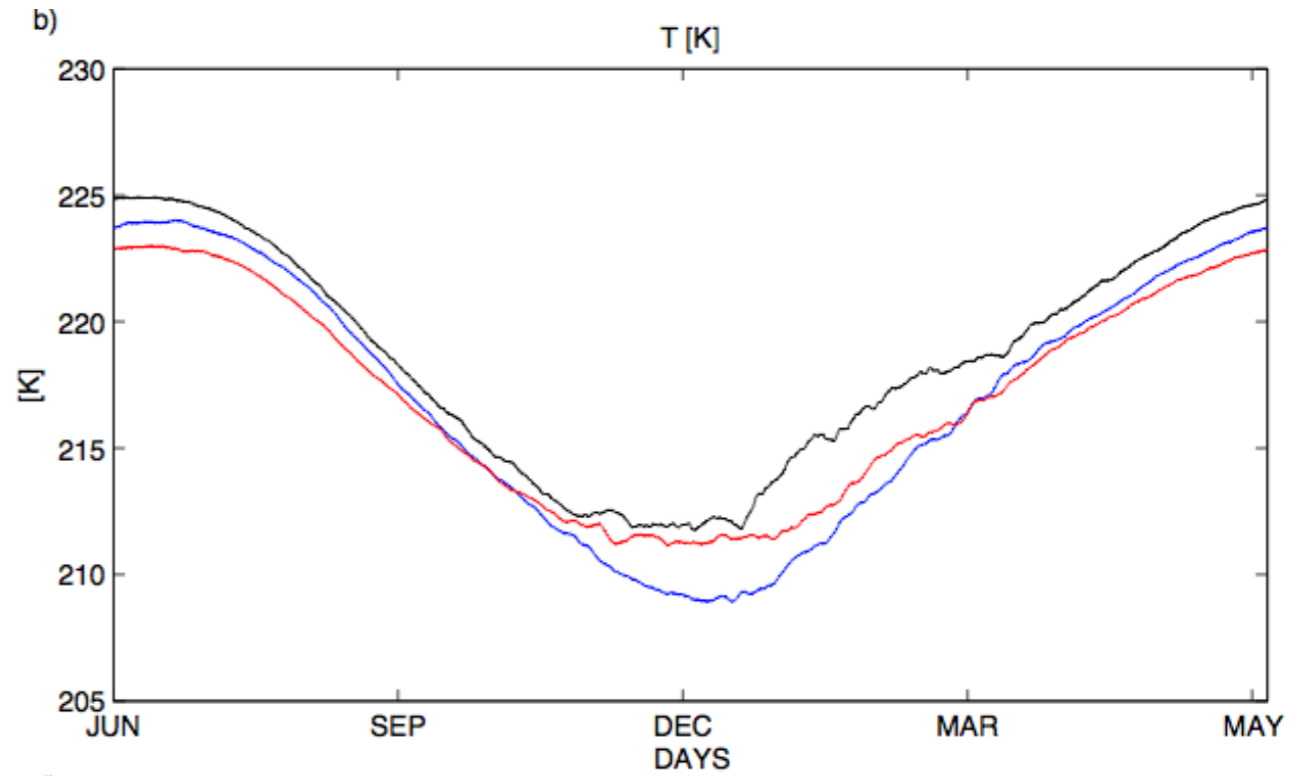
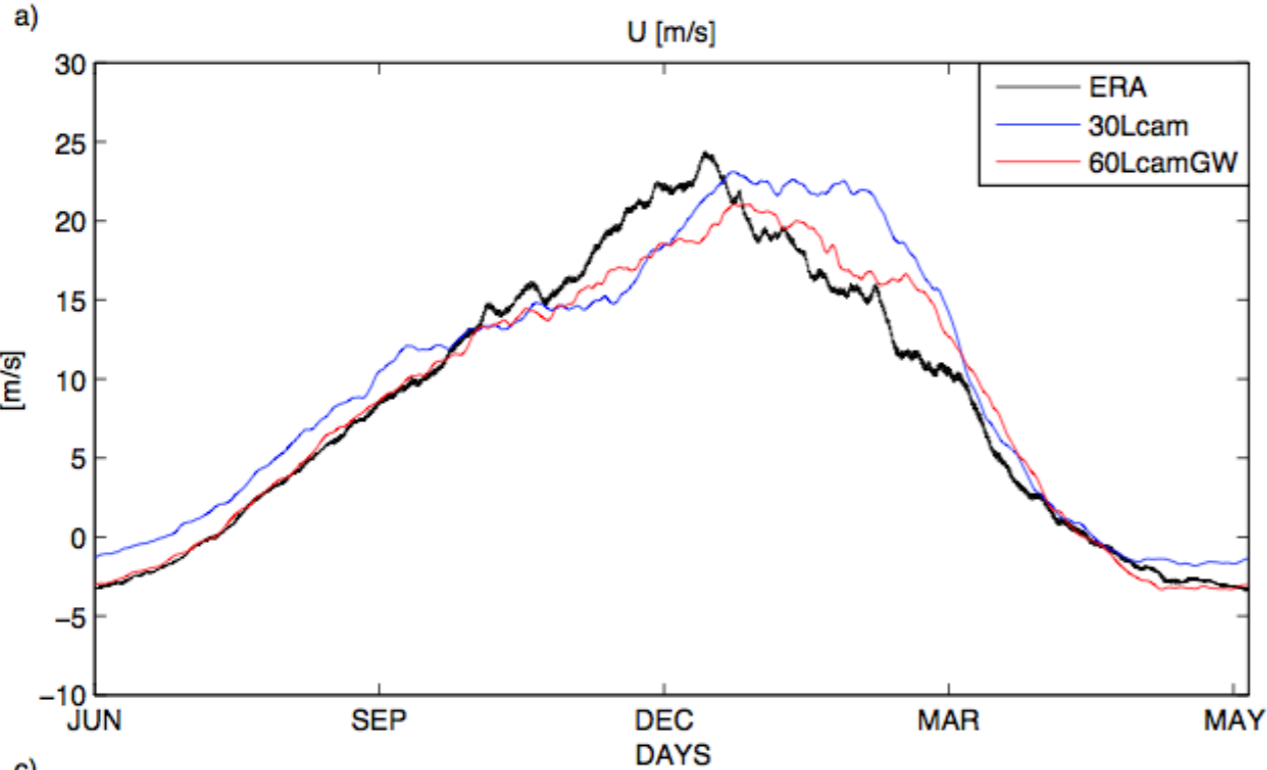


