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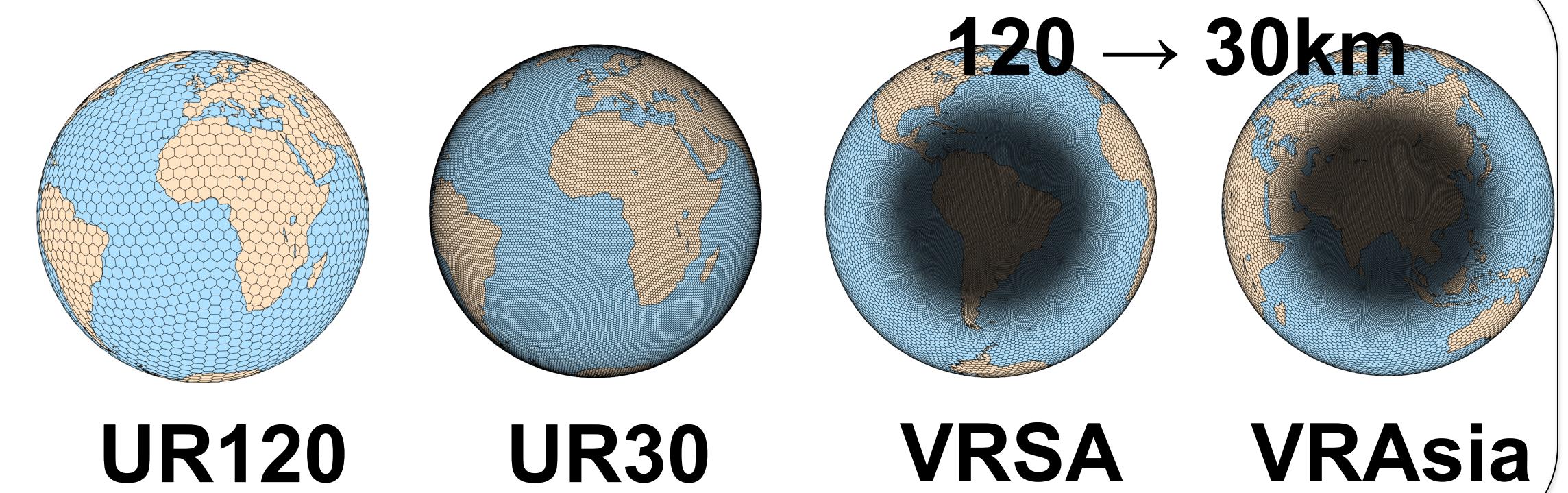
Koichi Sakaguchi<sup>1</sup>, Jian Lu<sup>1</sup>, L. Ruby Leung<sup>1</sup>, Chun Zhao<sup>1</sup>, Yanjie