



Physical Mechanism underlying tropical biases from Transpose AMIP simulation with CAM5

Jianhua Lu^{1,2}, Wuyin Lin¹, Yangang Liu¹, Andrew M. Vogelmann¹, Minghua Zhang³, His-Yen Ma⁴, Shaocheng Xie⁴

¹ Brookhaven National Laboratory, DOE; ²COAPS, Florida State University; ³ SoMAS, Stony Brook University; ⁴ Lawrence Livermore National Laboratory, DOE



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1. Motivation

There is physical linkage between cloud radiative feedback, water vapor feedback, convection, and surface turbulent fluxes in the tropics in response to external forcing in climate models (Fig. 1).

We are interested to seek the similar internal linkage between multiple tropical and even extra-tropical processes which may be related to the tropical biases widely existed in the climate models. Such biases are thought to be mainly caused by the biases in physical parameterizations (cloud, convection) in the atmospheric models because similar biases emerge in just several days with the atmospheric model (as NWP model) forced by observed SST and reanalysis initial conditions, see Xie et al (2012) and Ma et al. (2013 2014) for the appearance and evolution of tropical biases during the 6-day hindcast experiments.

Here we use the difference between the 4th-day and the 2nd-day run during the 2009-2010 winter to show how the tropical biases is growing during the model runs, which may help us to understanding the physical and dynamical processes through which the parameterization schemes cause the biases in the simulation. Some preliminary results are shown here, and further research is undergoing.

