

# Convective-Stratiform-Anvil Transition in CAM5 and SPCAM

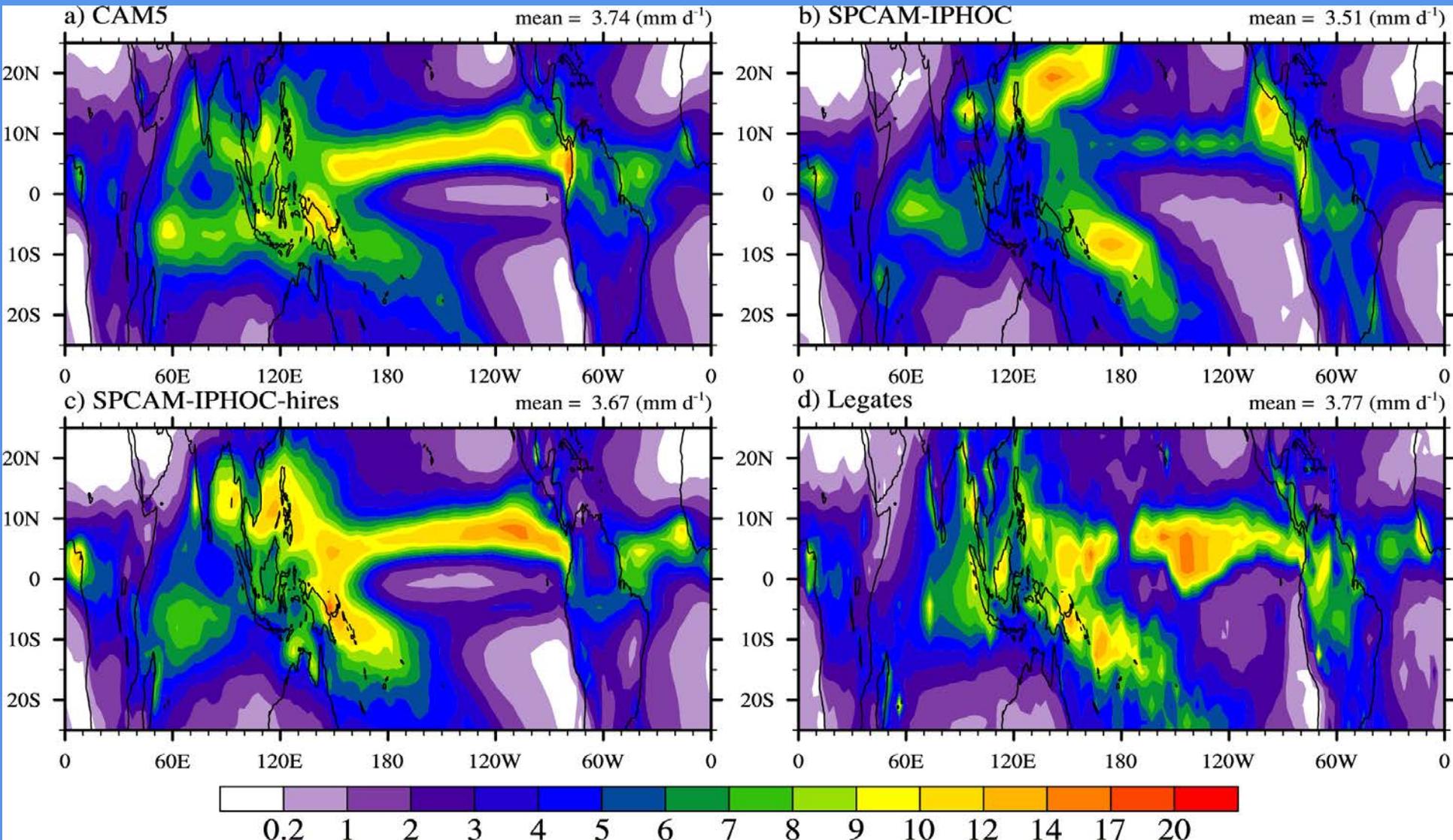
