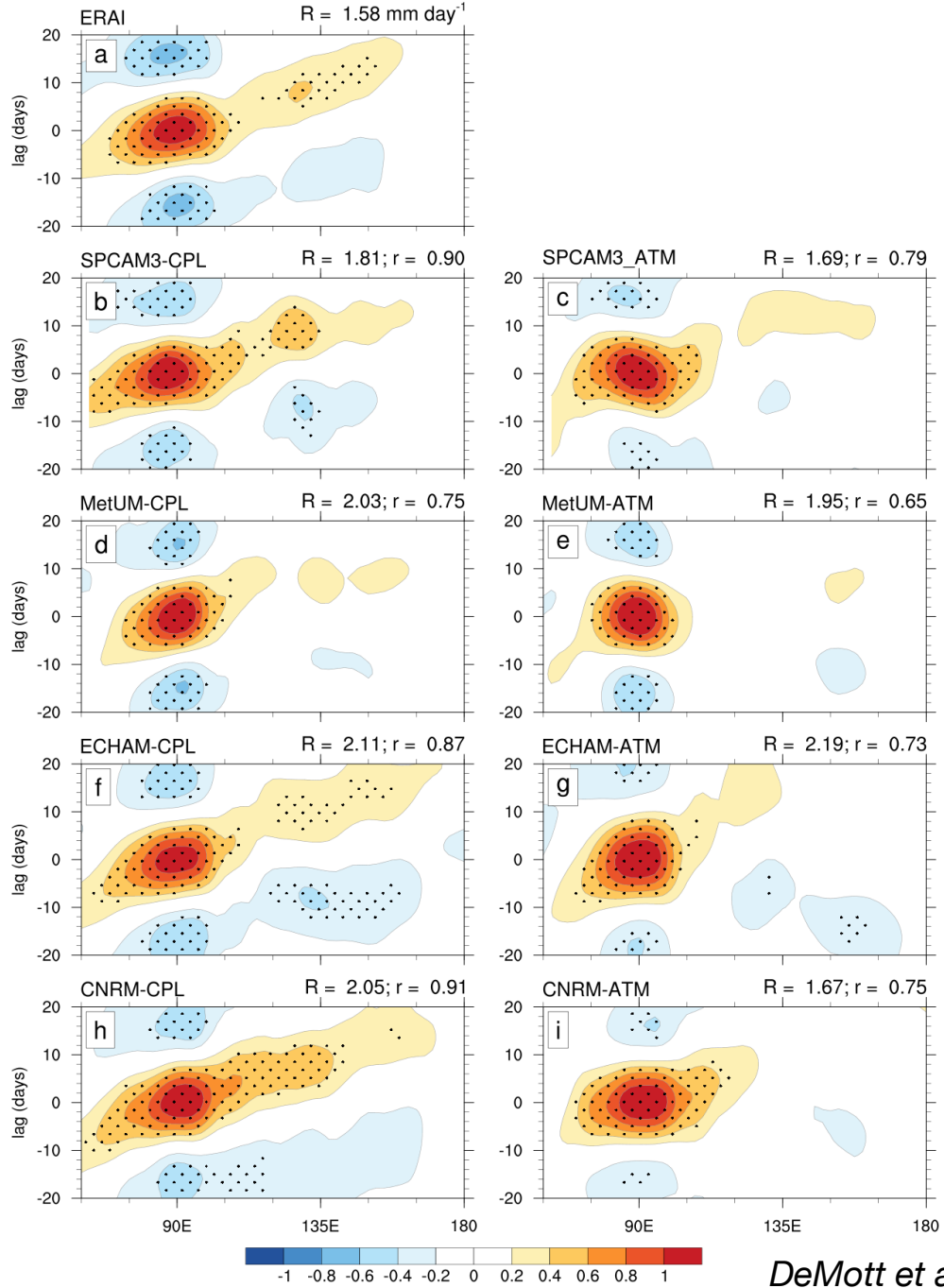


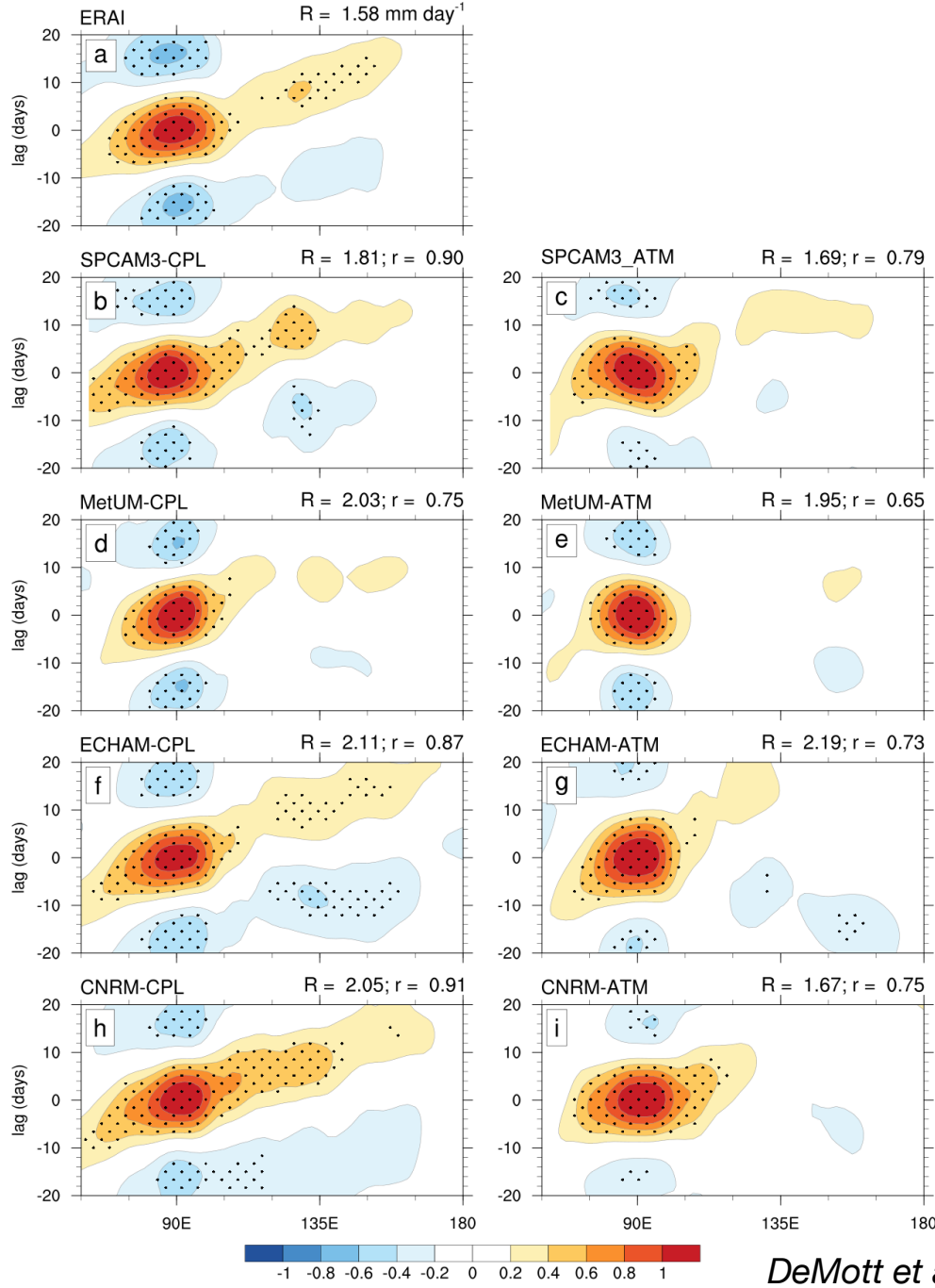
Understanding air-sea feedbacks to the MJO through process evaluation of observations and E3SM experiments

Charlotte A. DeMott (Colorado State University)
Nicholas P. Klingaman (University of Reading)

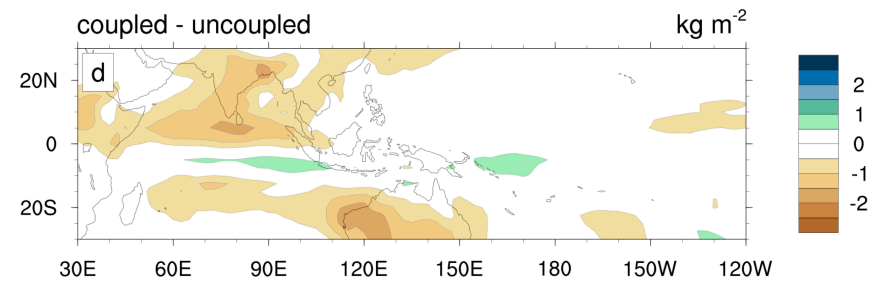
motivation: ocean-atmosphere coupled feedbacks improve MJO simulation



