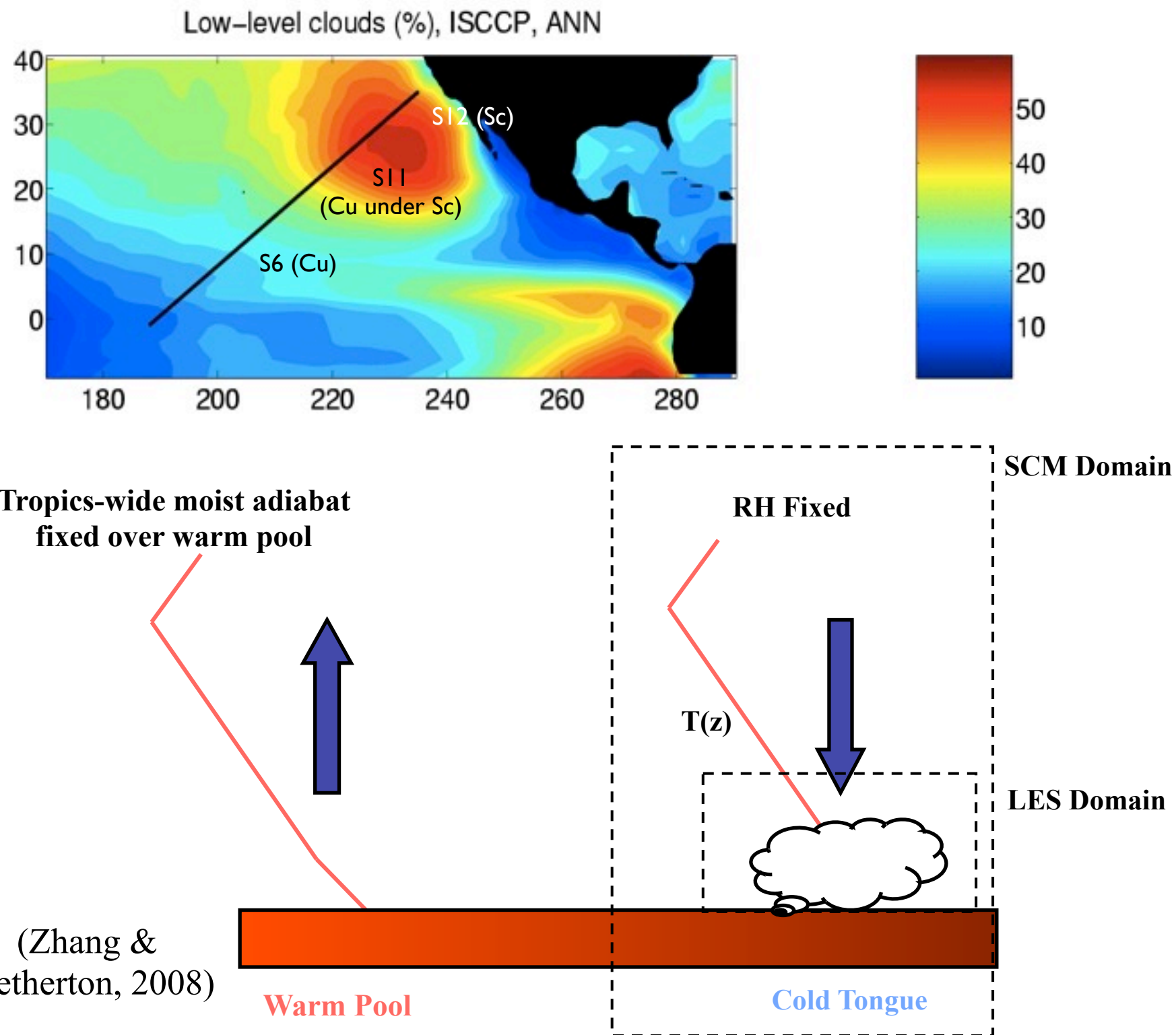


# CGILS Update

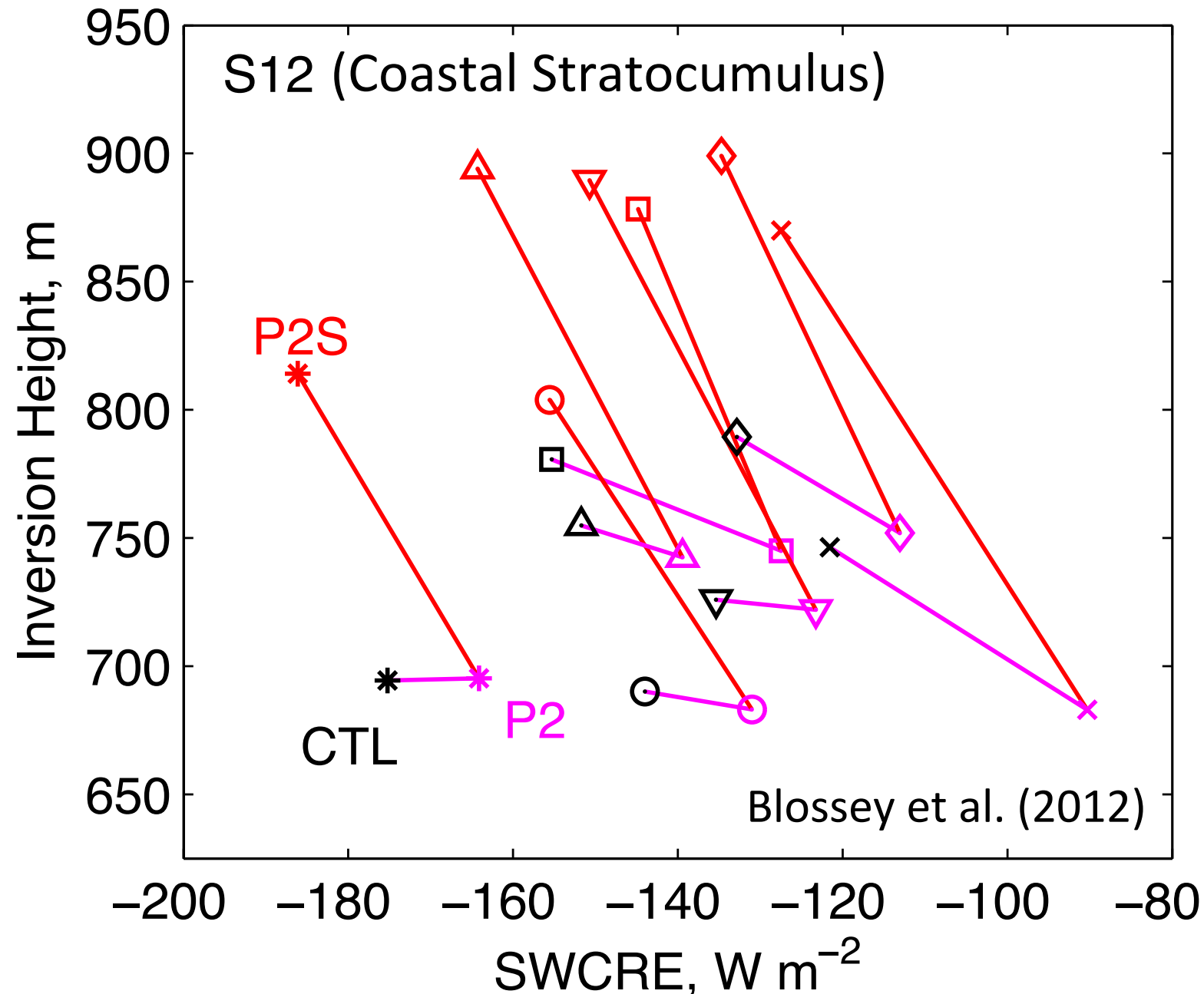
Peter Blossey & Chris Bretherton (UW)  
Minghua Zhang (StonyBrook)  
CGILS Collaborators