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2. Results

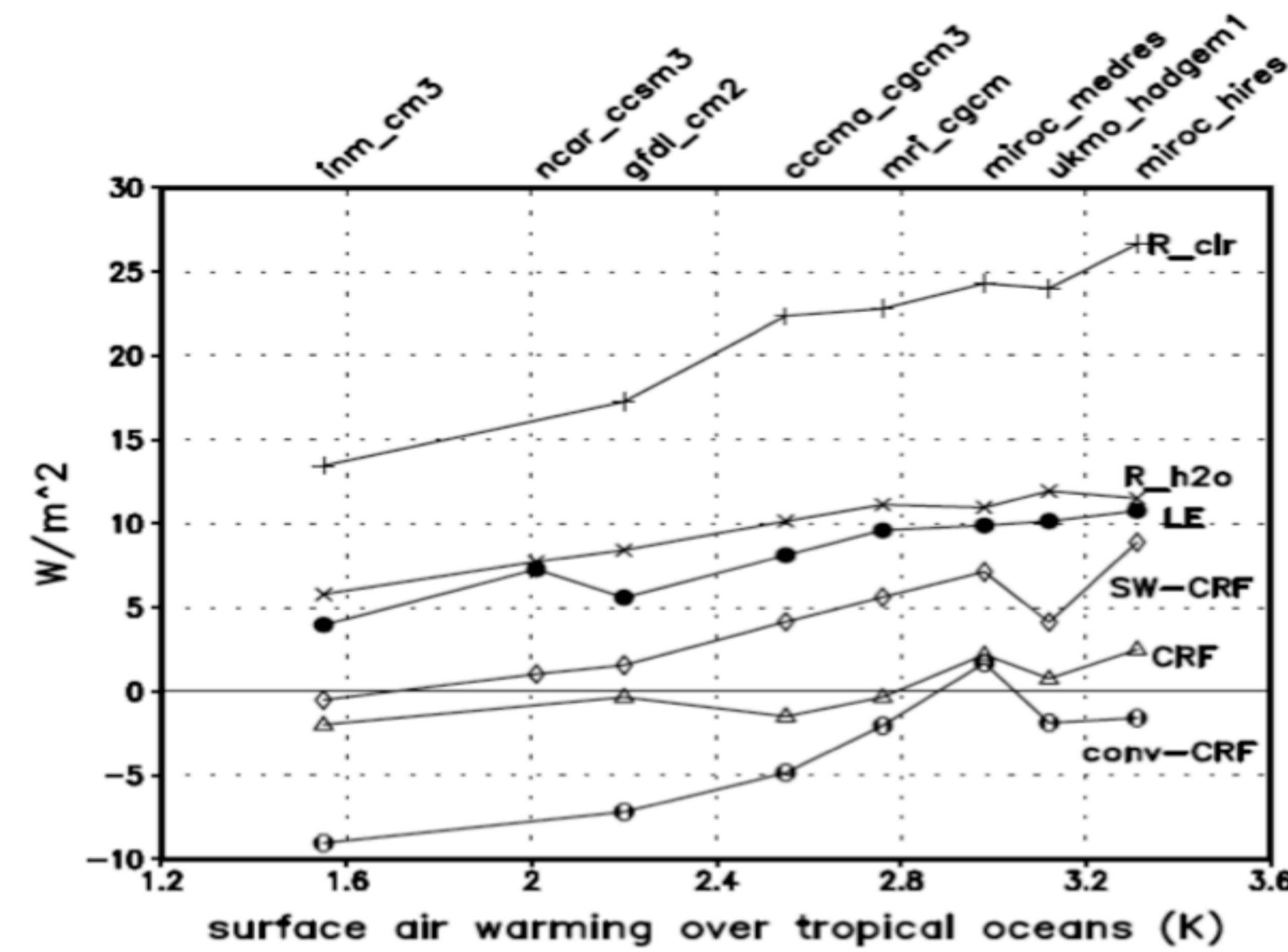


Figure 1 The intermodel spreads in R_{clr} , R_{h2o} , surface latent heat flux (labeled with LE), surface shortwave CRF (labeled with SW-CRF), and surface CRF (labeled with CRF). All of the results are averaged over low-loud region (with 500 hPa vertical velocity ($\omega > 0$)), except that the curve labeled with conv-CRF is for the surface CRF averaged over deep-convective region ($\omega < -30$ hPa/day).