JJA



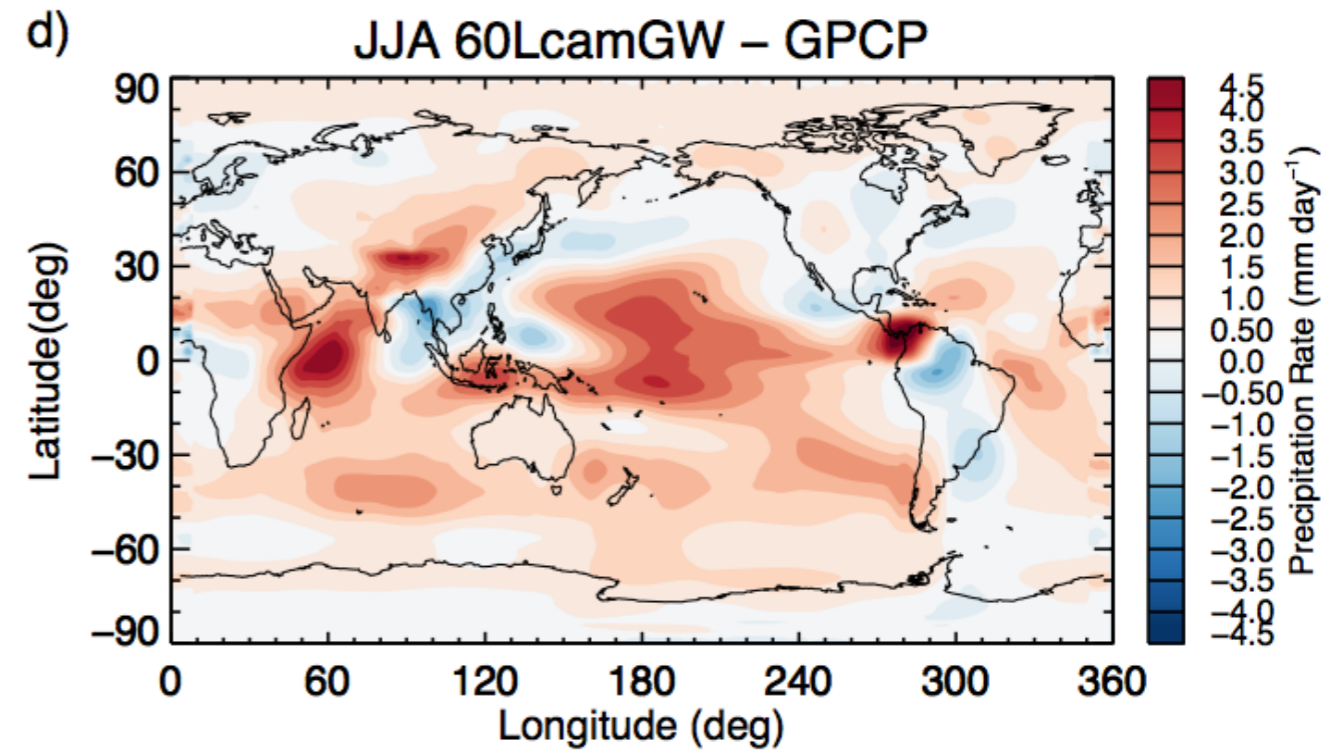
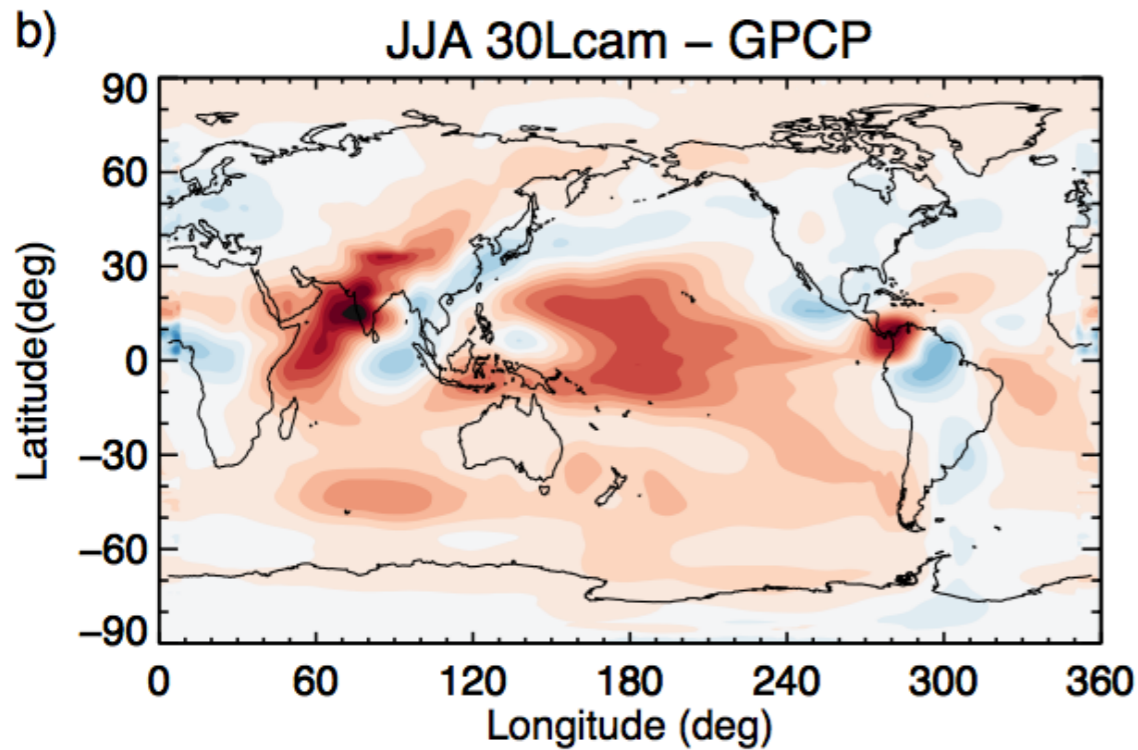
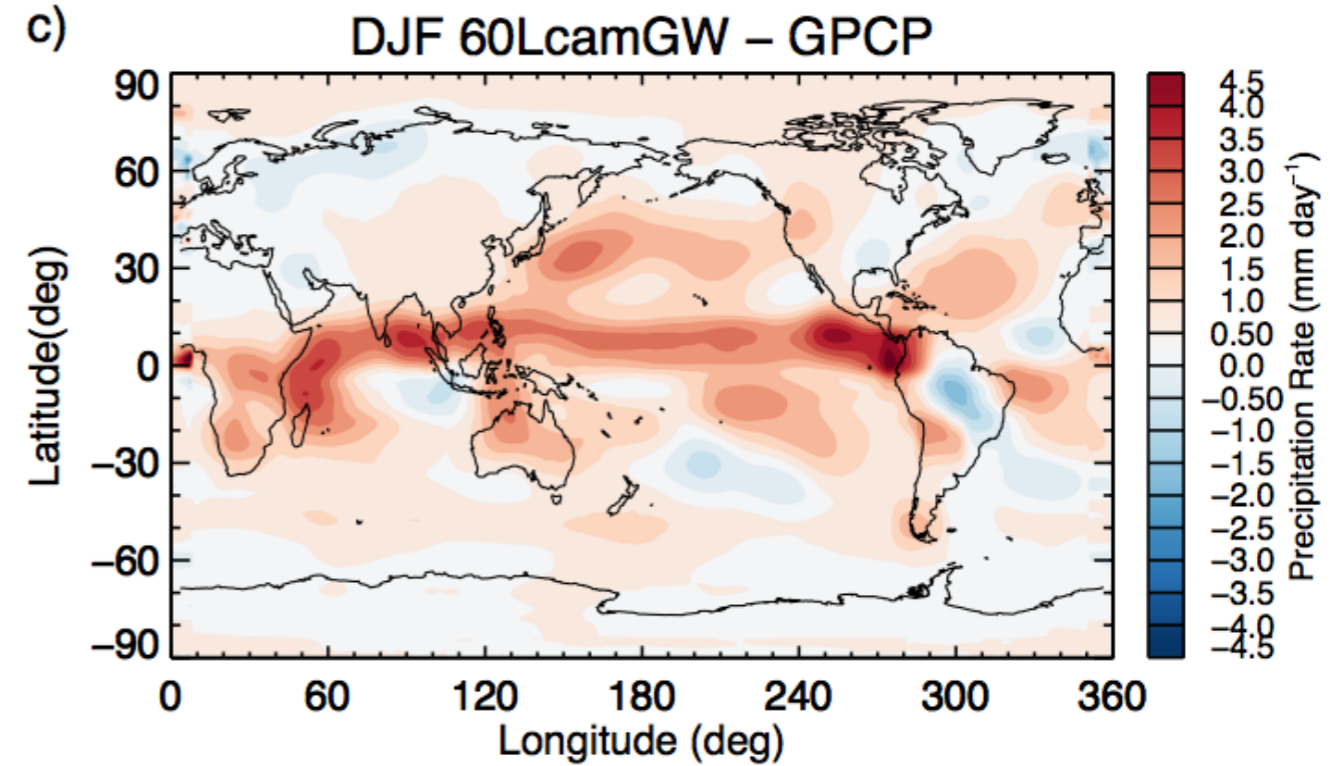
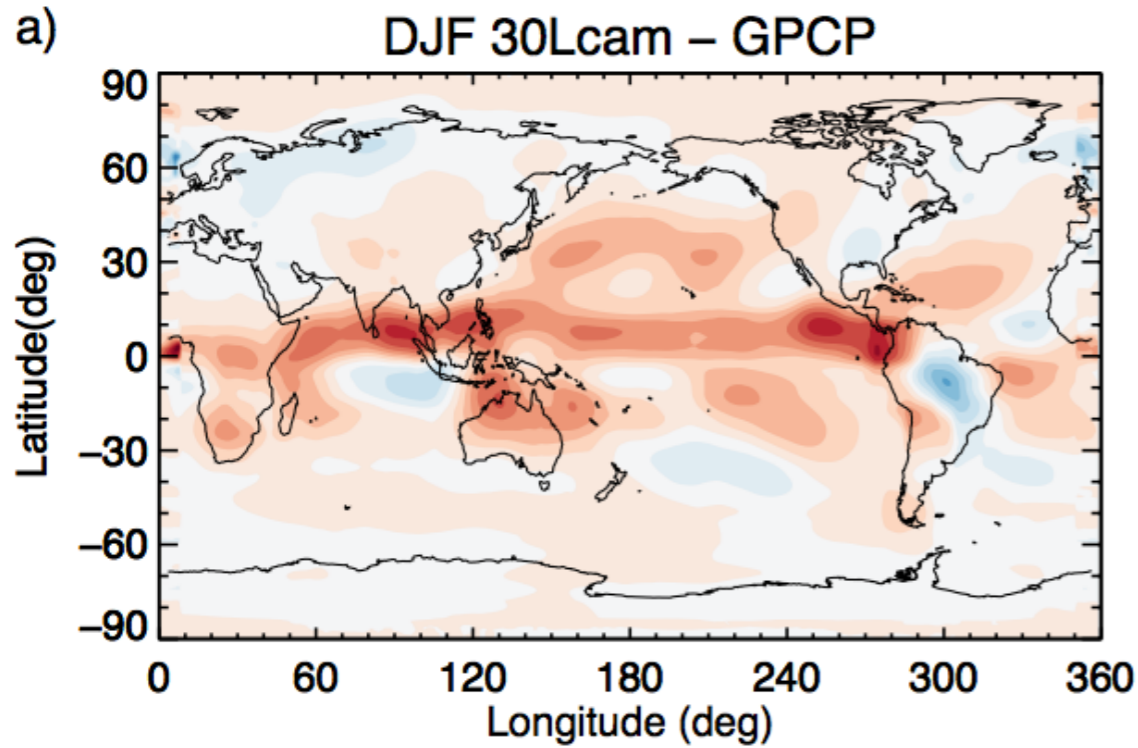
Seasonal Cycle at 50hPa:

60N

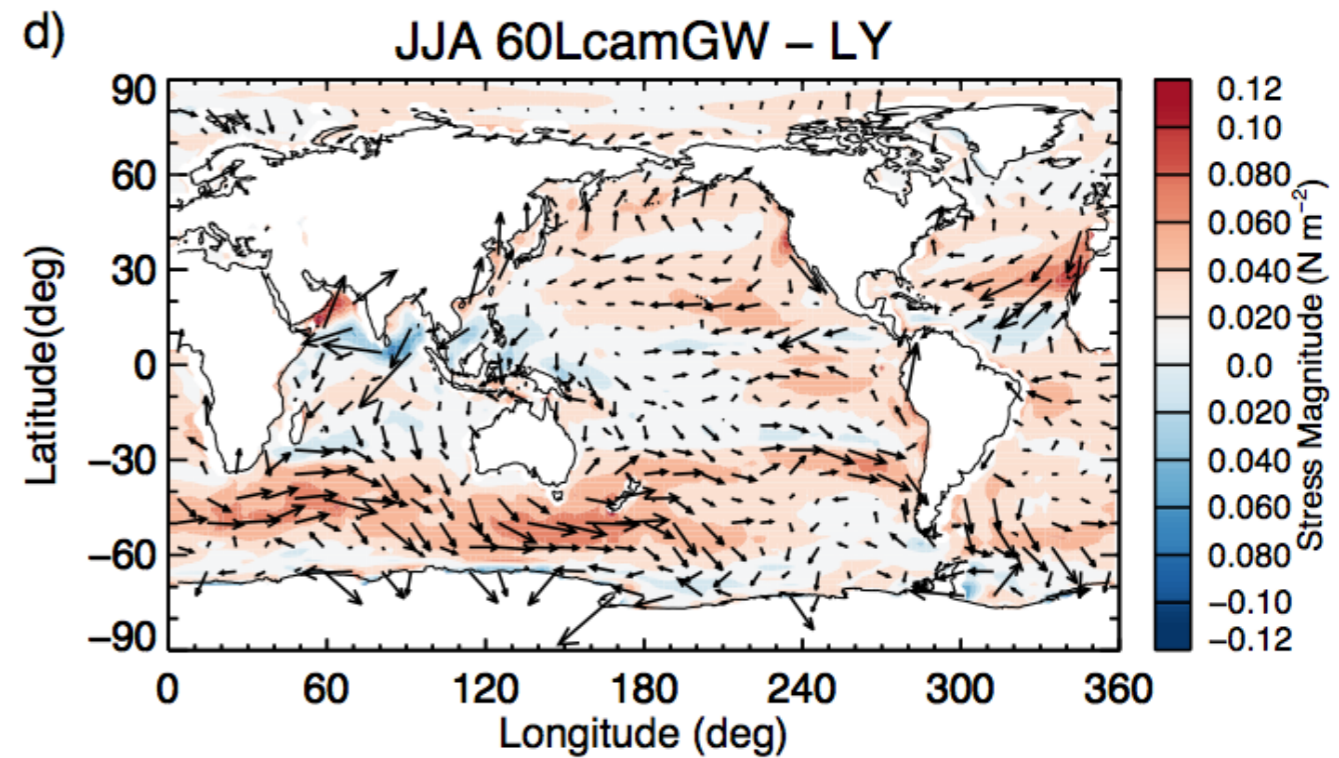
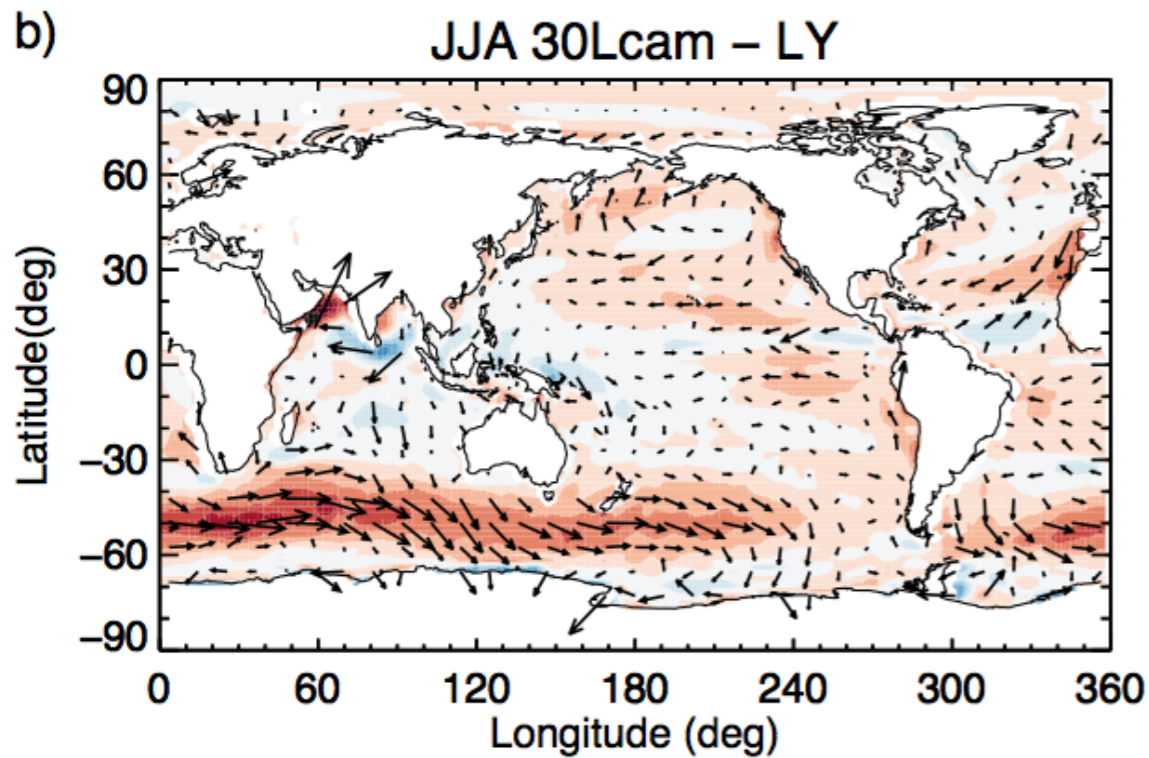
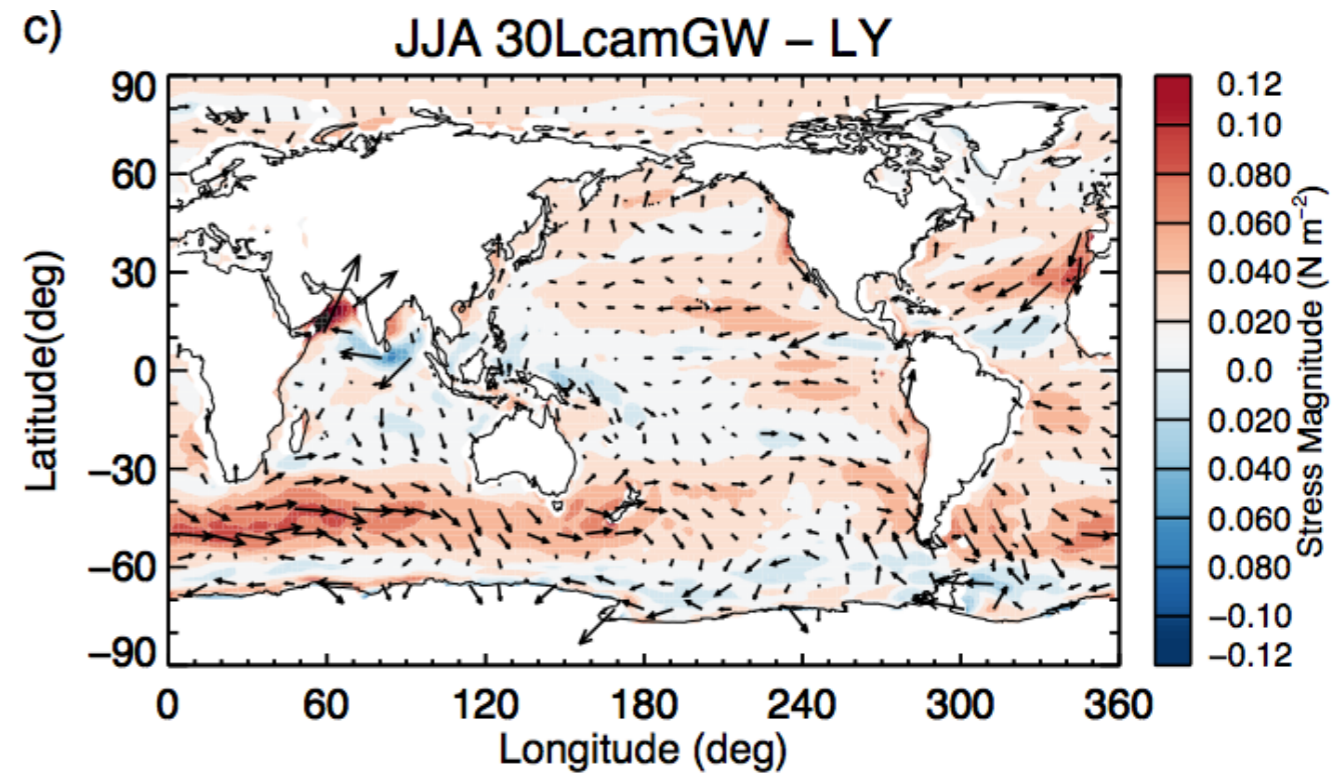