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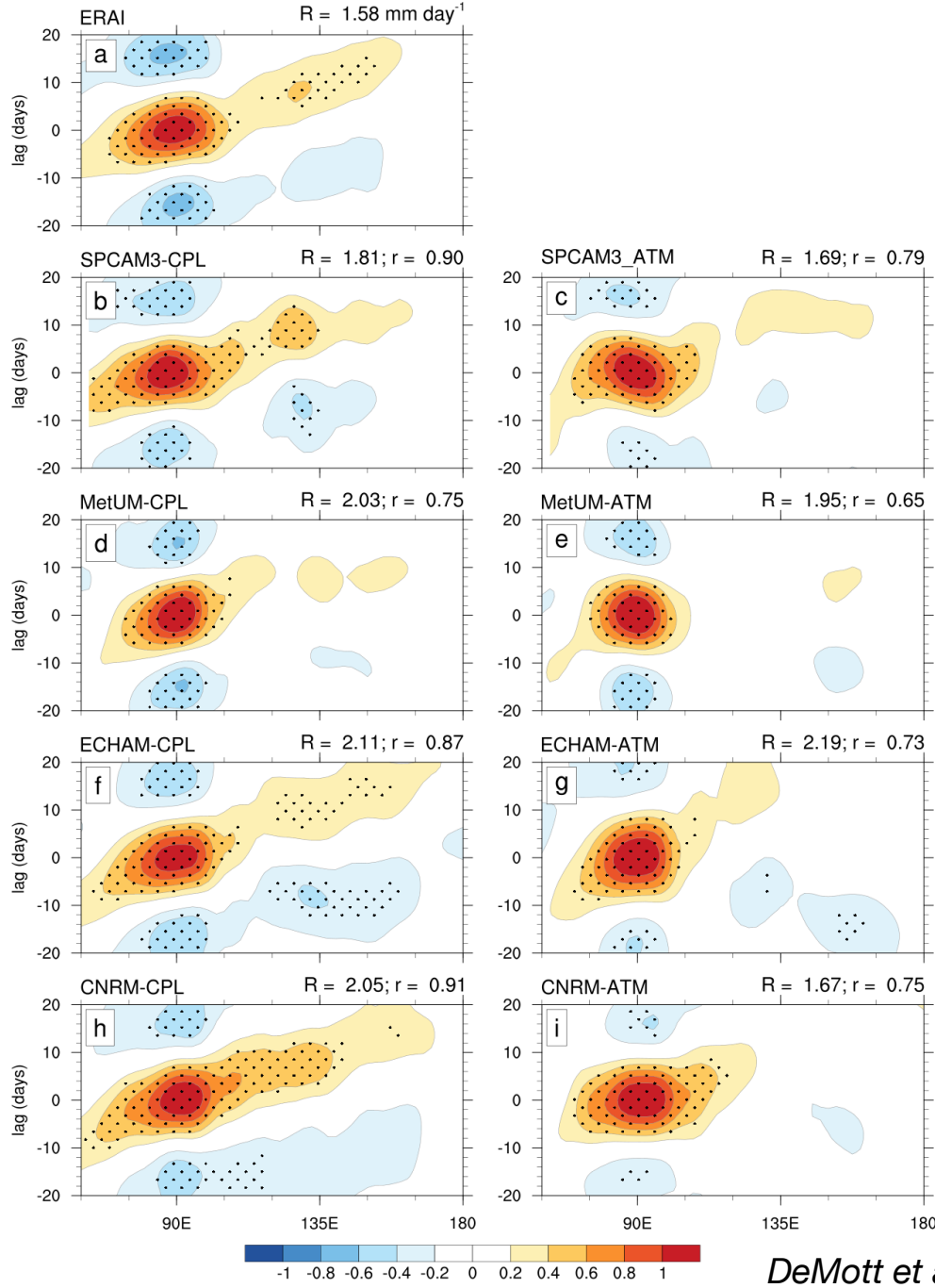
- coupled feedbacks affect mean state moisture distribution (primary effect).



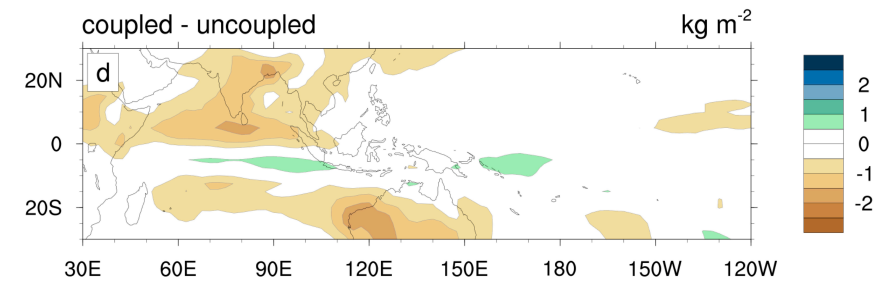
Xiang et al. (2020)

DeMott et al. (2019)

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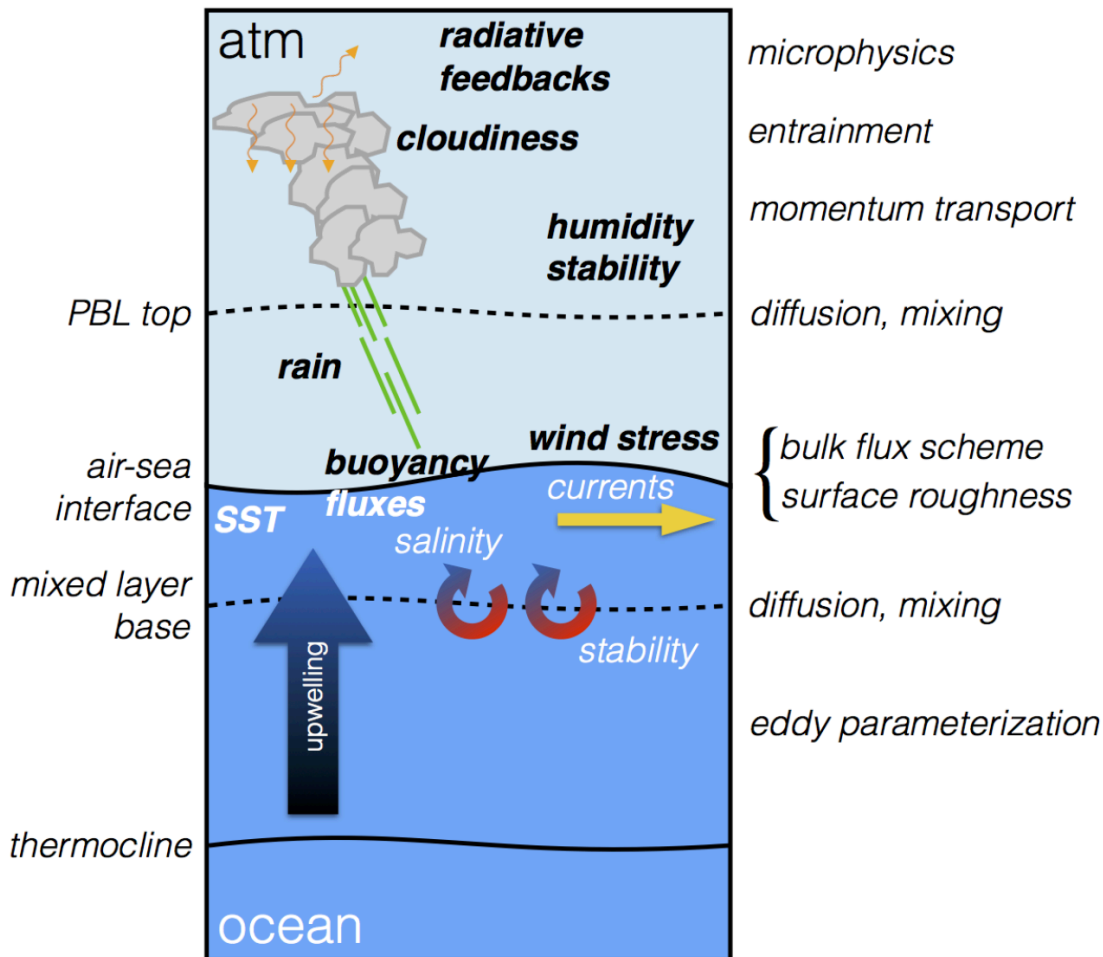


