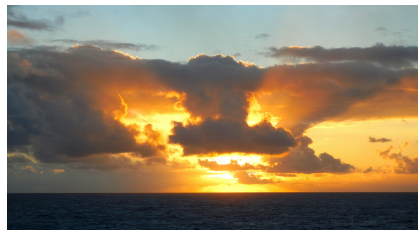


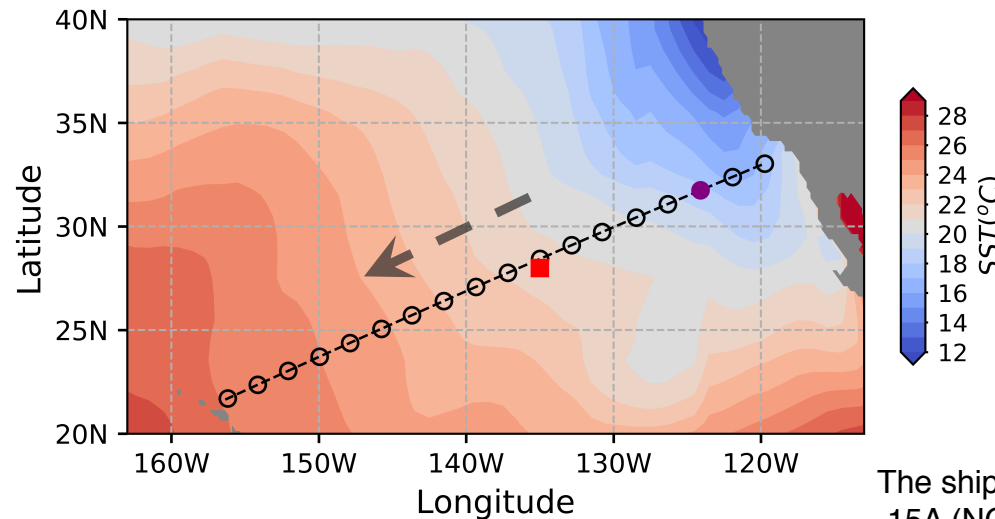
# Assessment of Precipitating Marine Stratocumulus Clouds in E3SM

Xue Zheng

October 2012 to September 2013



Hawaii



MAGIC Field Campaign



LA

The ship track for MAGIC Leg 15A (NOAA weekly SST and the sounding locations)

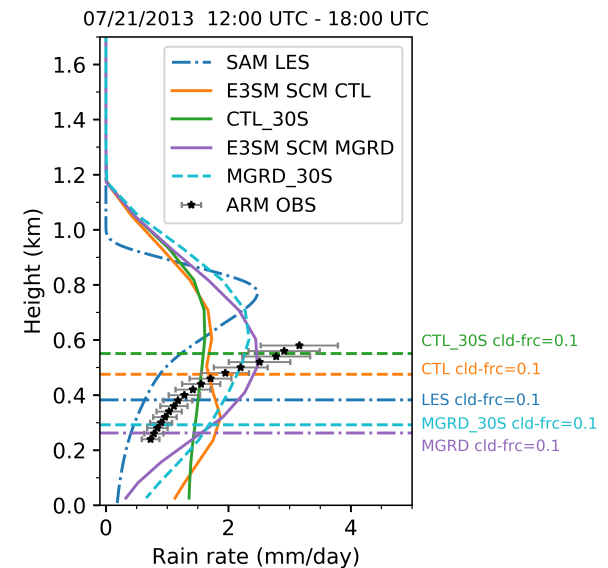
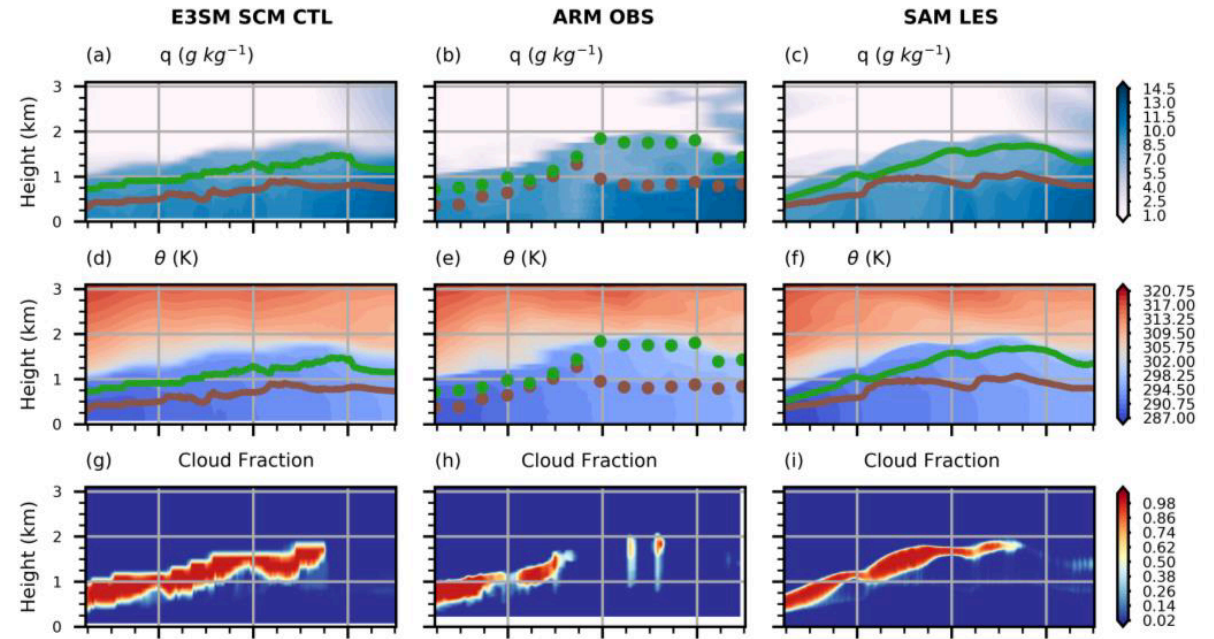
Zheng, X., S.A. Klein, V.P. Ghatge, S. Santos, J. McGibbon, P. Caldwell, P. Bogenschutz, W. Lin, and M.P. Cadeddu, 2020: [Assessment of Precipitating Marine Stratocumulus Clouds in the E3SMv1 Atmosphere Model: A Case Study from the ARM MAGIC Field Campaign](https://doi.org/10.1175/MWR-D-19-0349.10). *Mon. Wea. Rev.*, <https://doi.org/10.1175/MWR-D-19-0349.10>

## Objective

- Evaluate the physical parameterizations of E3SMv1 with the combination of advanced ARM observations and LES from the MAGIC field campaign.

## Key results

- E3SMv1 SCM realistically represents the evolution of clouds and PBL structure during the stratocumulus-to-cumulus transition.
- E3SMv1 produces an unrealistically small sub-cloud precipitation fraction, an unrealistic double-peak in the vertical profiles of precipitation mass, and drizzle that evaporates too close to the surface.
- An overly long microphysics timestep and an unrealistic parameterization of precipitation fraction are the main causes for the identified biases.



## Ongoing and Future Work

- Continue and improve the effective framework involving a combination of ARM data, LES and SCM approach for E3SM model evaluation and development.
  - Further assess and refine the representation of marine BL precipitation processes based on the advanced precipitation and PBL retrievals from the expanding record of observations collected at ARM's ENA site and the related LES simulations.
- Collaborate with E3SM team to test the climate impact of the modifications based on our findings.