Li<sup>2</sup>, and Samson Hagos<sup>1</sup>

## Introduction

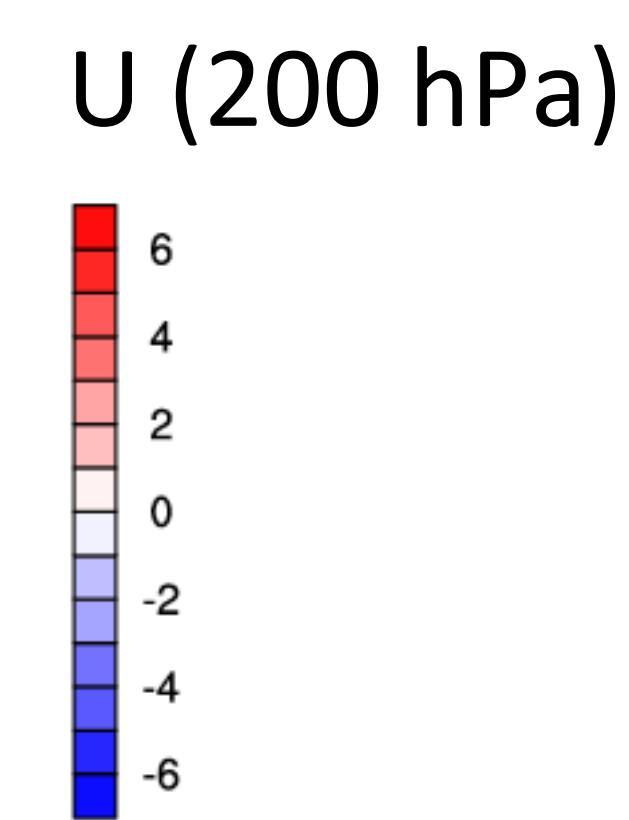
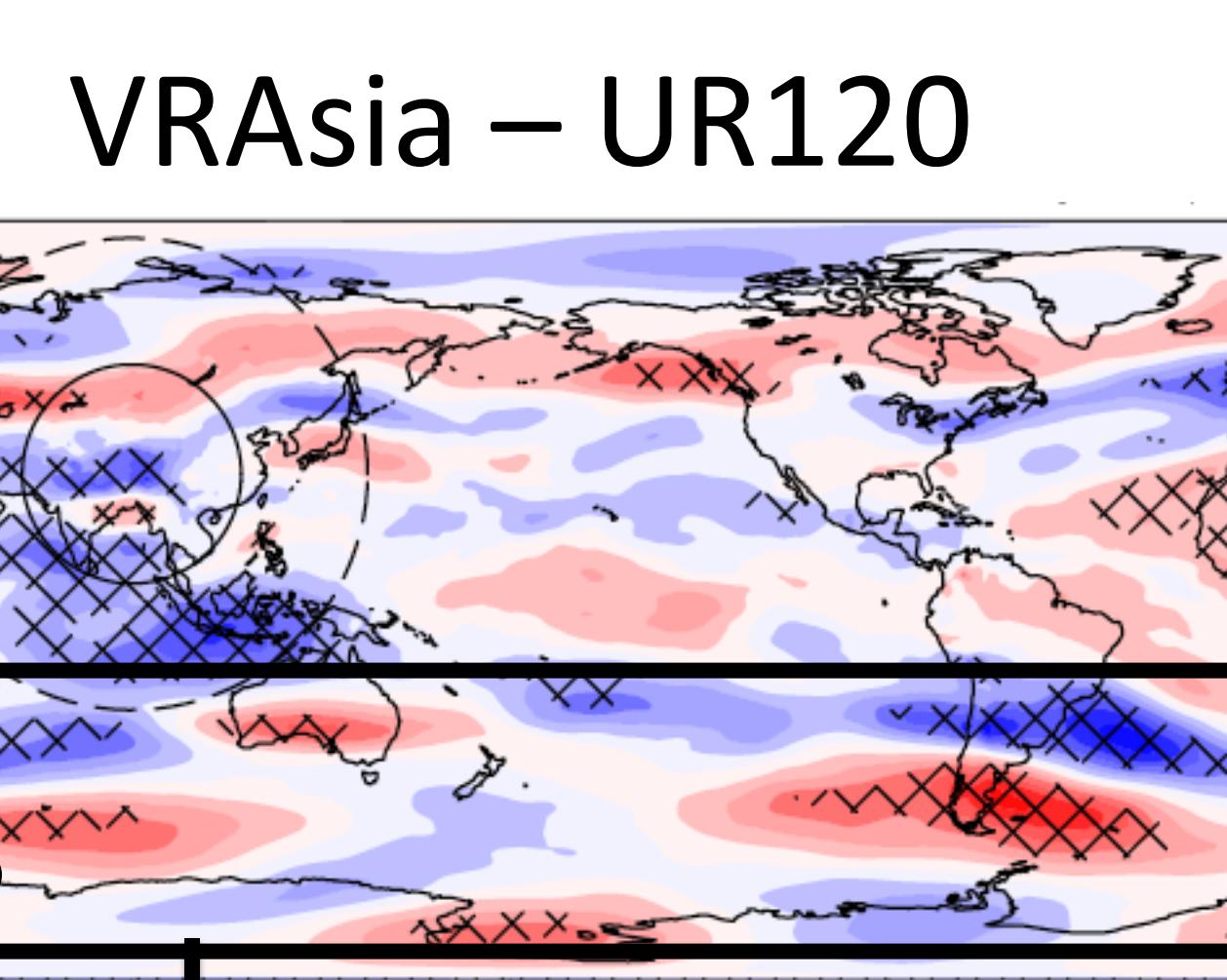
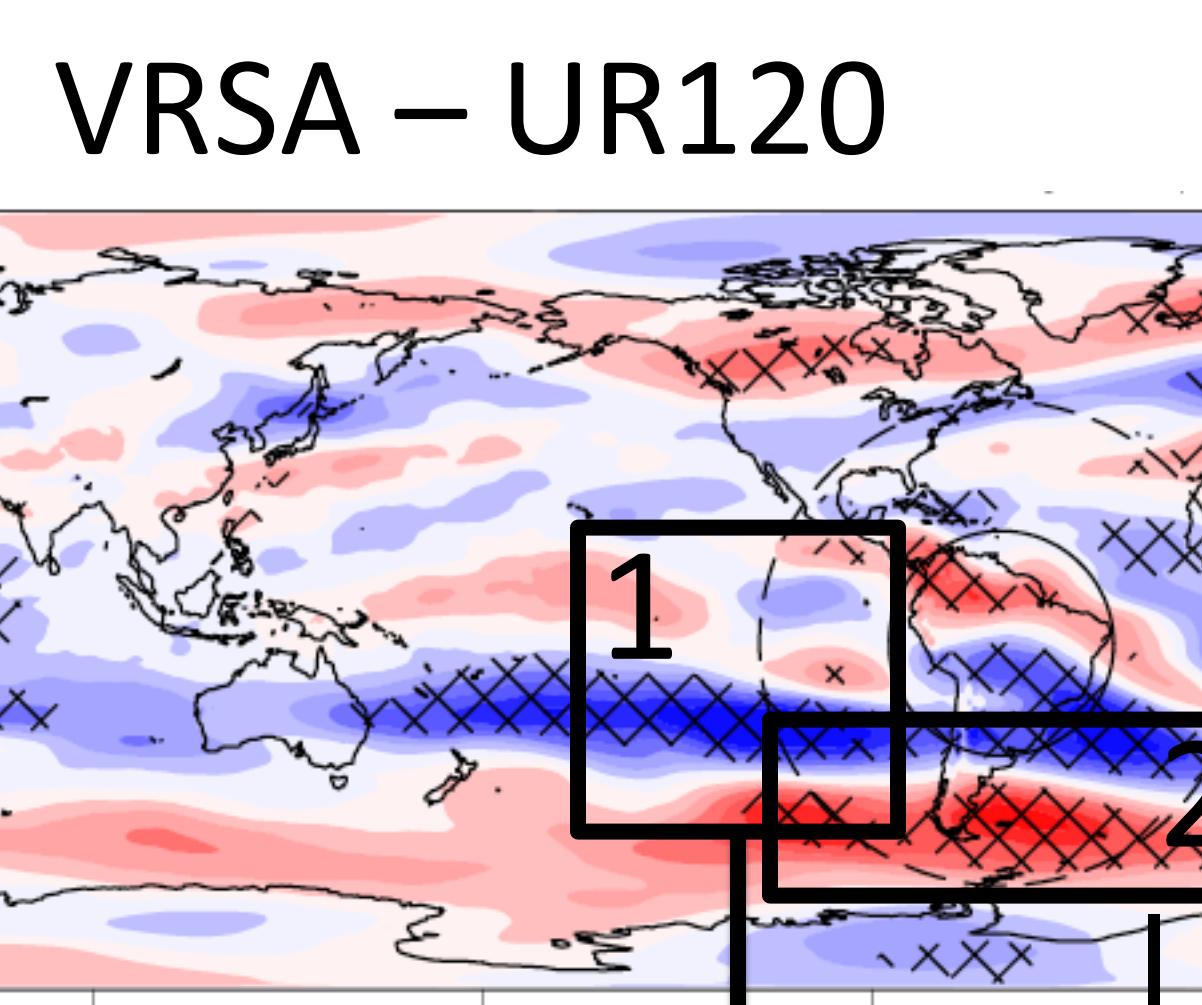