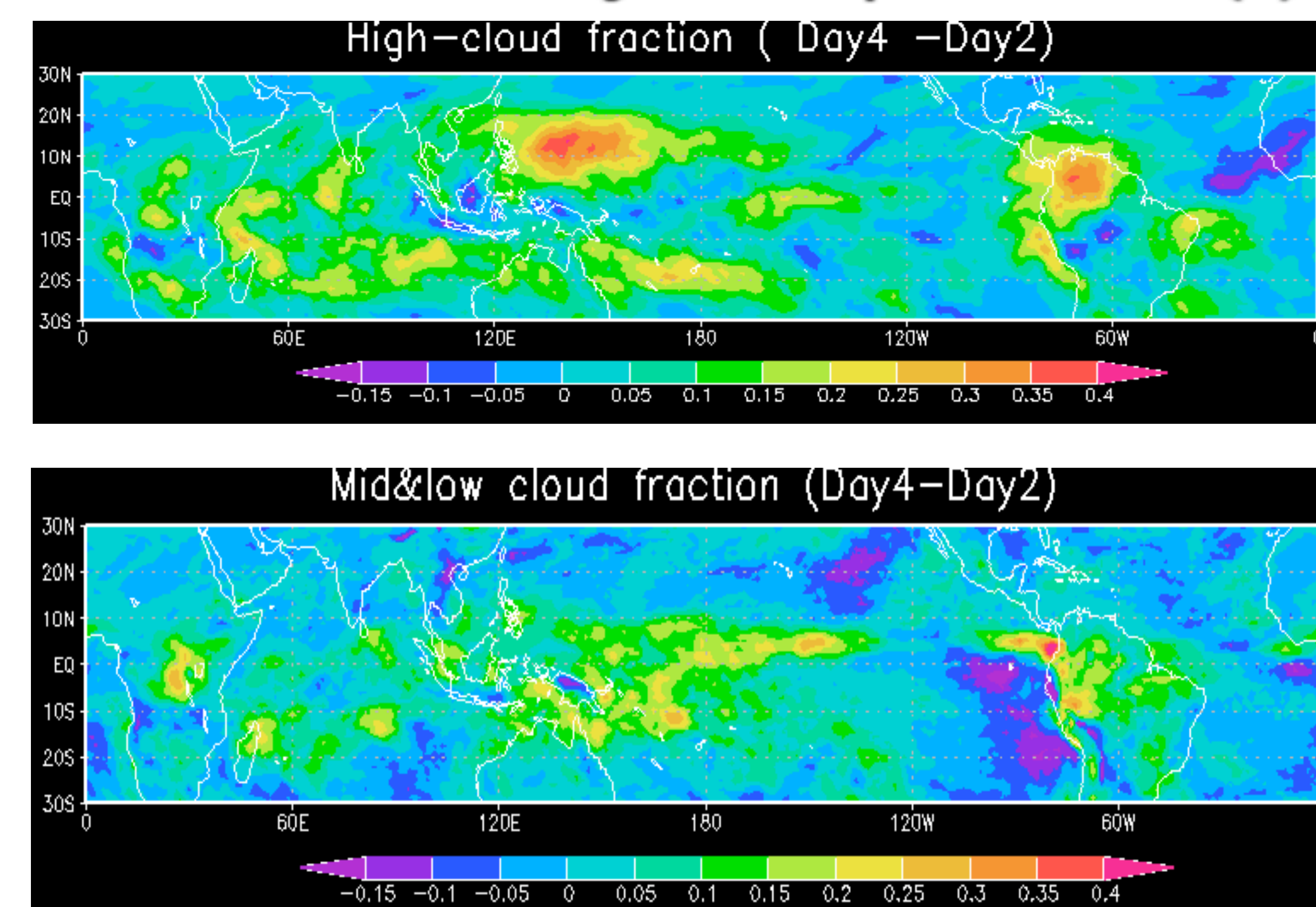


Figure 2 The differences in high-cloud fraction (upper panel) and middle-and-low cloud fraction (lower panel) between 4th-day and 2nd-day of the TAMIP simulation for 2009-2010 winter.

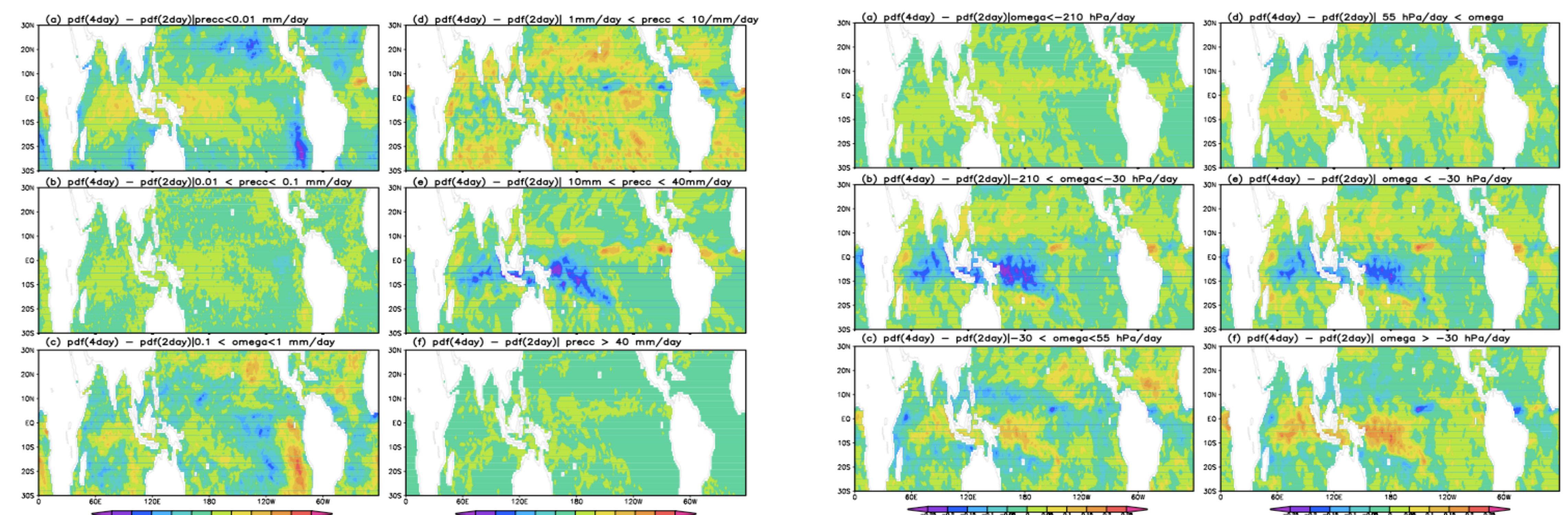


Figure 3 The differences in PDF of convective precipitation (left panel) and ω 500 (right panel) between 4th-day and 2nd-day of the TAMIP simulation for 2009-2010 winter. PDF calculation based on 3-hourly data.