The Simulation of Stratospheric Water Vapor over the Asian Summer Monsoon Region in CESM1(WACCM) Models

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• Stratospheric water vapor (SWV) exhibits localized maximum in the UTLS over the Asian monsoon region during boreal summer
• Convection-> vertical conduit -> confined within the anticyclone
• Dehydration on the southern side of the anticyclone
Questions to address

- 1. How are SWV simulated in CESM1(WACCM) models?
- 2. What causes the biases in the simulation of SWV among different models?
- 3. How does the simulation of SWV depend on model’s vertical resolution?
Differences in Temperature

Stronger heating associated with stronger convection over the Pacific ocean in L70

Stronger upwelling associated with intensified subtropical jet in L70

Stronger heating associated with stronger convection over the Pacific ocean in L70
- Troposphere: warmer over the central Pacific in L70
- Lower Stratosphere: colder over the central Pacific in L70
• The warmer (colder) temperature, the wetter (drier) SWV
  ○ Not likely a result of stronger convection in L70
  ○ Increased vertical resolution may play a role
• Less stratified UTLS

• To a lesser extent, the horizontal circulation
In L70, CO leaks to the central Pacific, which is correlated with the PV anomaly.

UTLS temperature anomalies over the central Pacific are responsible for the model deficiency in the confinement of chemical tracers.
Conclusions

– 1. How are SWV simulated in CESM1(WACCM) models? The discrepancies over the Asian summer monsoon region are commonly found.

– 2. What causes the biases in the simulation of SWV among different models? The UTLS temperature over the central Pacific Ocean is crucial for spatial pattern.

– 3. How does the simulation of SWV depend on model’s vertical resolution? Model with high vertical resolution resolves the UTLS temperature more accurately which better confines the SWV within the transport barrier.

Thank you! Questions?

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