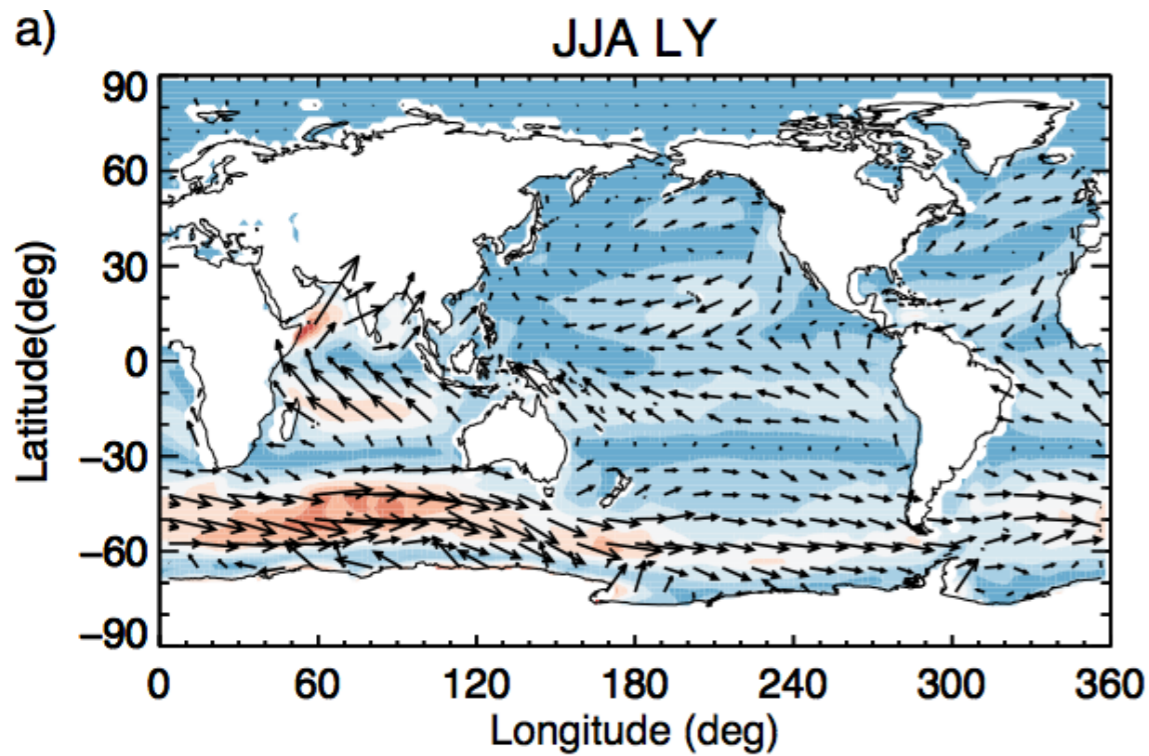


60S

Precipitation:

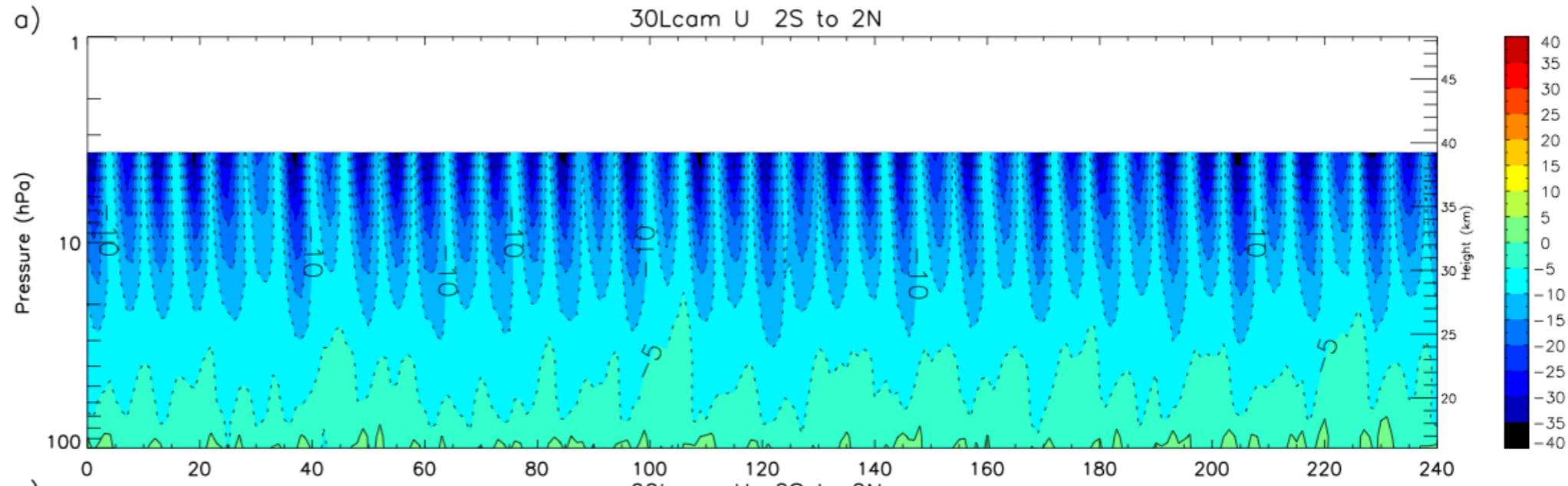


Surface Stresses:

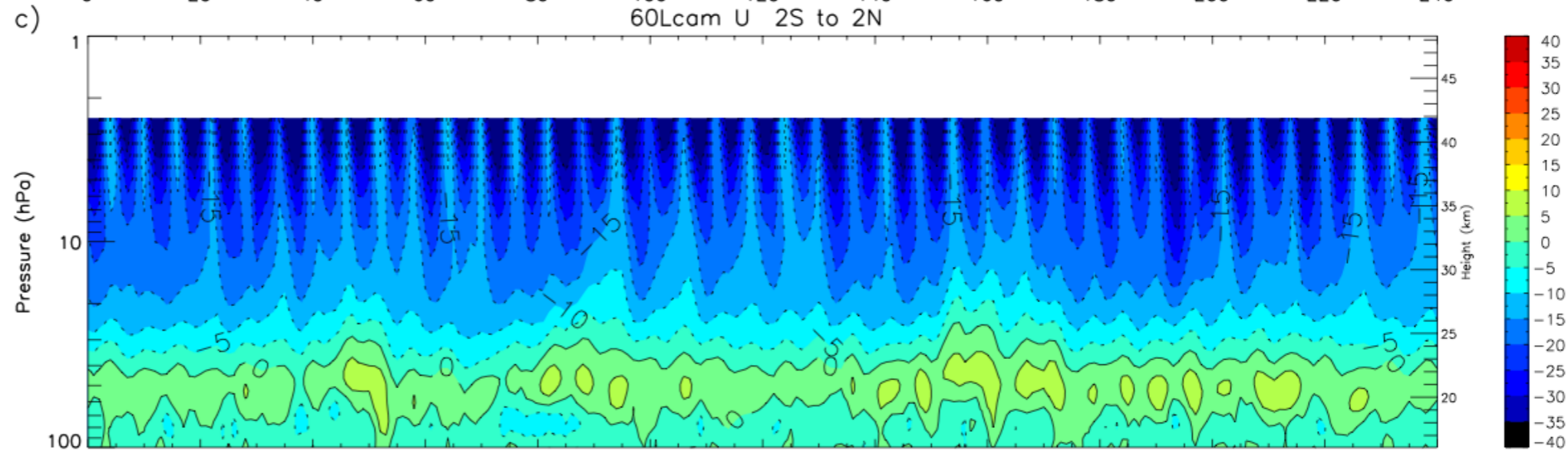


QBO:

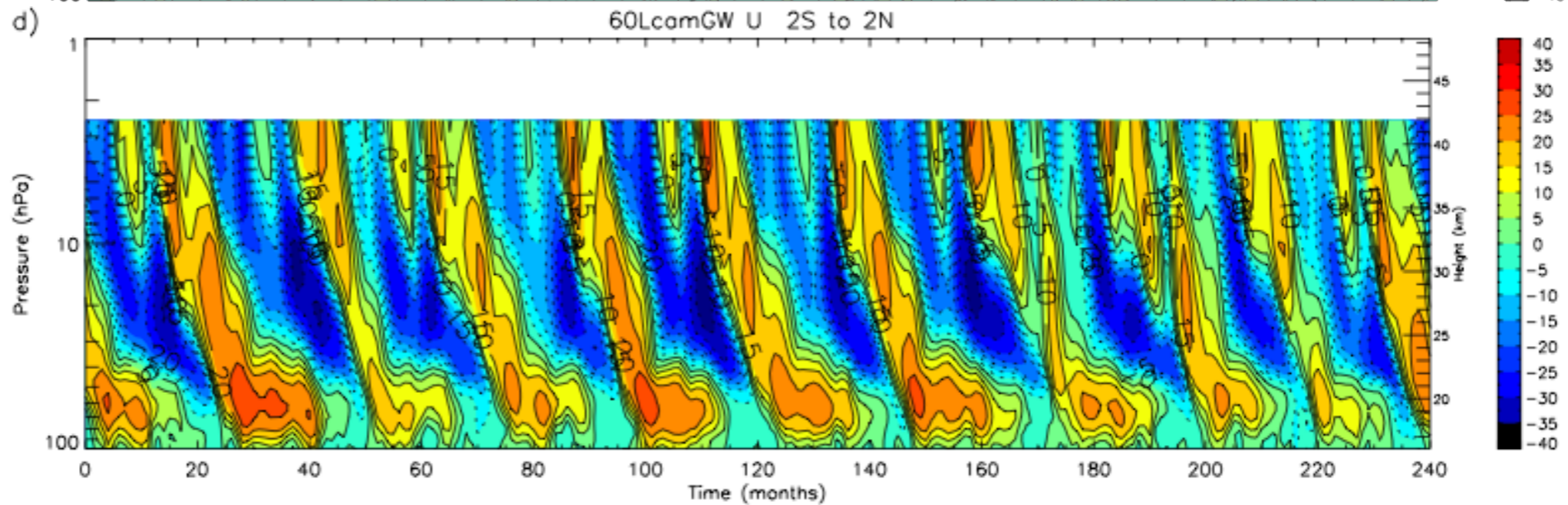
30L



60L



60LGW



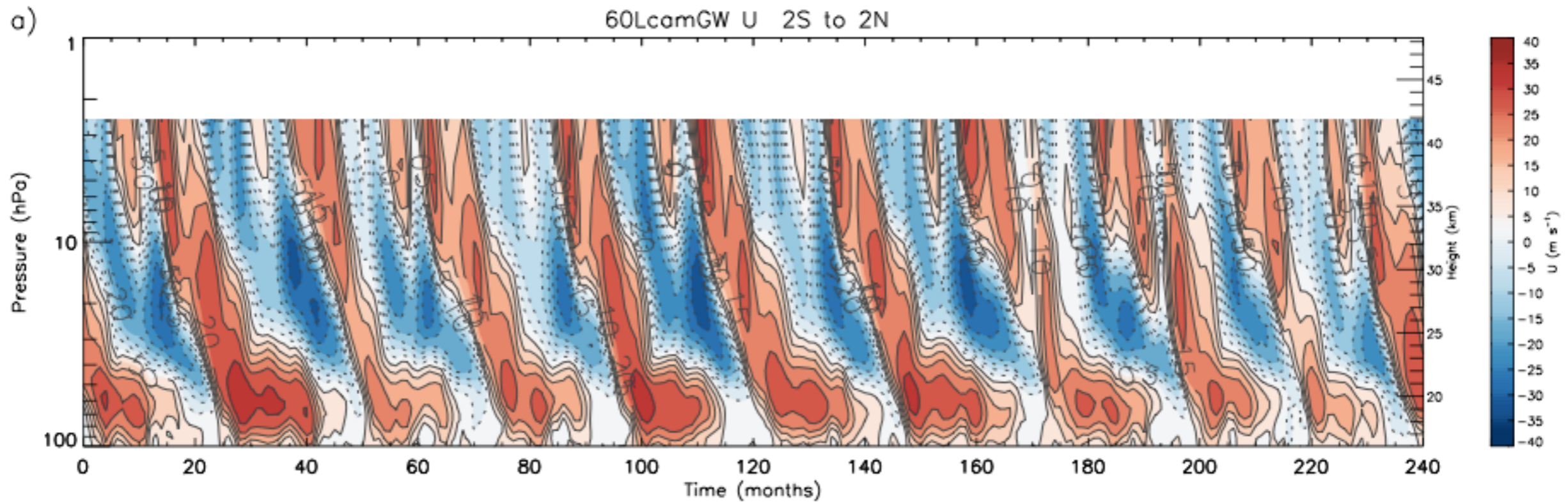
References:

- Richter, J. H., A. Solomon and J. Bacmeister 2013: “*On the Simulation of the Quasi-Biennial Oscillation in the Community Atmosphere Model, Version 5*”, JGR, Accepted
- Richter, J. H., A. Solomon and J. Bacmeister 2013: “*Effects of Vertical Resolution and Non-Orographic Gravity Wave Drag On the Simulated Climate in the Community Atmosphere Model, Version 5*”, JAMES, submitted

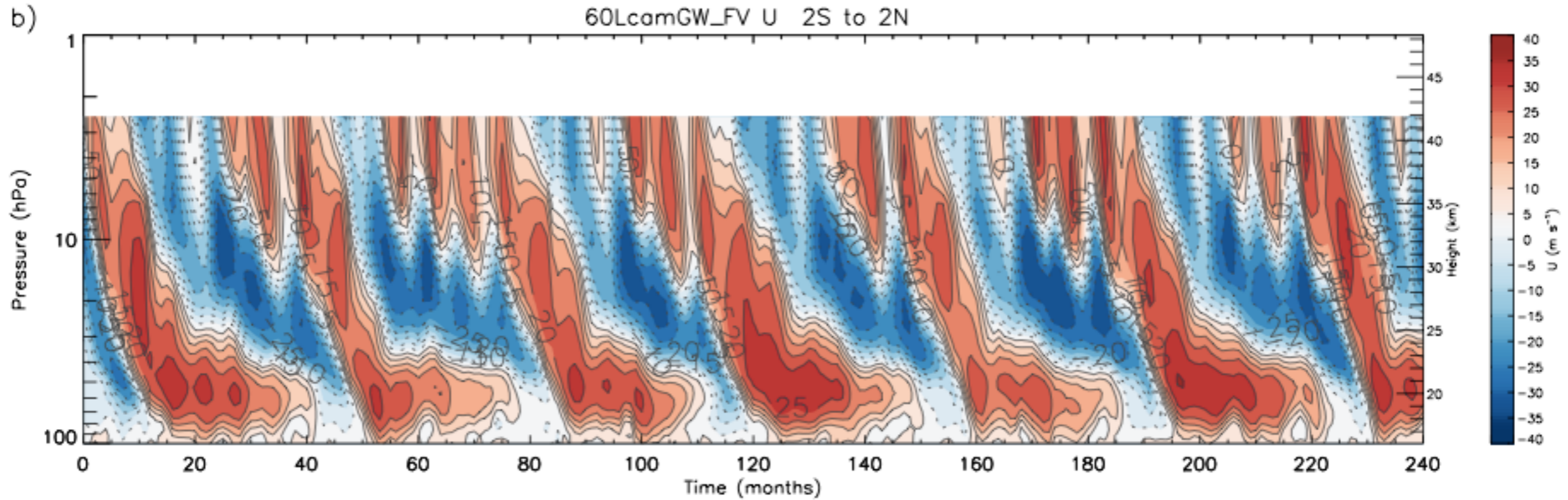
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Effects of Dynamical Core:

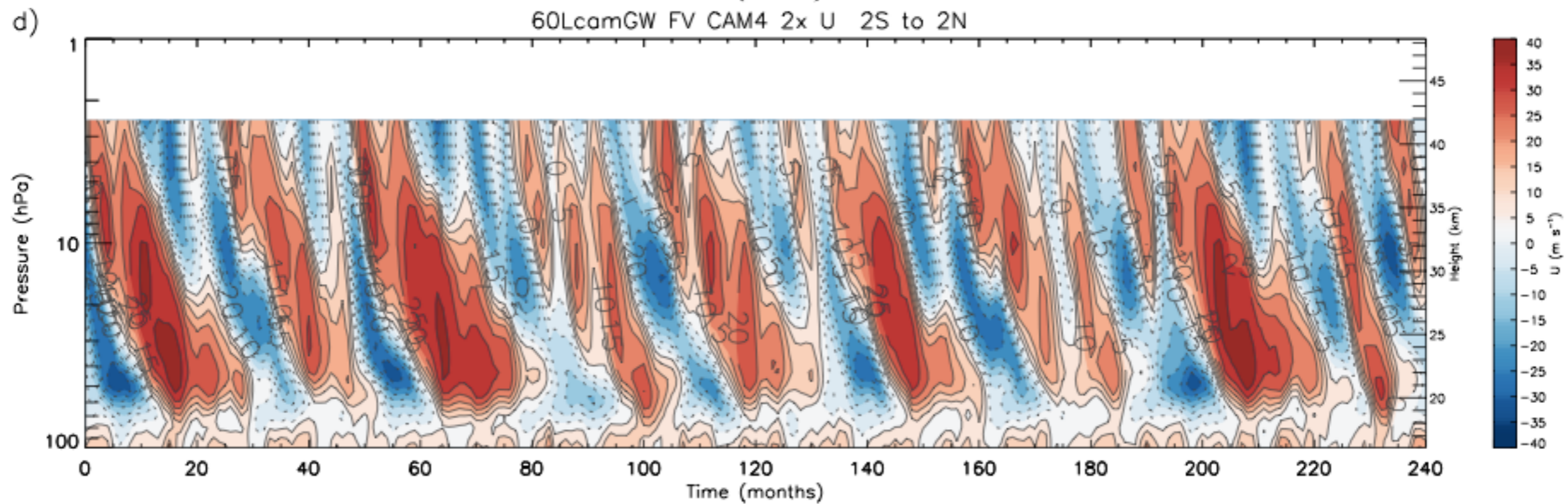
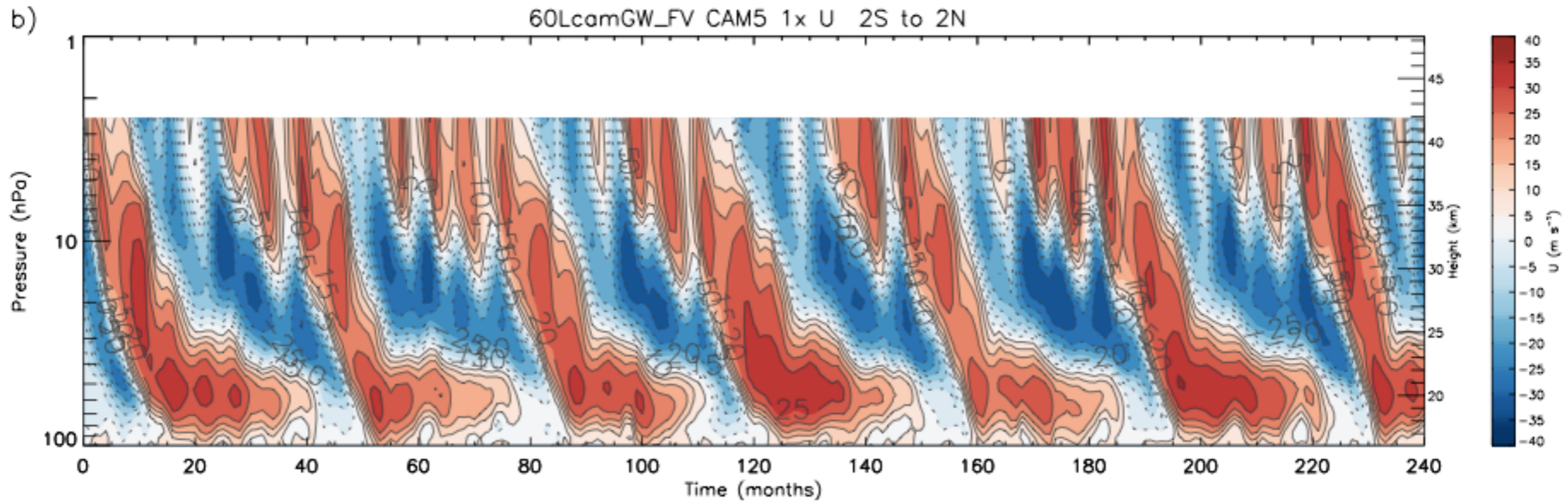
SE