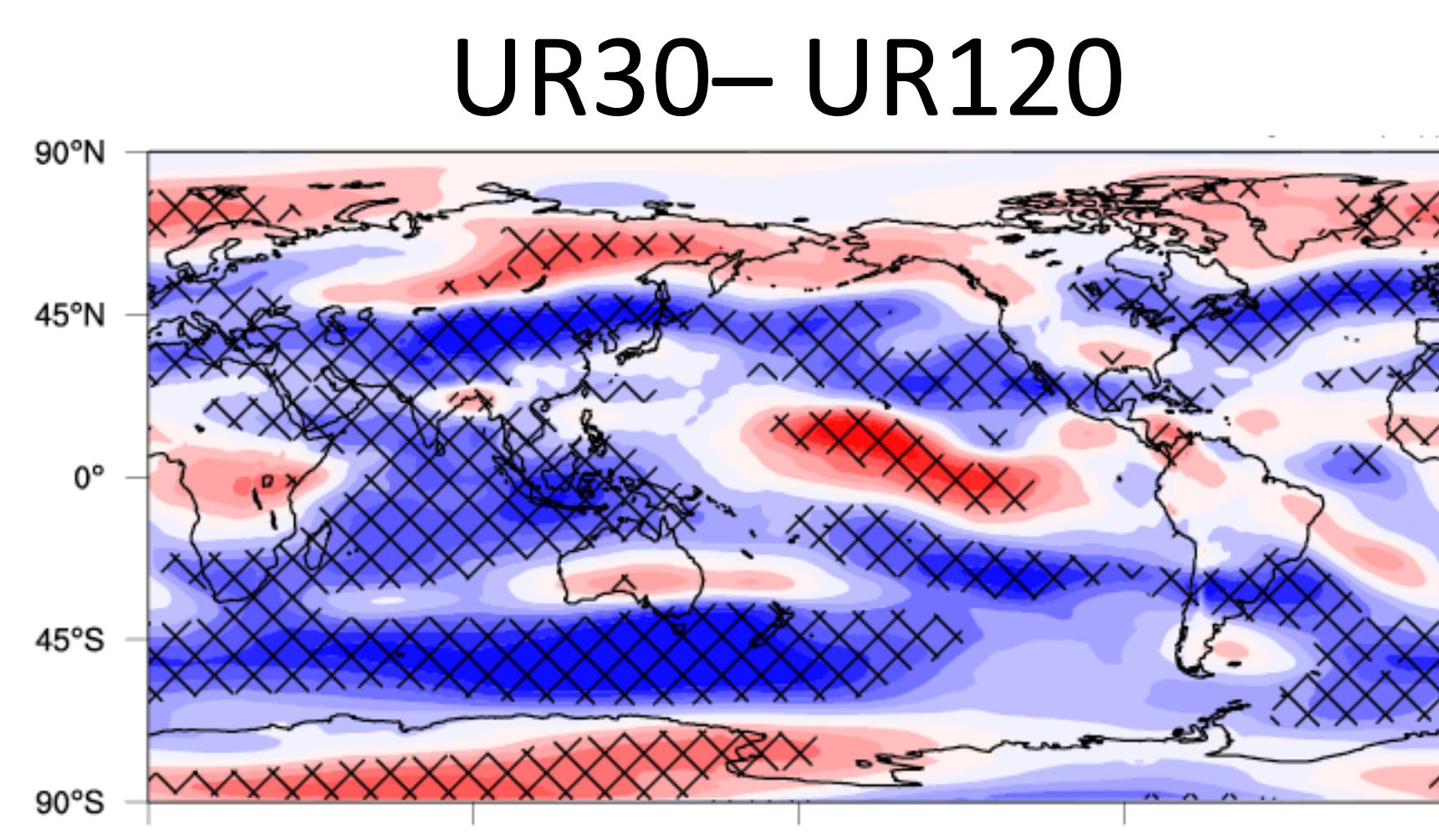
Promising performance of the global model MPAS-A CAM4 with regional grid refinement was reported by Sakaguchi et al. 2015. The study also found the large-scale circulation, particularly