Xiang et al. (2020)

- coupled feedbacks directly affect MJO (secondary effect).

DeMott et al. (2019)

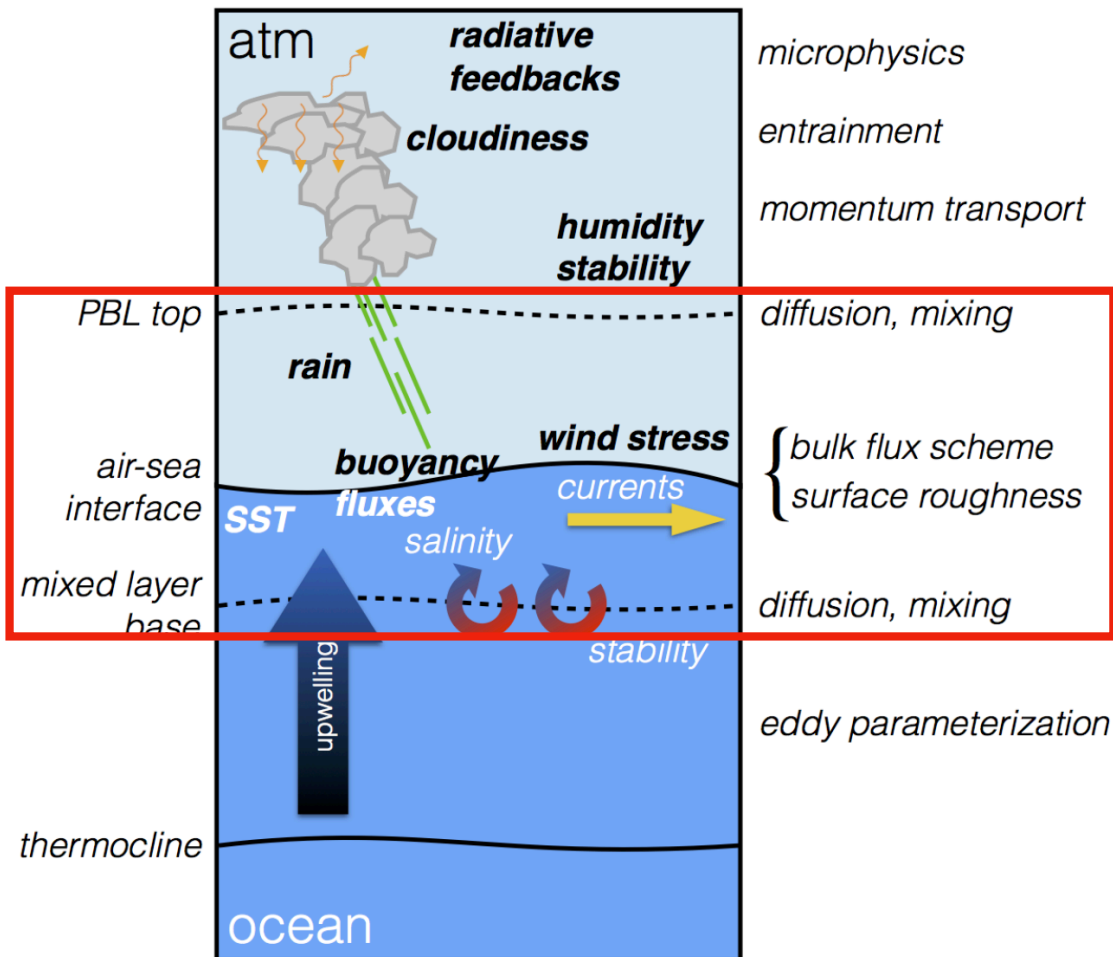
overarching science question: how do MABL and OML regulate surface flux feedbacks to MJO convection?



Specific science questions:

- How well does E3SM capture air-sea coupled feedbacks to the MJO relative to other CMIP6-class ESMs?
- How do biases in air-sea coupled feedbacks in E3SM relate to errors in atmospheric and oceanic boundary-layer physics?
- How do mean-state biases in SSTs and tropospheric water vapor affect the representation of convection in E3SM?