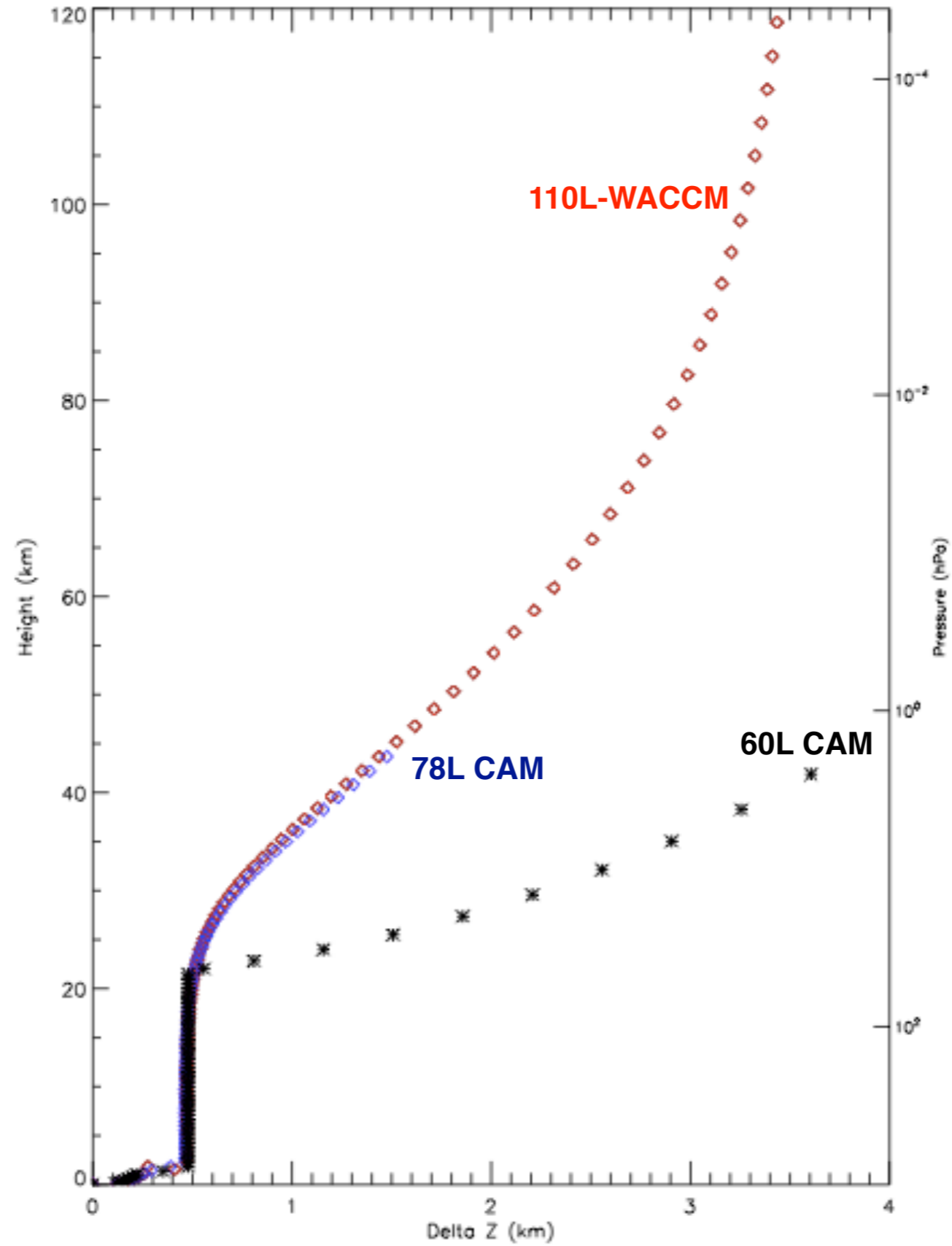
FV



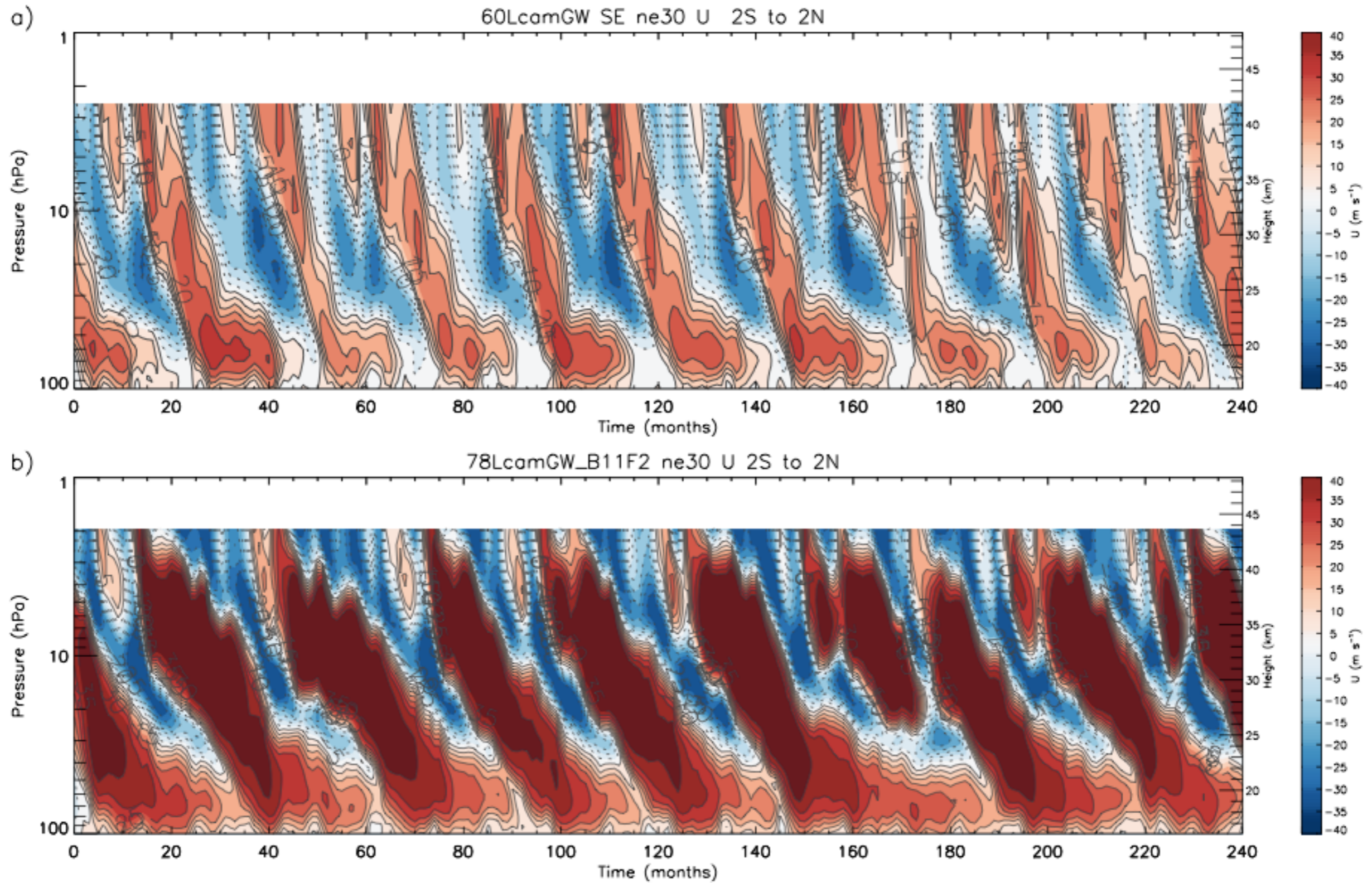
Effects of Horizontal Resolution:



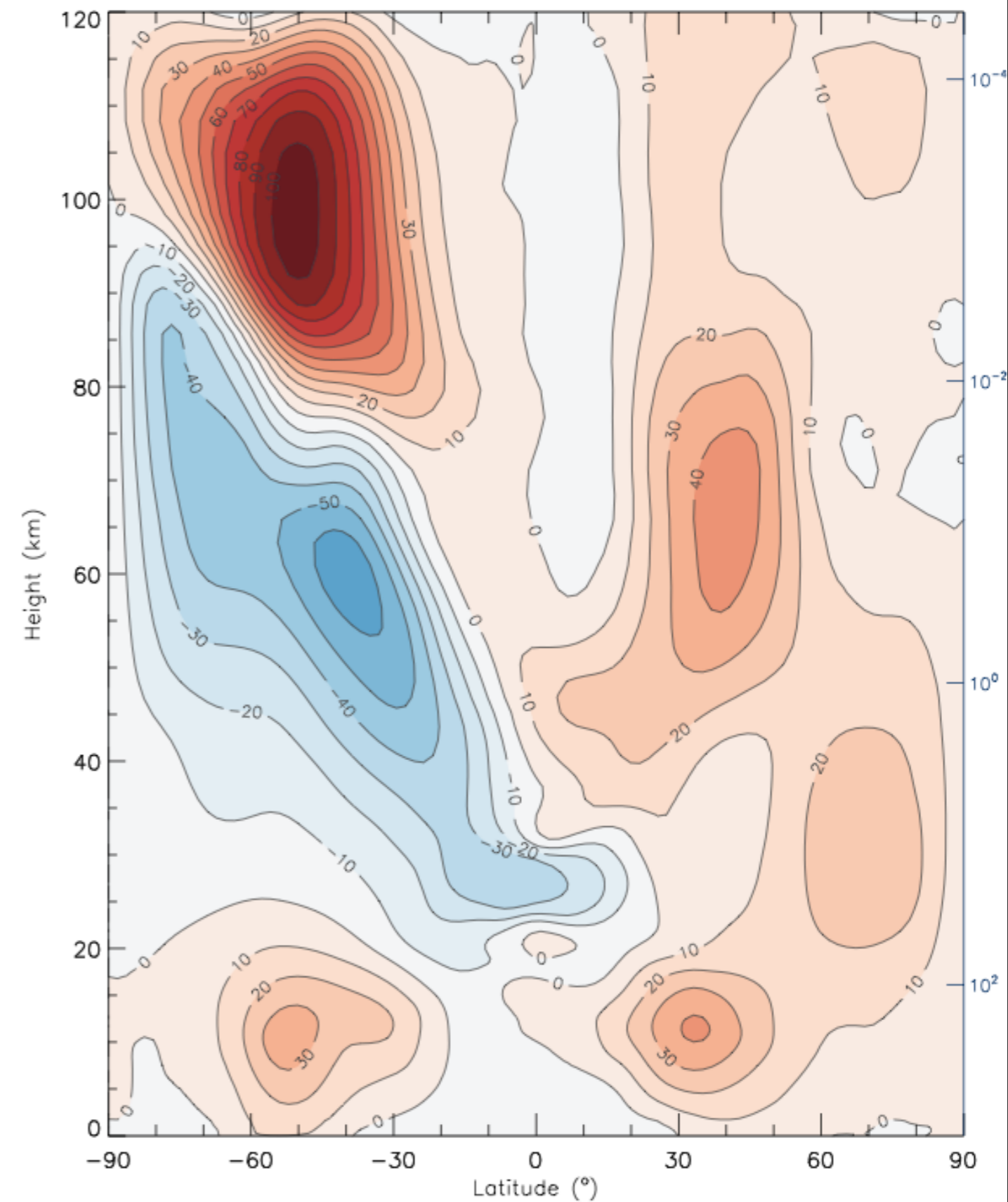
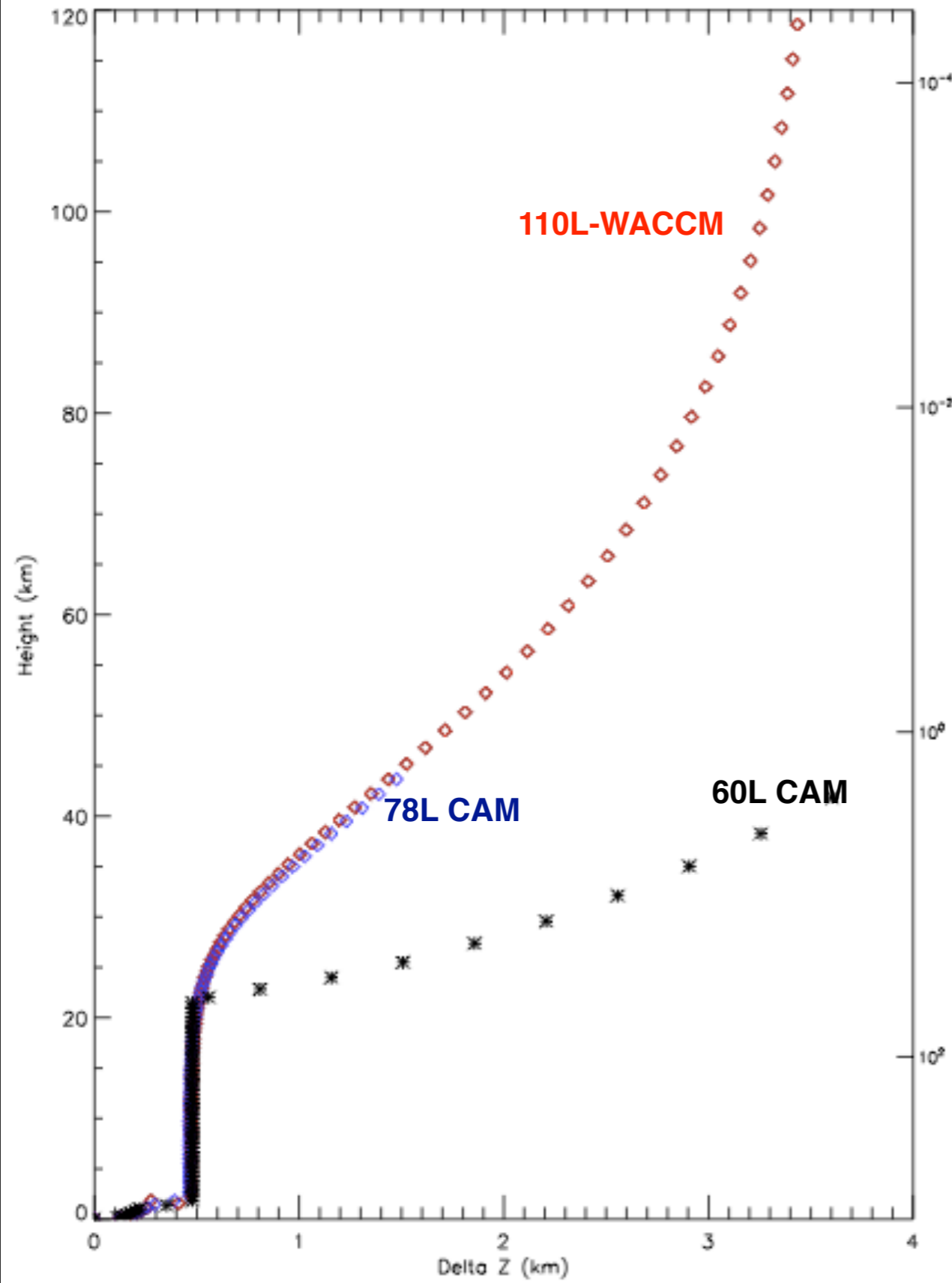
Effects of Vertical Resolution above 50 hPa:



60 vs 78 L CAM5



Vertical Grids & WACCM IC



Conclusions/Questions:

- Vertical resolution is very important to simulating the tropopause and the stratosphere adequately
- Increased vertical resolution impacts precipitation and surface stresses: needs to be tested in a coupled model
- 60L compset available soon for community use
- How do we go forward from here?