the Southern Hemisphere jet in JJA, is influenced outside of the high-resolution region. Here we report this "upscale effect" in more detail.

## MPAS-A &CAM4

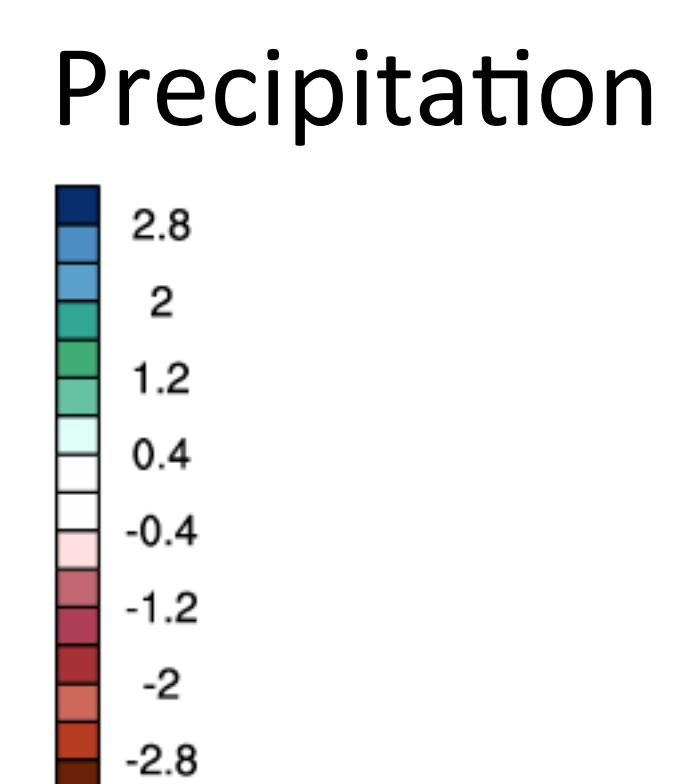