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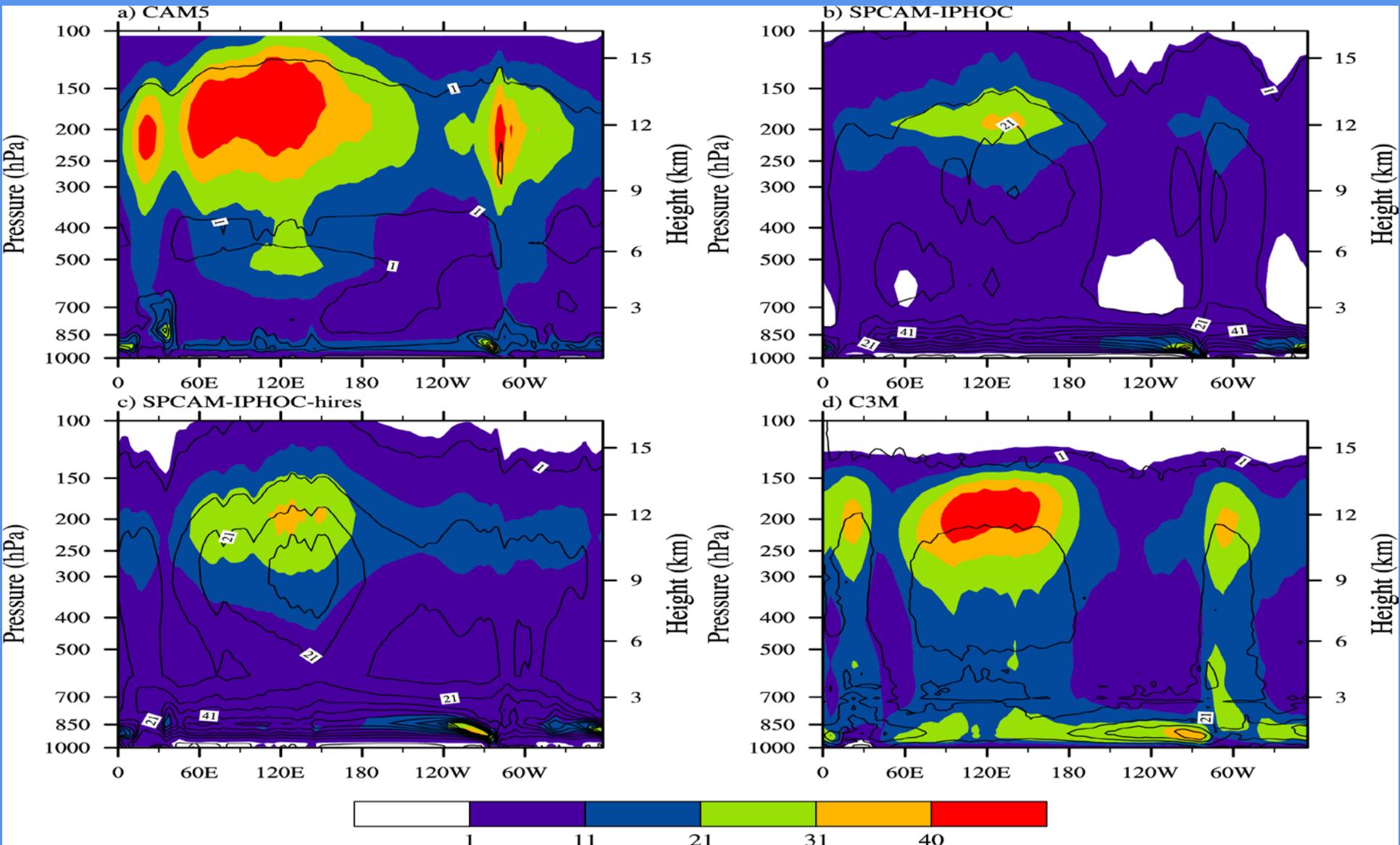
# Experiment Design