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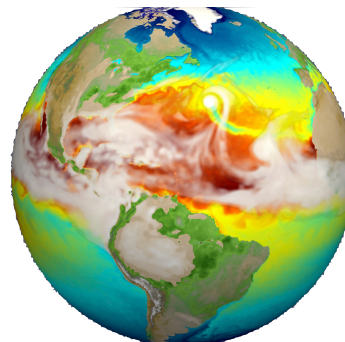
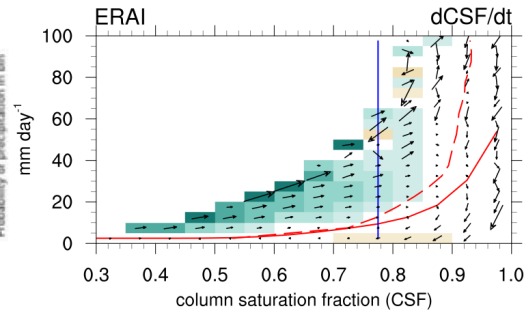
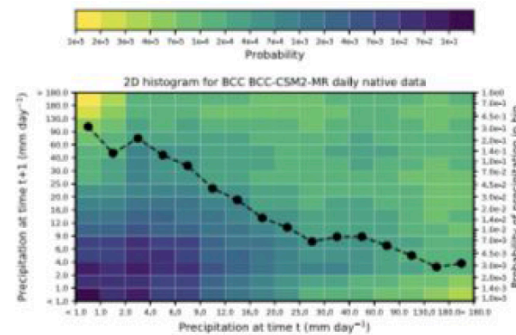
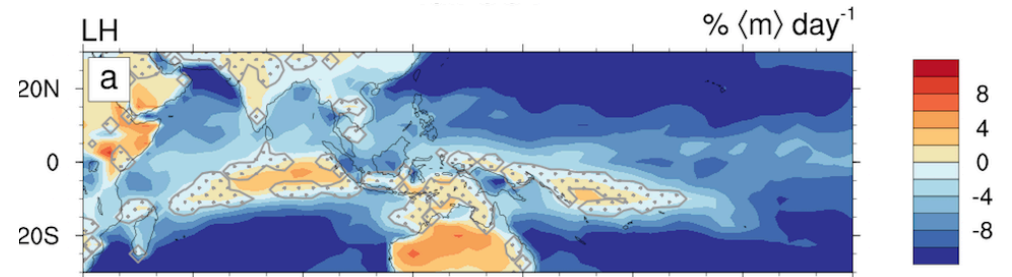


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science objectives

- Document MJO ocean feedback strength by applying existing air–sea interaction diagnostics suite to E3SM and other CMIP6 ESMs.
- Understand how tropical air–sea feedbacks affect the organization of precipitation.
- Diagnose atmospheric and oceanic processes that contribute to E3SM biases in intraseasonal air–sea interactions.

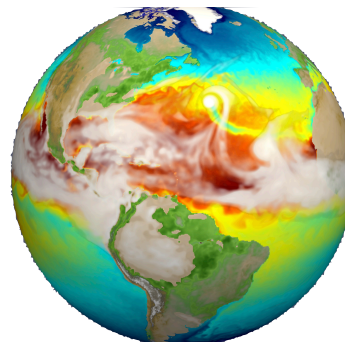
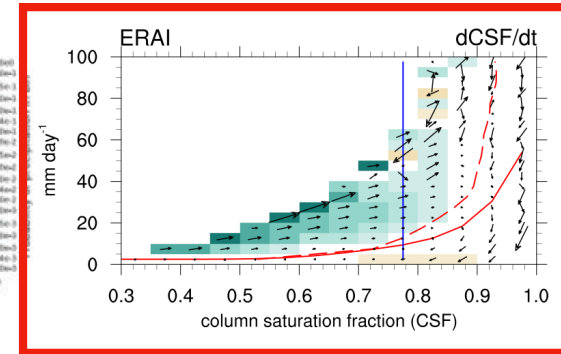
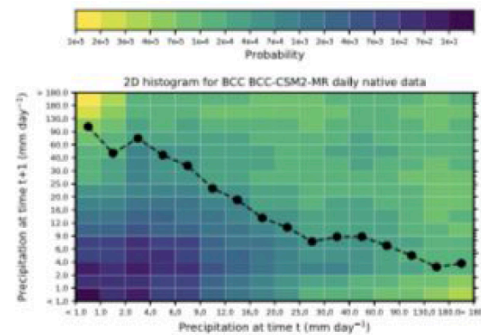
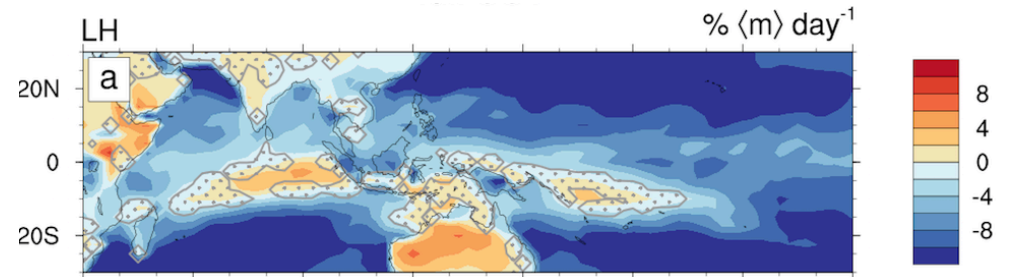


using E3SM **daily output**:

- AML T, q budgets
- OML heat budgets

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current and upcoming efforts



- **Exploratory metrics** (C. DeMott): rainfall-moisture coupling in CMIP6 models.

