Parameterization of deep convection in E3SM with higher-order closure

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CLUBB-SILHS can parameterize deep convection and stratocumulus in the same global simulation

One advantage of this unification is that the same microphysics scheme can be called everywhere. Therefore, aerosol indirect effects can be treated in all cloud types.

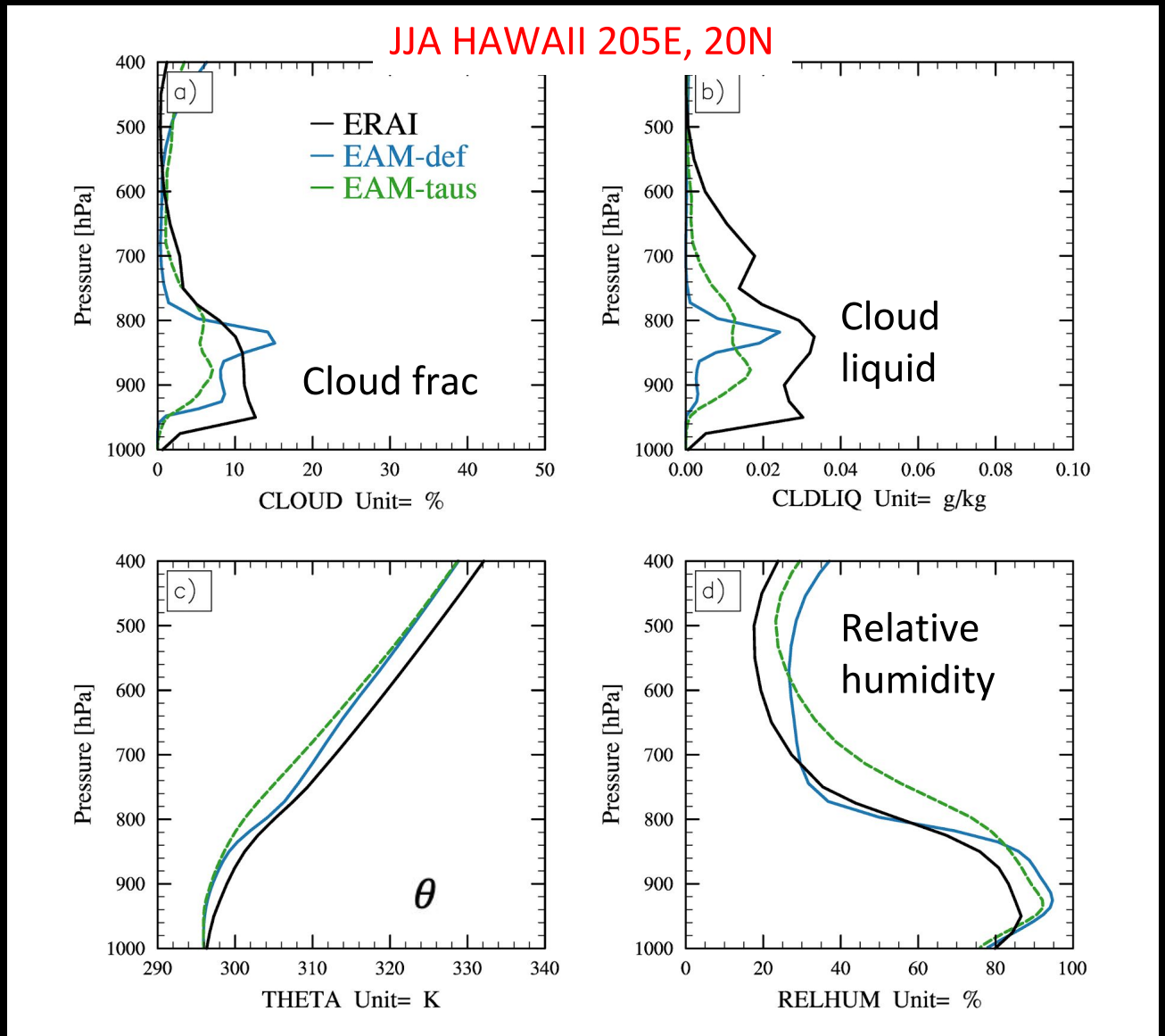
Let’s show profiles from selected grid columns in two global simulations

Format of the following profiles:

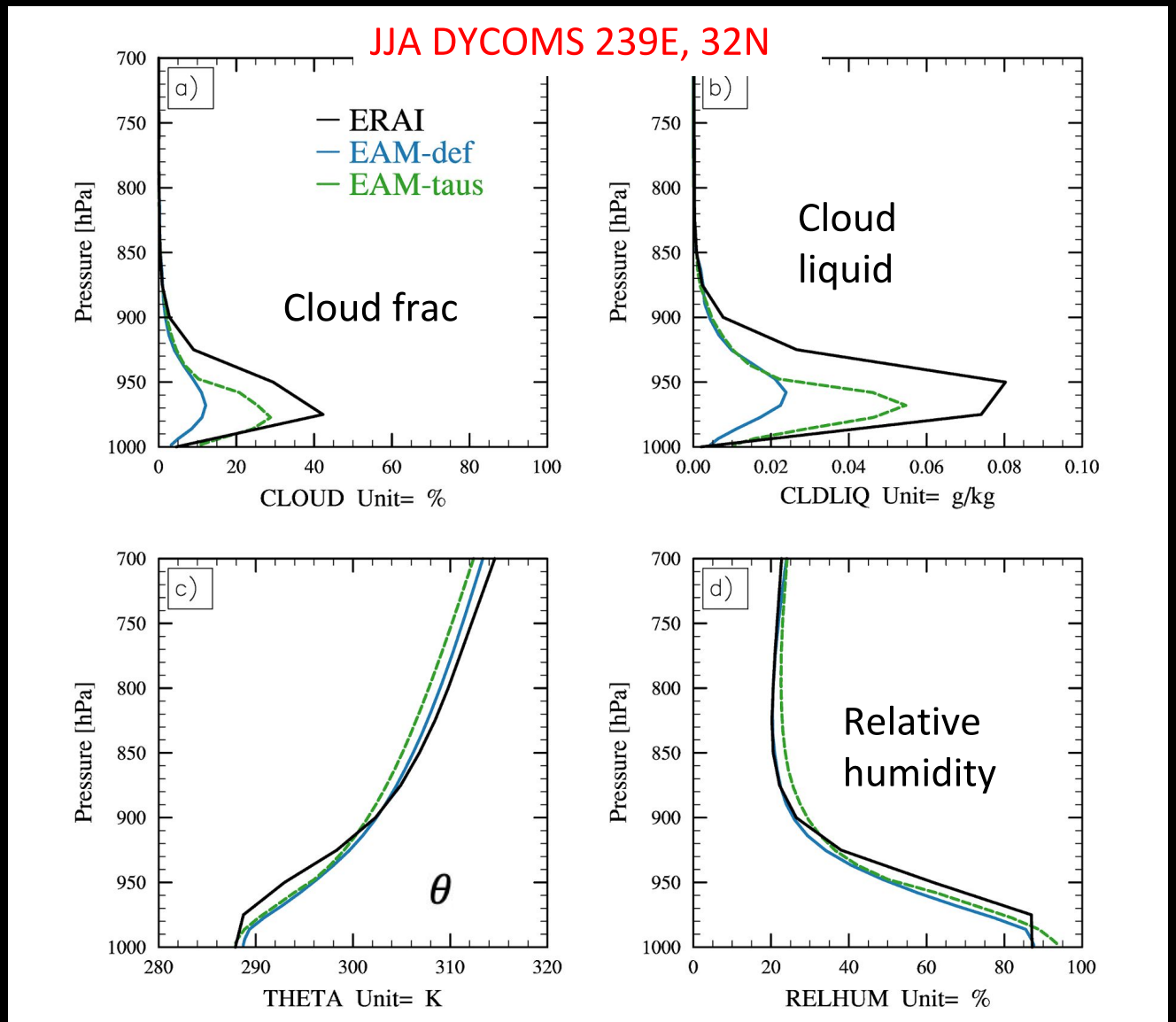
EAMv1 1° “EAM-def” EAM-taus 1°

Shown for comparison. Has CLUBB-SILHS, but no ZM.

In EAM-taus, cloud maximizes near cloud base in shallow Cu regimes



In EAM-taus, Sc clouds have more liquid



Does introducing a Multi-time-scale parameterization improve global metrics?

- We'll show some 1° simulations.