- CAM5: standard Community Atmosphere Model version 5 with fv- $1.9^{\circ} \times 2.5^{\circ}$ , 26 levels in vertical direction
- SPCAM-IPHOC: CAM3.5 embedded a 2D System for Atmospheric Modeling (SAM) with intermediate prognostic higher-order turbulence closure (IPHOC); 26 levels in vertical direction for CAM3.5; same vertical levels and 32 Columns in horizontal with 4 km grid-size for SAM;
- SPCAM-IPHOC-hires: fv- $1.9^{\circ} \times 2.5^{\circ}$ , 32 levels in vertical direction with level doubled from 6 to 12 below 700 hPa.
- CAM5 and SPCAM-IPHOC-hires were integrated for ten years, and SPCAM-IPHOC integrated for 2 years and 3 months.

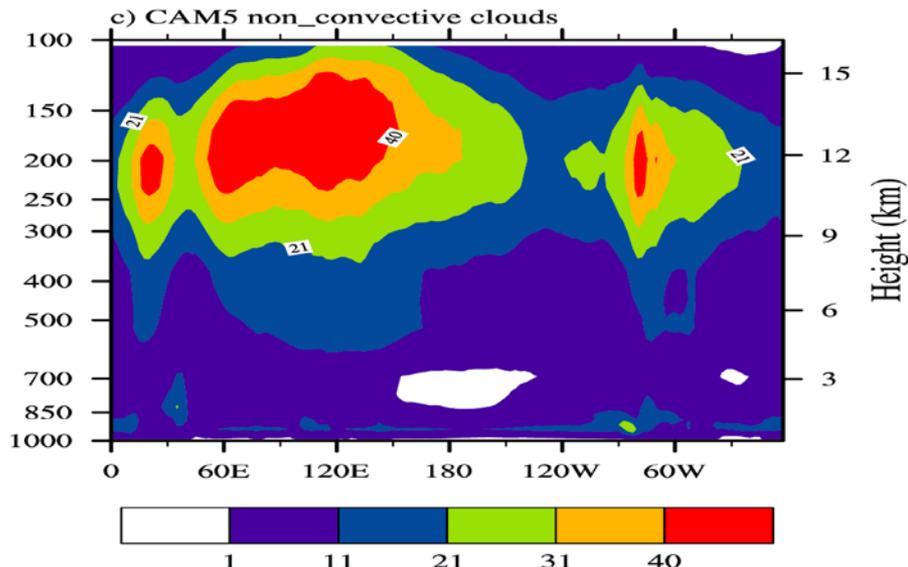
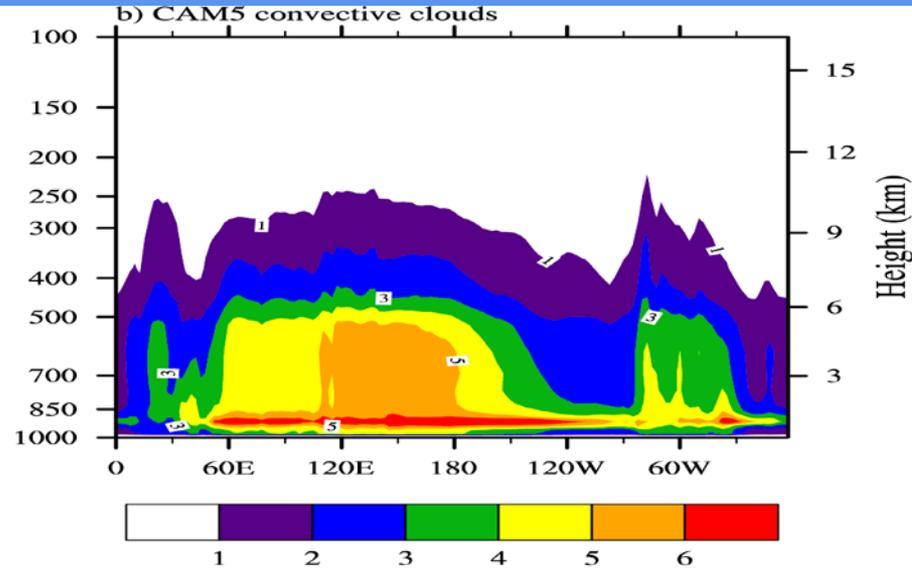
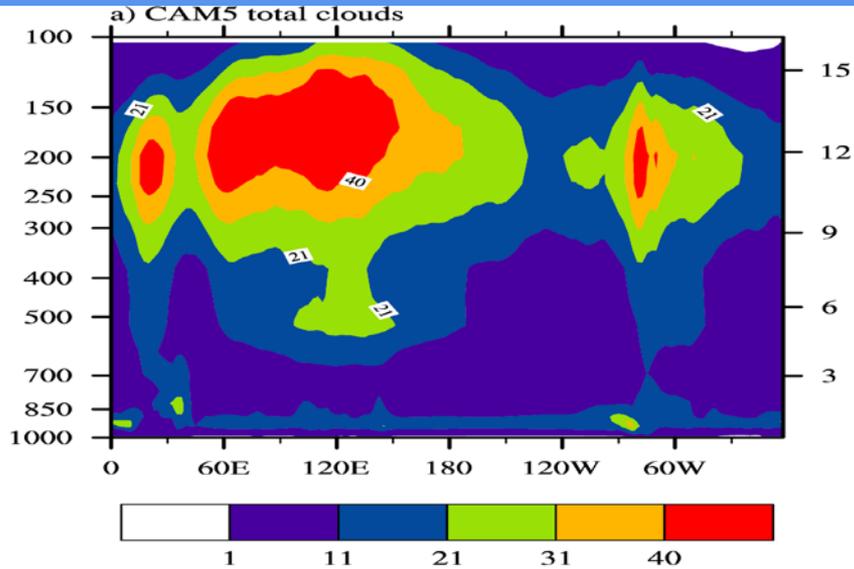
# Annual mean precipitation