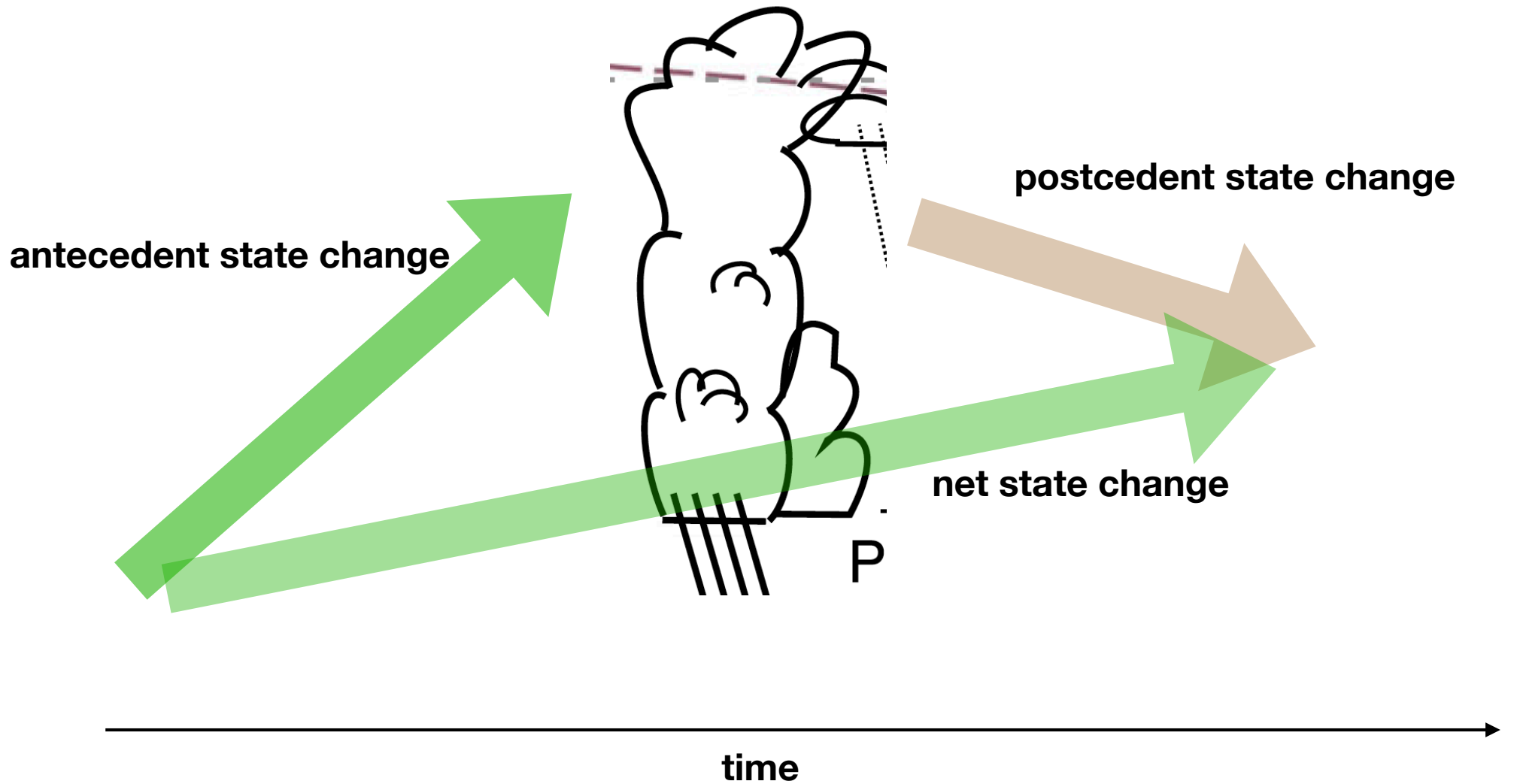


- **Exploratory metrics** (N. P. Klingaman; Robert Lee): Analysis of Scales of Precipitation (ASoP) for CMIP6 models.