- **Format of the following 2D figures**

Left panels: **Right panels:**

Default E3SMv1 E3SM**-taus (CLUBB-SILHS, no ZM)**

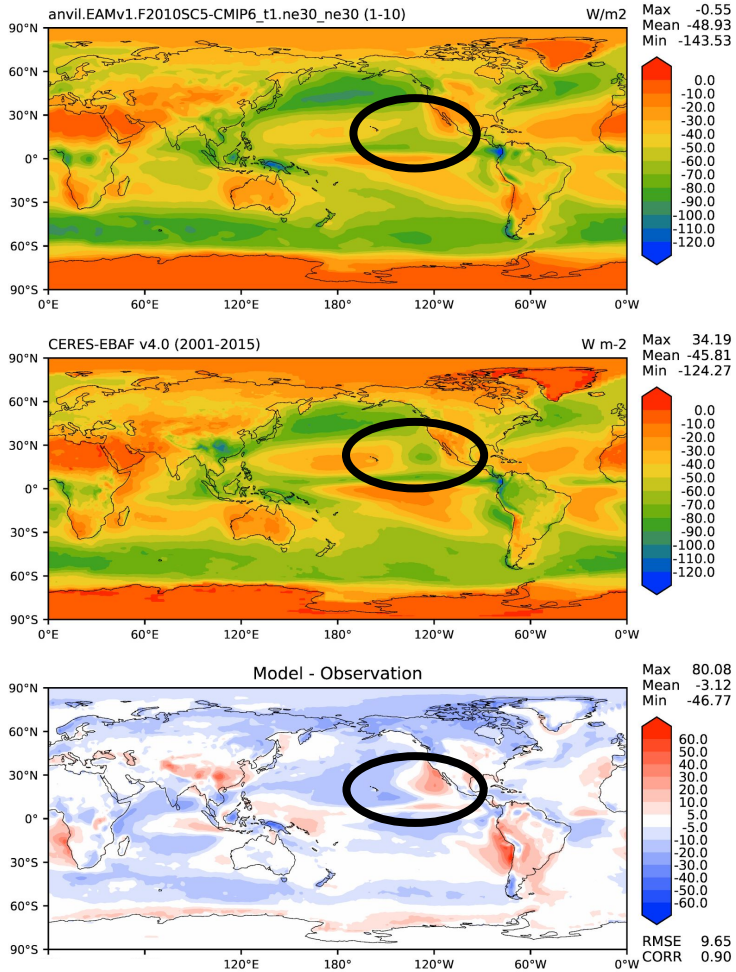
EAM-taus pushes SC deck closer to California, which improves SWCF there