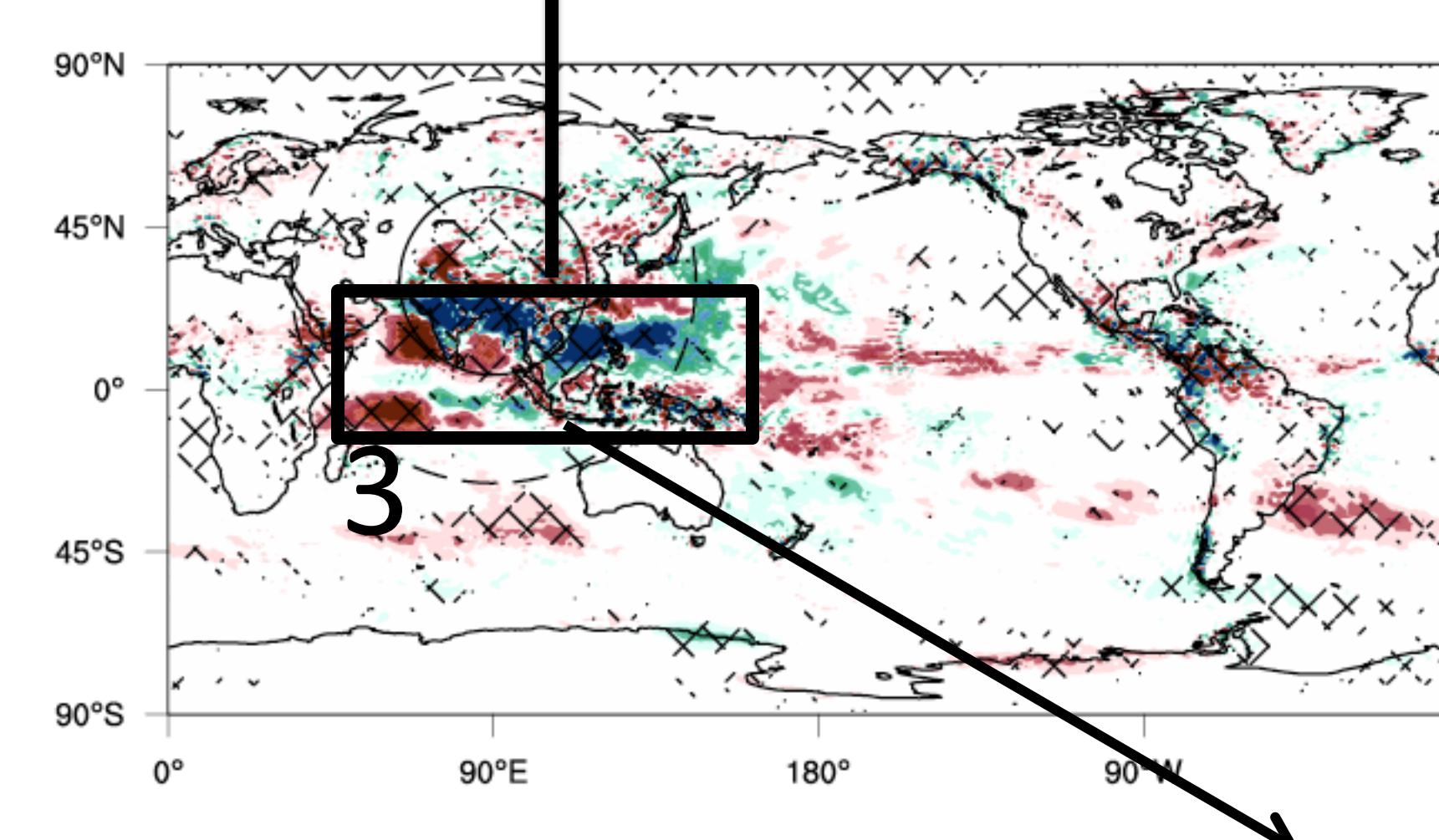
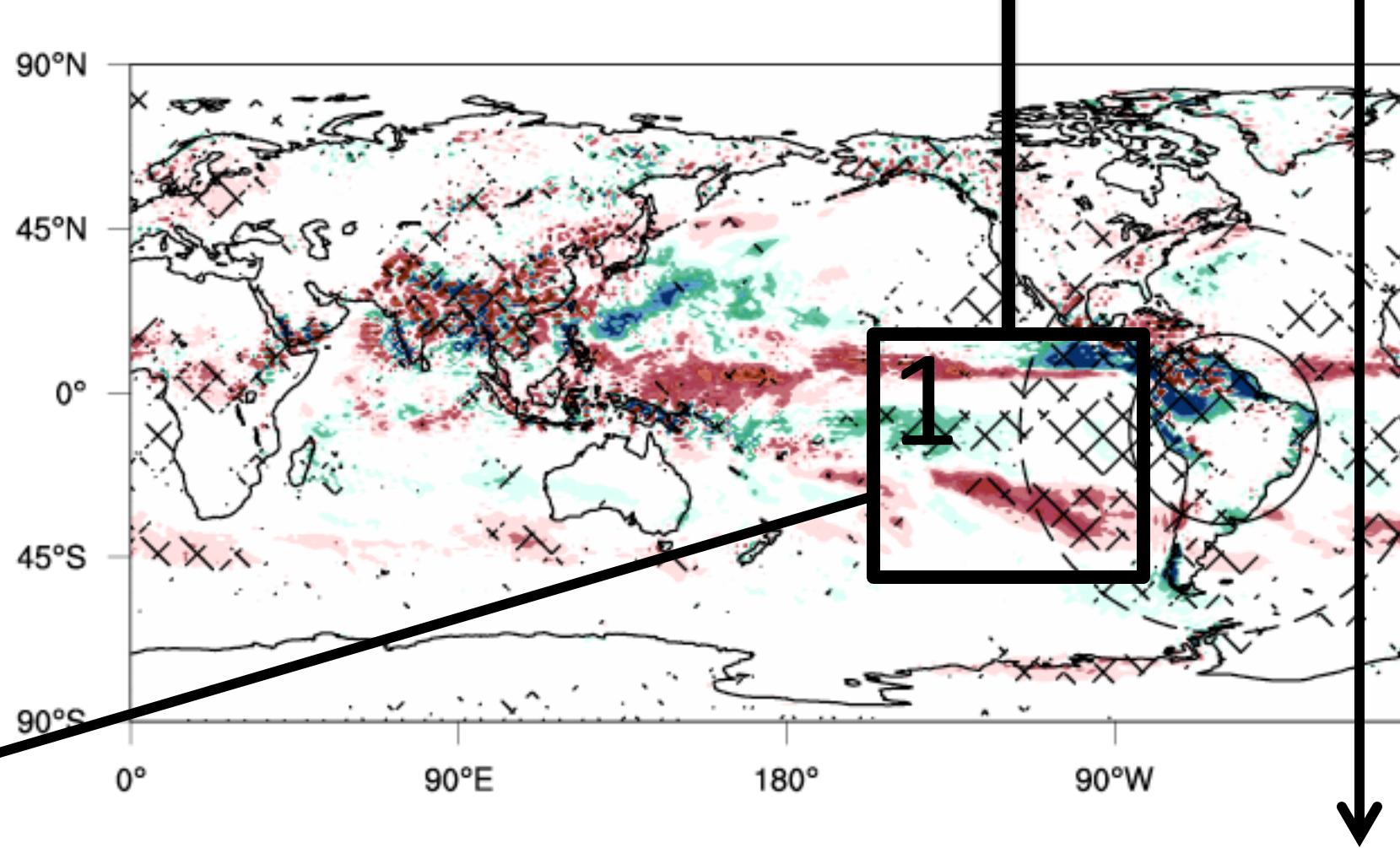
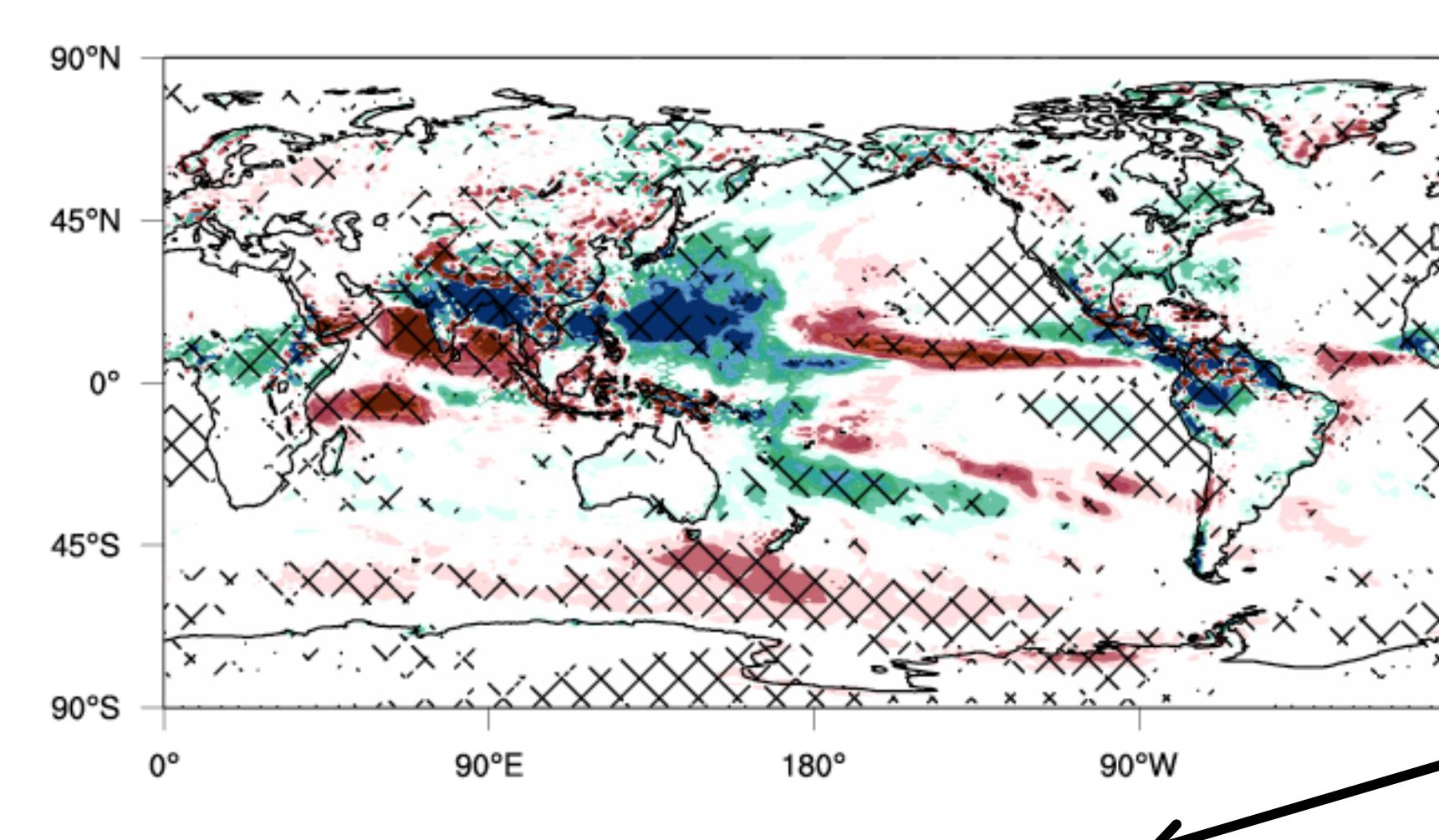
Model for Prediction across Scales for Atmosphere (MPAS-A) is a finite volume dynamical core capable of regional grid refinement (Skamarock et al. 2012). In this study its hydrostatic prototype is coupled to the physics parameterizations from Community Atmosphere Model version 4.