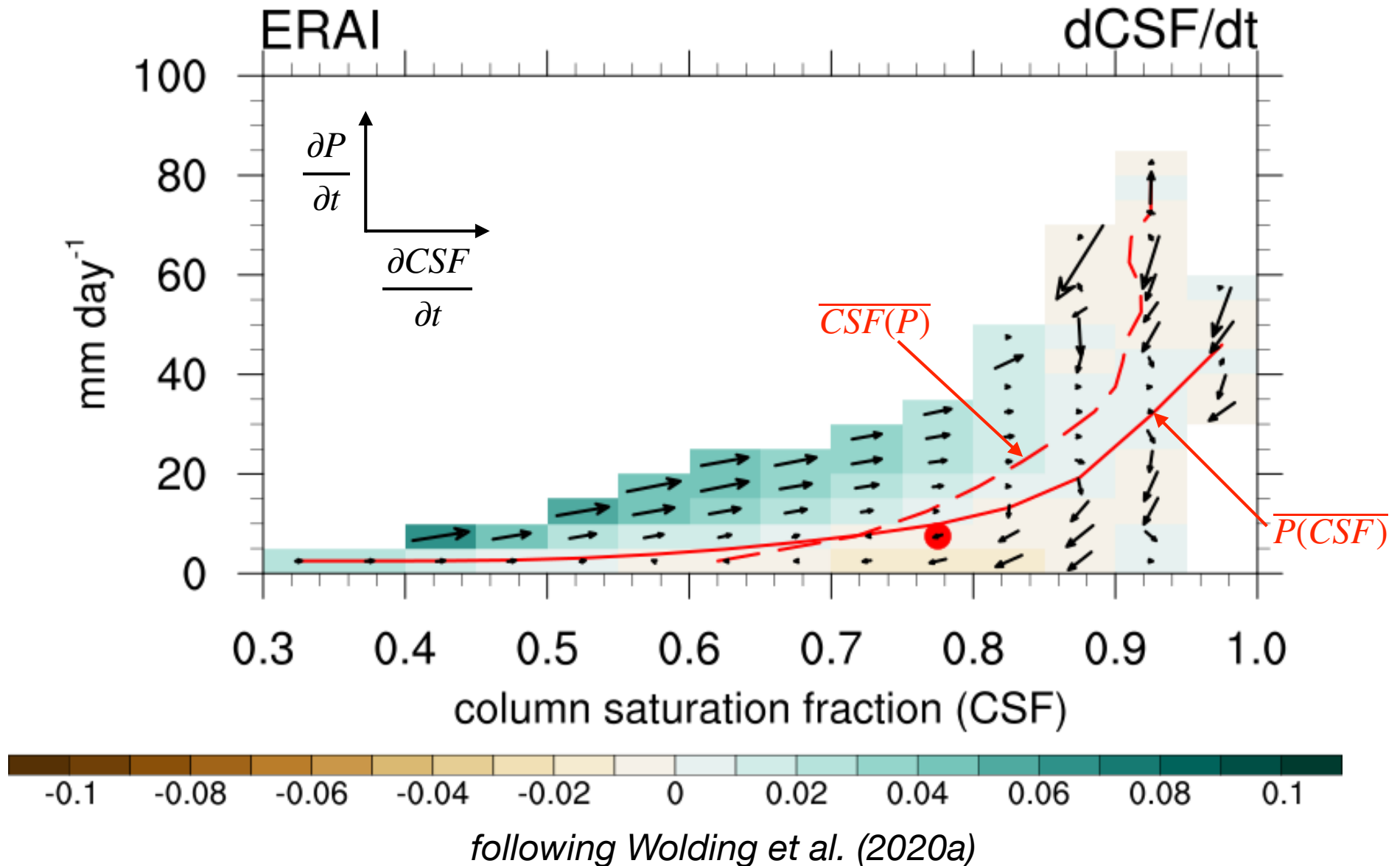


- **Upper ocean / lower atmosphere budget studies** (Chia-Wei Hsu; beginning Dec. 1 2020): E3SM, with **daily atm/ocn output**

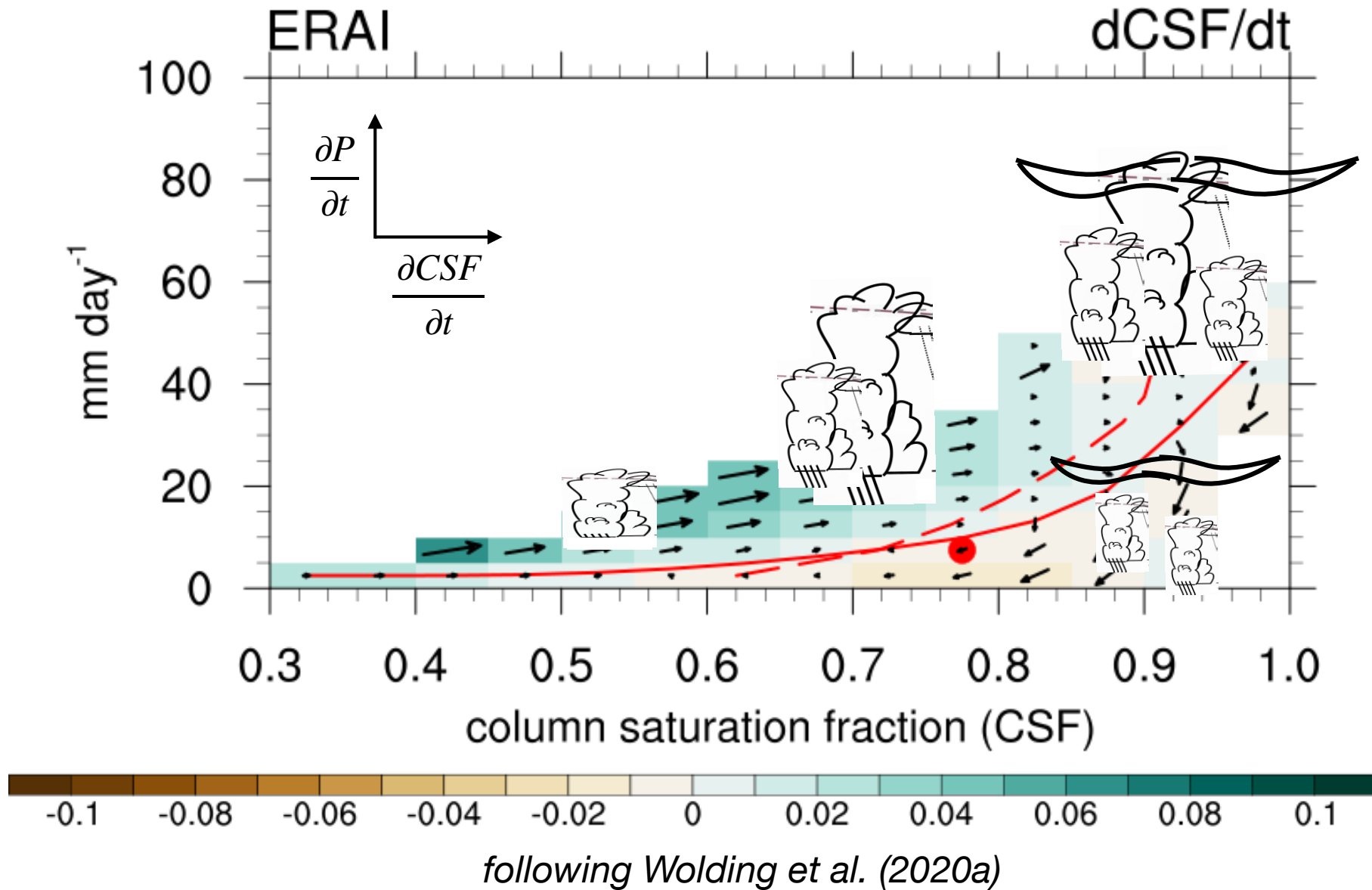
how does convection interact with its environment?