Simulation

EBAFV4

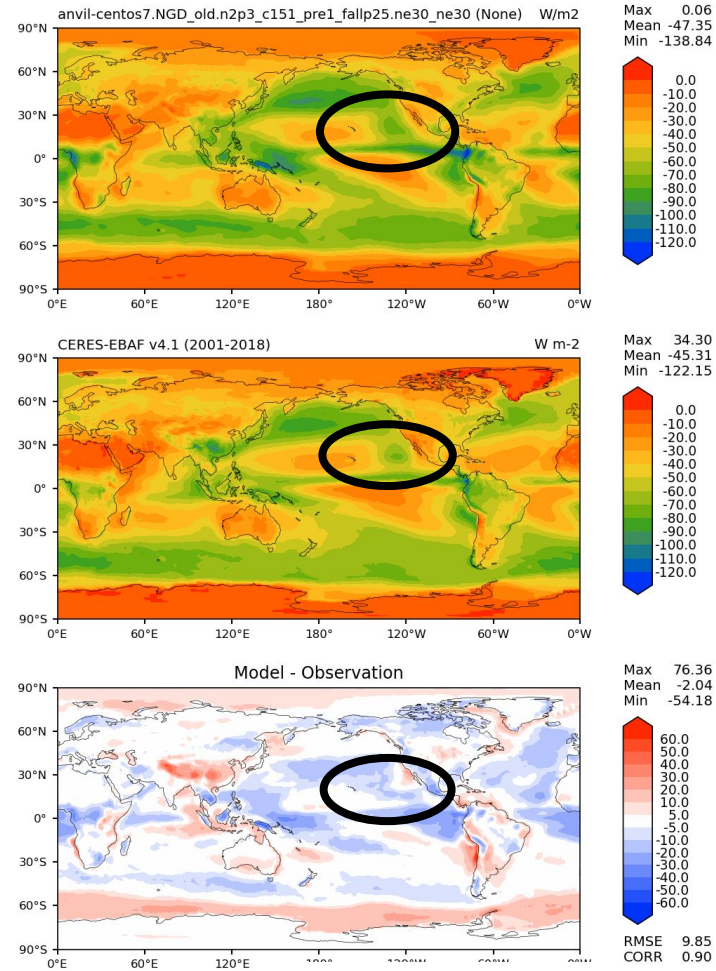
bias

E3SMv1 1°



RMSE 9.65
CORR 0.90

EAM-taus 1°



RMSE 9.85
CORR 0.90

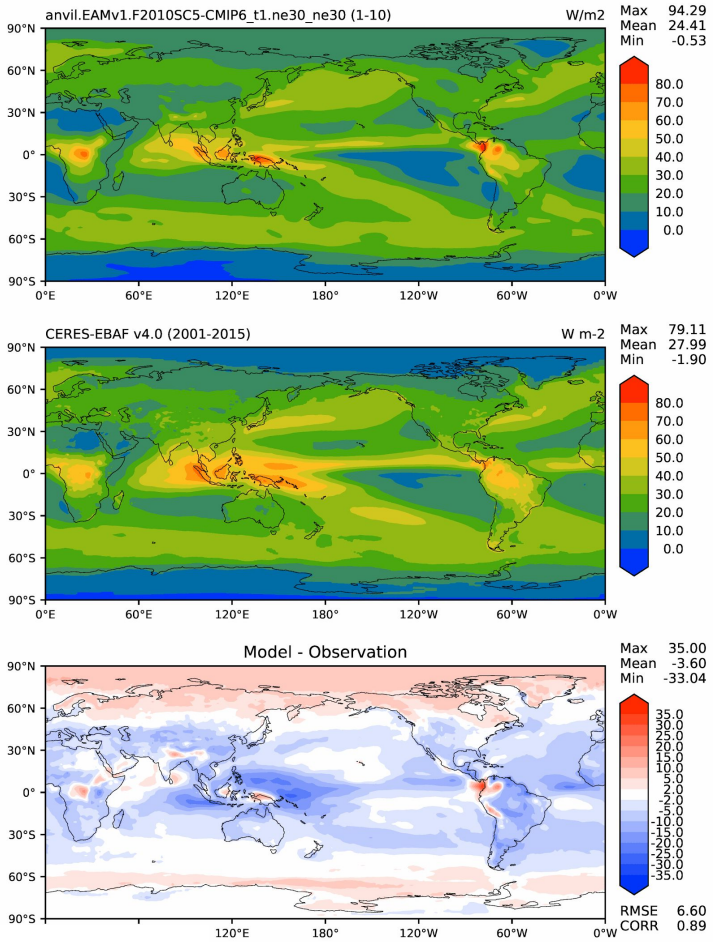
EAM-taus has weak LWCF along the ITCZ and over Amazon