## Upscale effects on the upper level jet in June-July-August

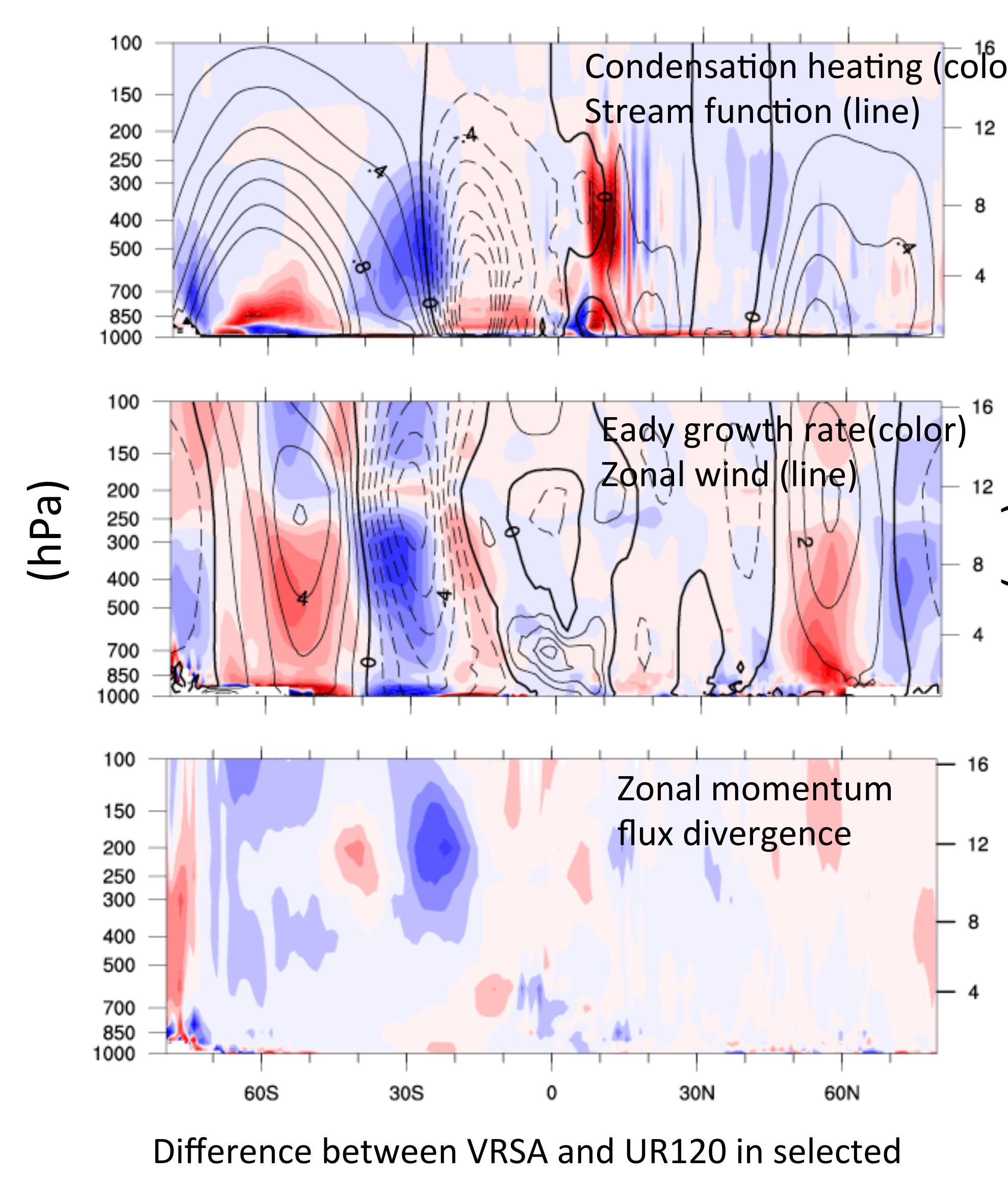


Part of them (1 & 3) related to condensational heating change with resolution



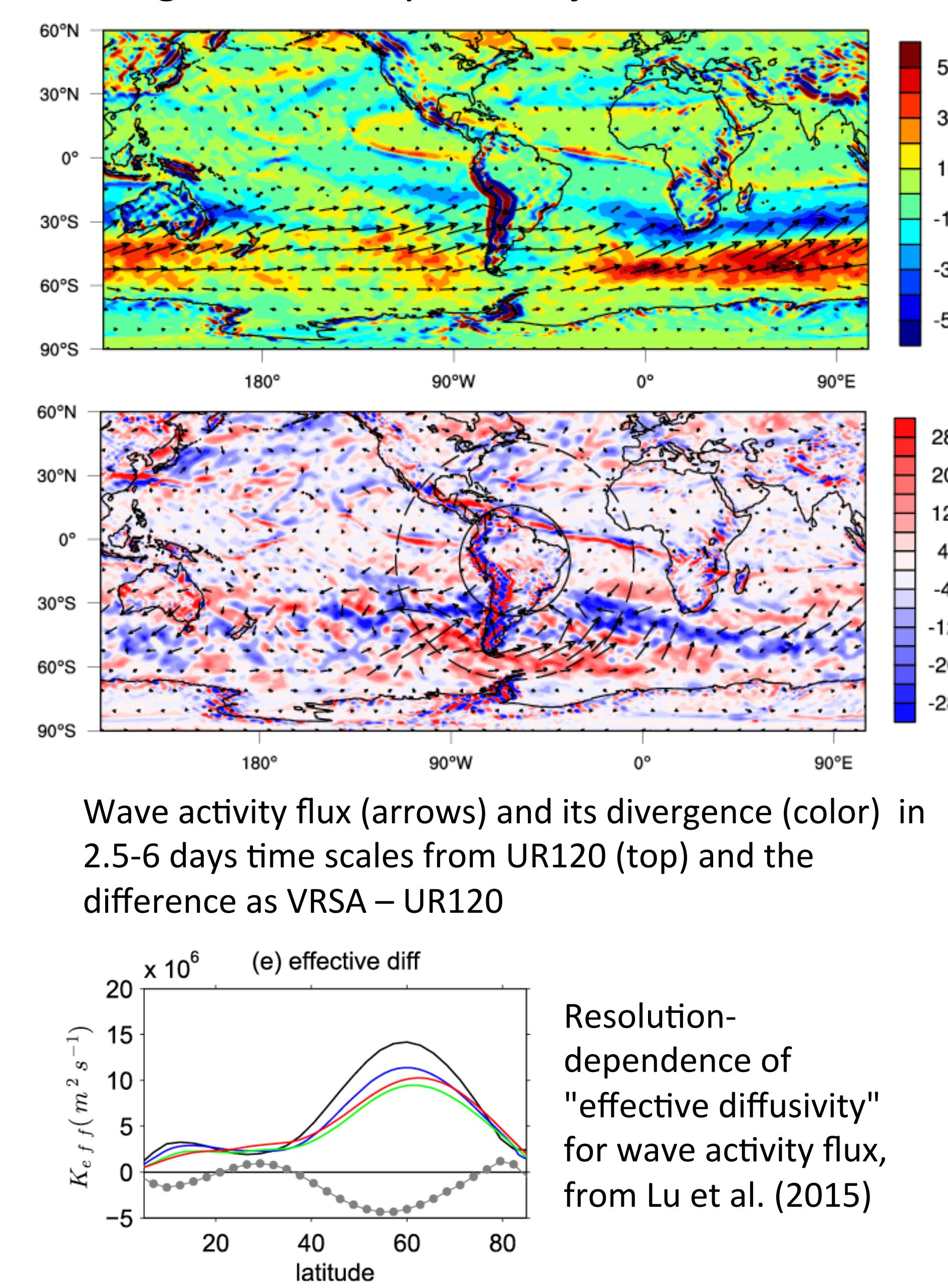
## Divergent circulations

Stronger ITCZ precipitation with higher resolution  
→ Stronger and poleward expanded local Hadley Cell  
→ The descending branch weakens the storm activity in the South Pacific Convergence Zone  
→ Changes the momentum flux divergence associated with baroclinic waves



## Transient Rossby Waves

More finely resolved and less dissipated wave activity flux (Lu et al. 2015)  
→ Enhanced subtropical wave breaking  
→ Poleward shifts of eddy momentum flux divergence & eddy-driven jet



## Stationary Rossby Waves

Greater monsoon precipitation  
→ Stronger Rossby wave source (Sardeshmukh and Hoskins 1988) and stronger upper-level northerly wind  
→ Greater chances for stationary Rossby waves (> 40 days time scale) to cross the equator and reach the SH jet (Li et al. 2015).