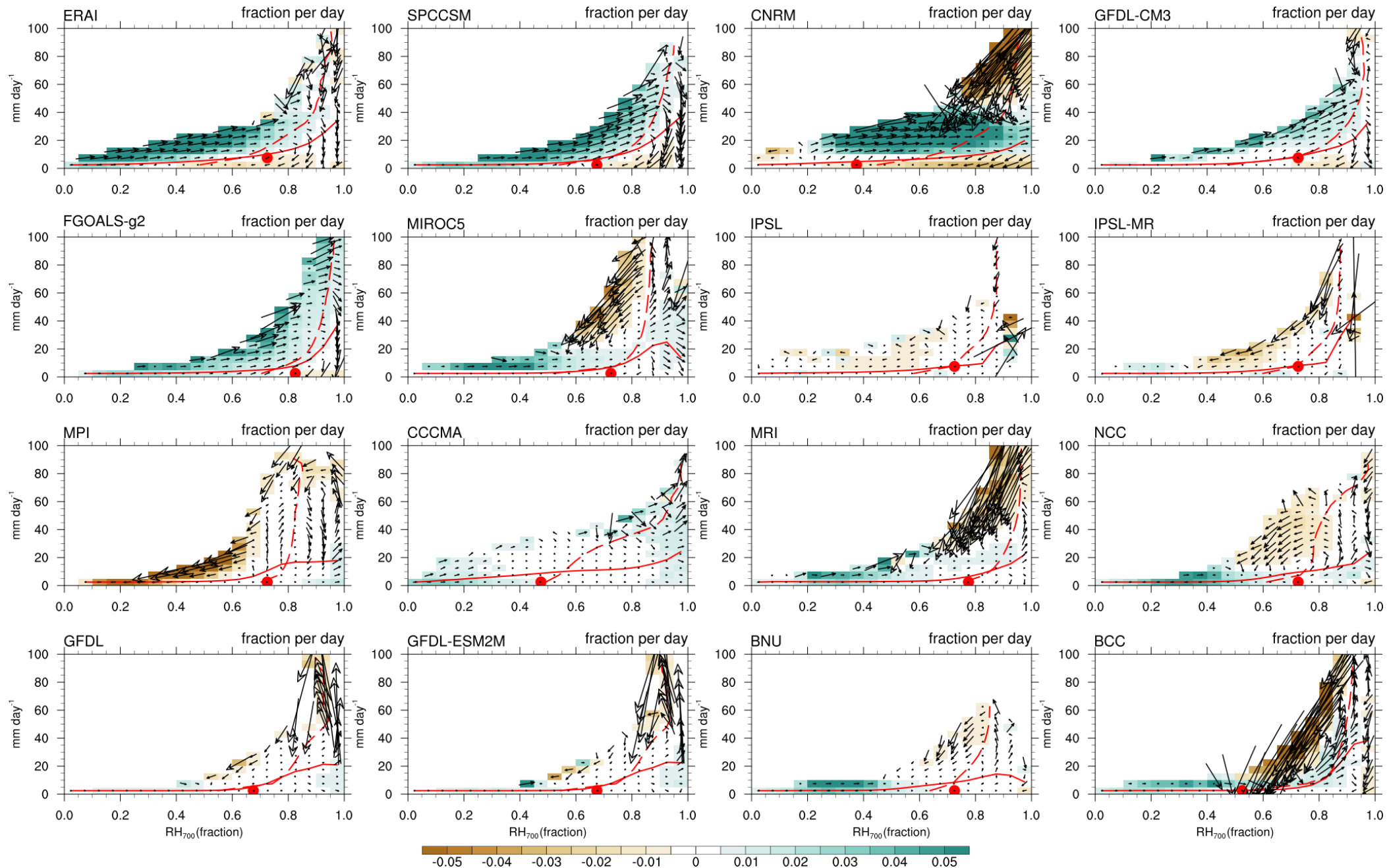
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next steps

- relate rainfall-moisture coupling metric (i.e., the “rotation metric”) to MJO skill, mean state moisture distribution.
- translate this analysis to a buoyancy profile framework.