Simulation

EBAFV4

bias

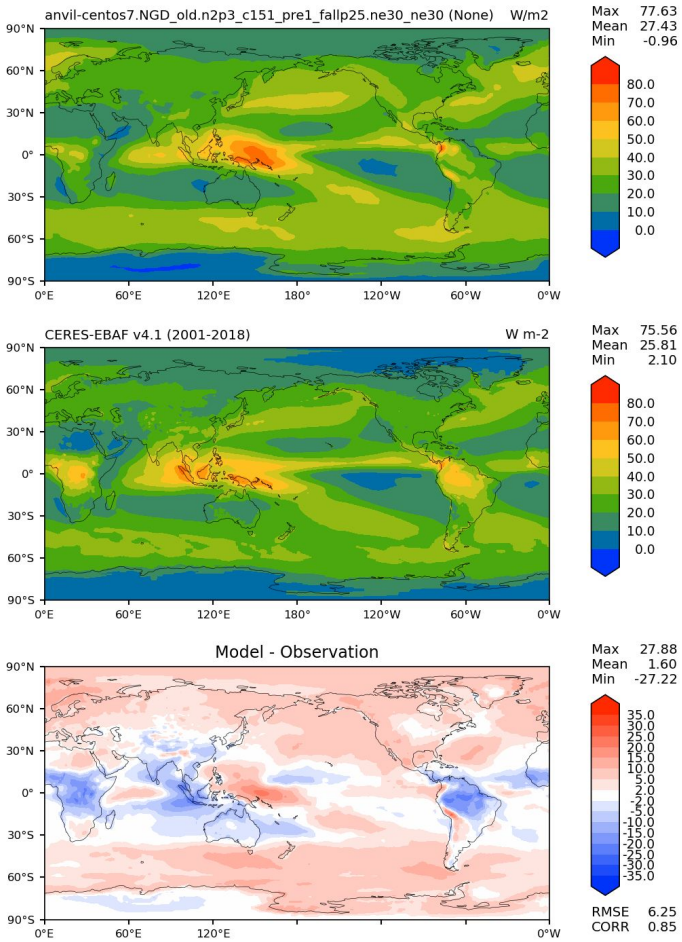
E3SMv1 1°



RMSE 6.6

CORR 0.89

EAM-taus 1°



RMSE 6.25

CORR 0.85

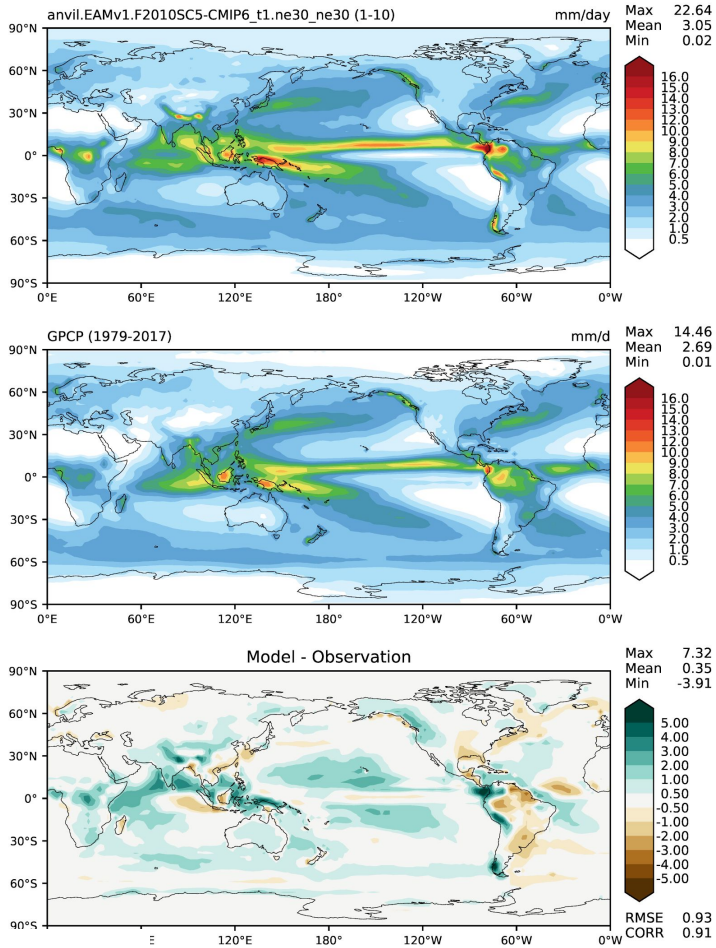
EAM-taus has large RMSE of PRECT but reduces the double ITCZ

Simulation

GPCP

bias

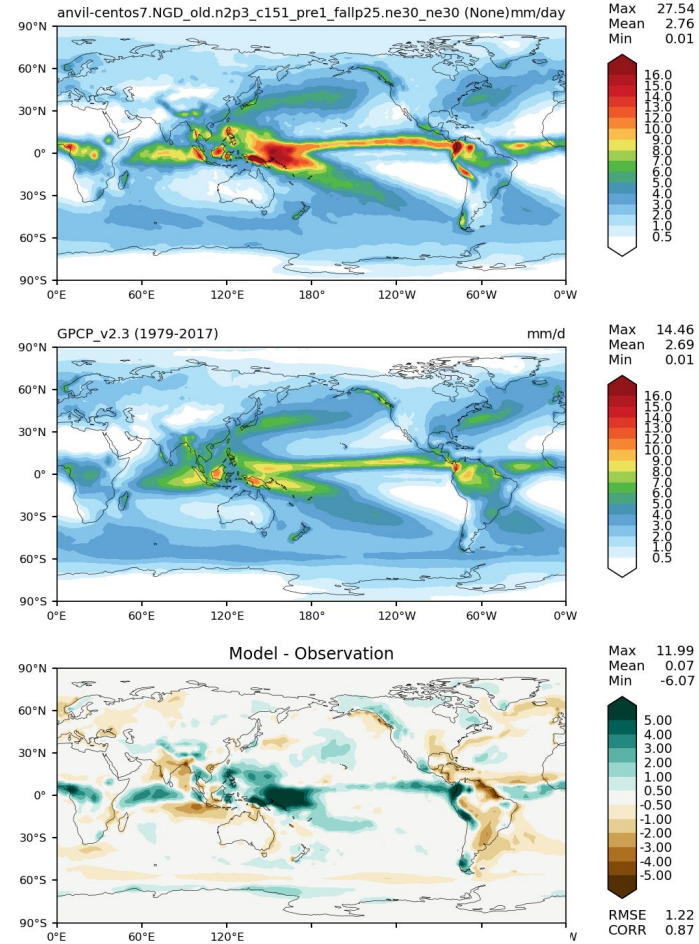
E3SMv1 1°



RMSE 0.93

CORR 0.91

EAM-taus 1°



RMSE 1.22

CORR 0.87