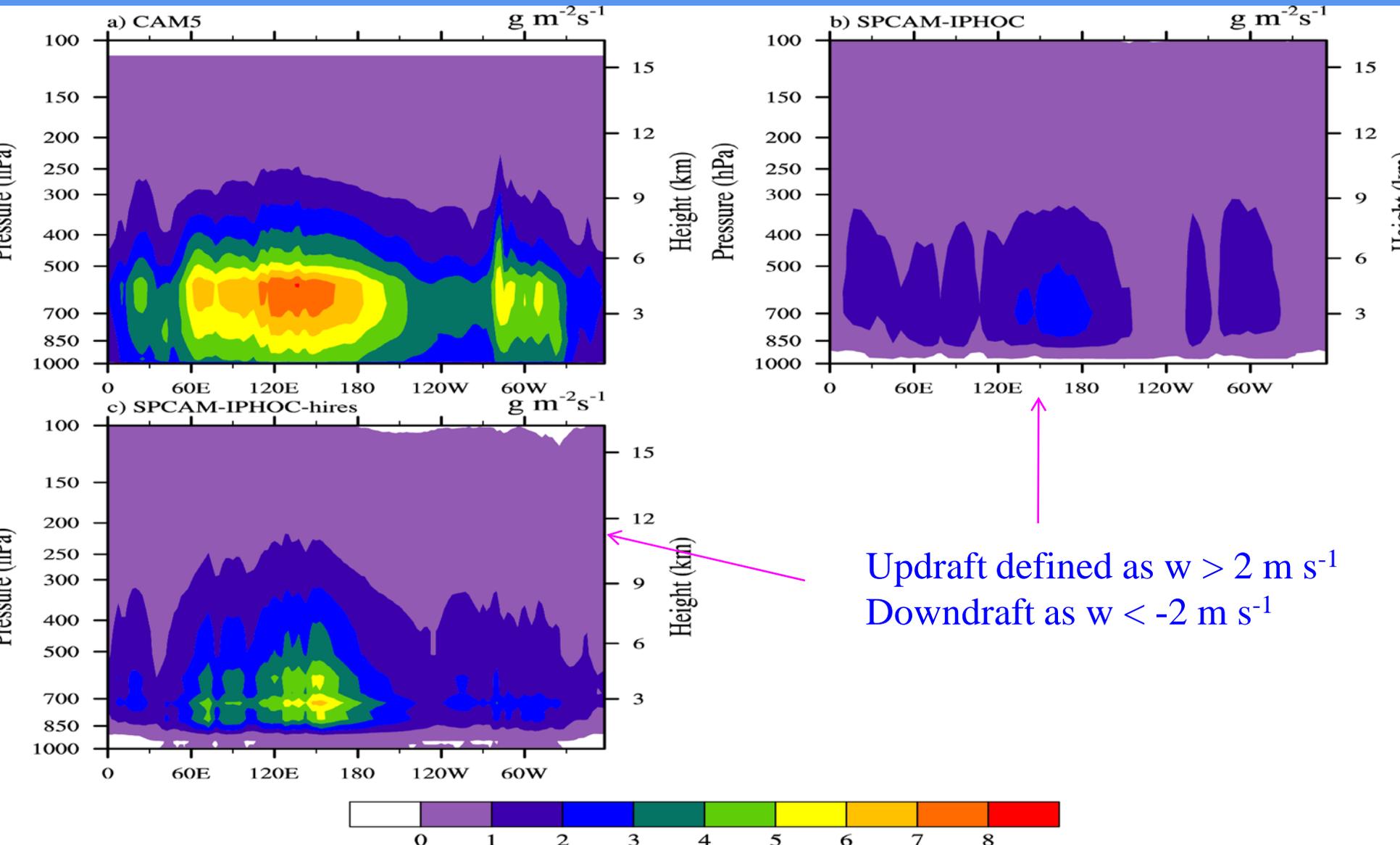
# Cross-sectional plots of cloud fraction and the sum of cloud water and ice between 15°S and 15°N



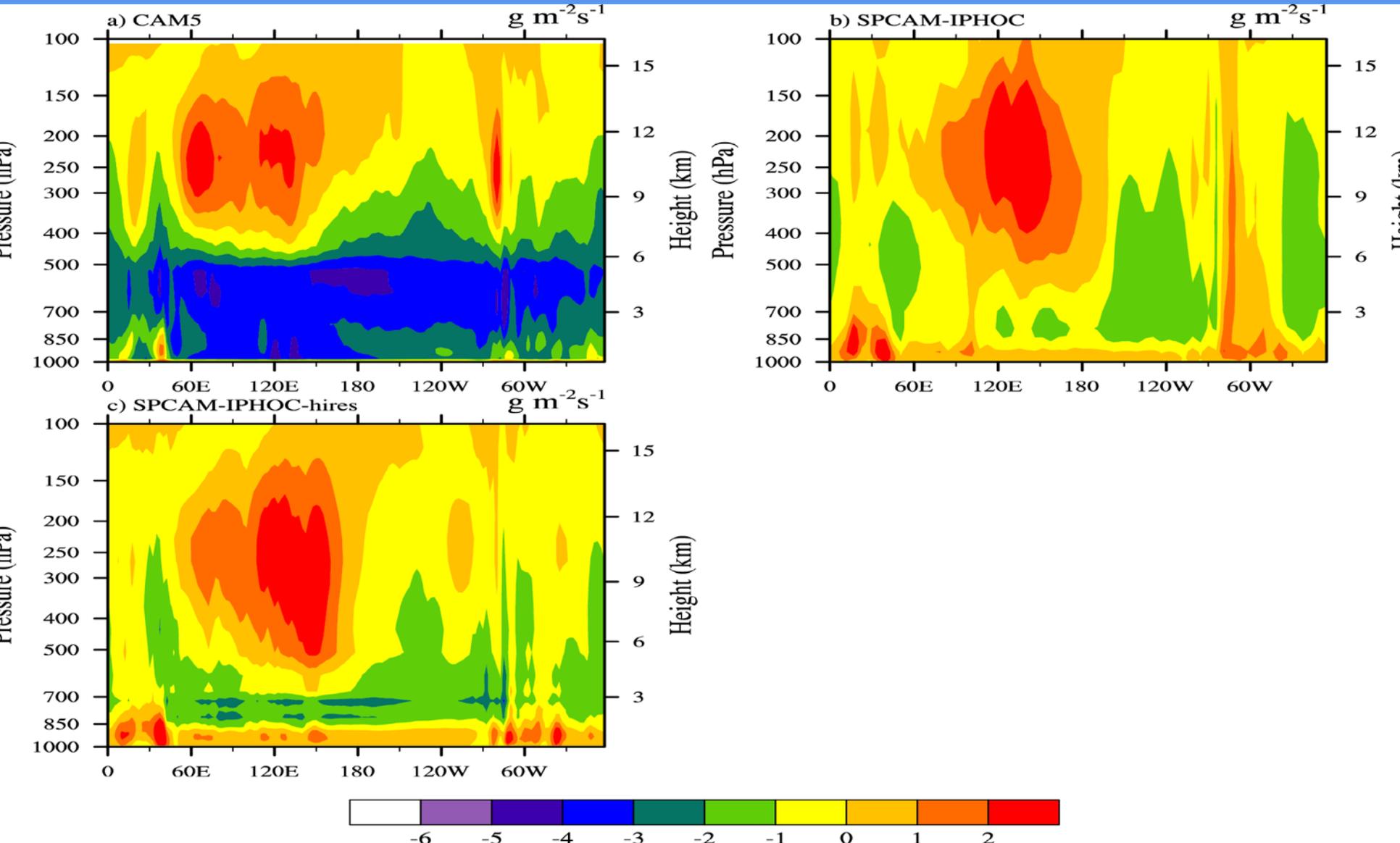
# Cross-sectional plots of total, convective, and non-convective cloud fraction between 15°S and 15°N from CAM5



# Cross-sectional plots of convective mass flux between 15°S and 15°N



# Cross-sectional plots of environmental and mesoscale mass flux between 15°S and 15°N



# Summary

- The convective-stratiform-anvil transition clouds and liquid and ice water averaged between 15°N and 15°S simulated by CAM5, and SPCAM-IPHOC are compared with C3M observations.
- CAM5 underestimated the liquid and ice water content, but overestimated the cloud fraction for both the convective and transition clouds. The clouds in CAM5 probably do not have much condensates. Those from SPCAM-IPHOC and SPCAM-IPHOC-hires are more reasonable.
- The convective mass flux from CAM5 is the strongest among the three simulations, while the mesoscale mass flux above 500 hPa from SPCAM-IPHOC-hires is the largest. So SPCAM-IPHOC-hires tends to produce more transition clouds by the mesoscale updrafts.

# Annual mean large-scale precipitation