# Background: CGILS

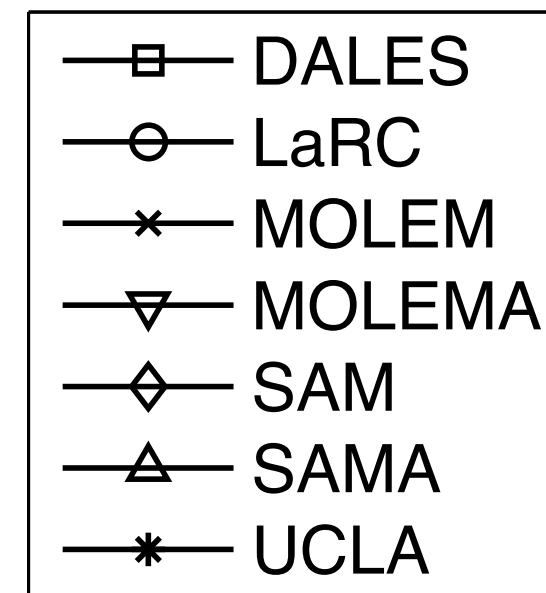
- Recently, CGILS, an intercomparison effort, looked at cloud feedbacks in three low cloud regimes in LES and single-column models.



# CGILS LES: Response to warming and subsidence

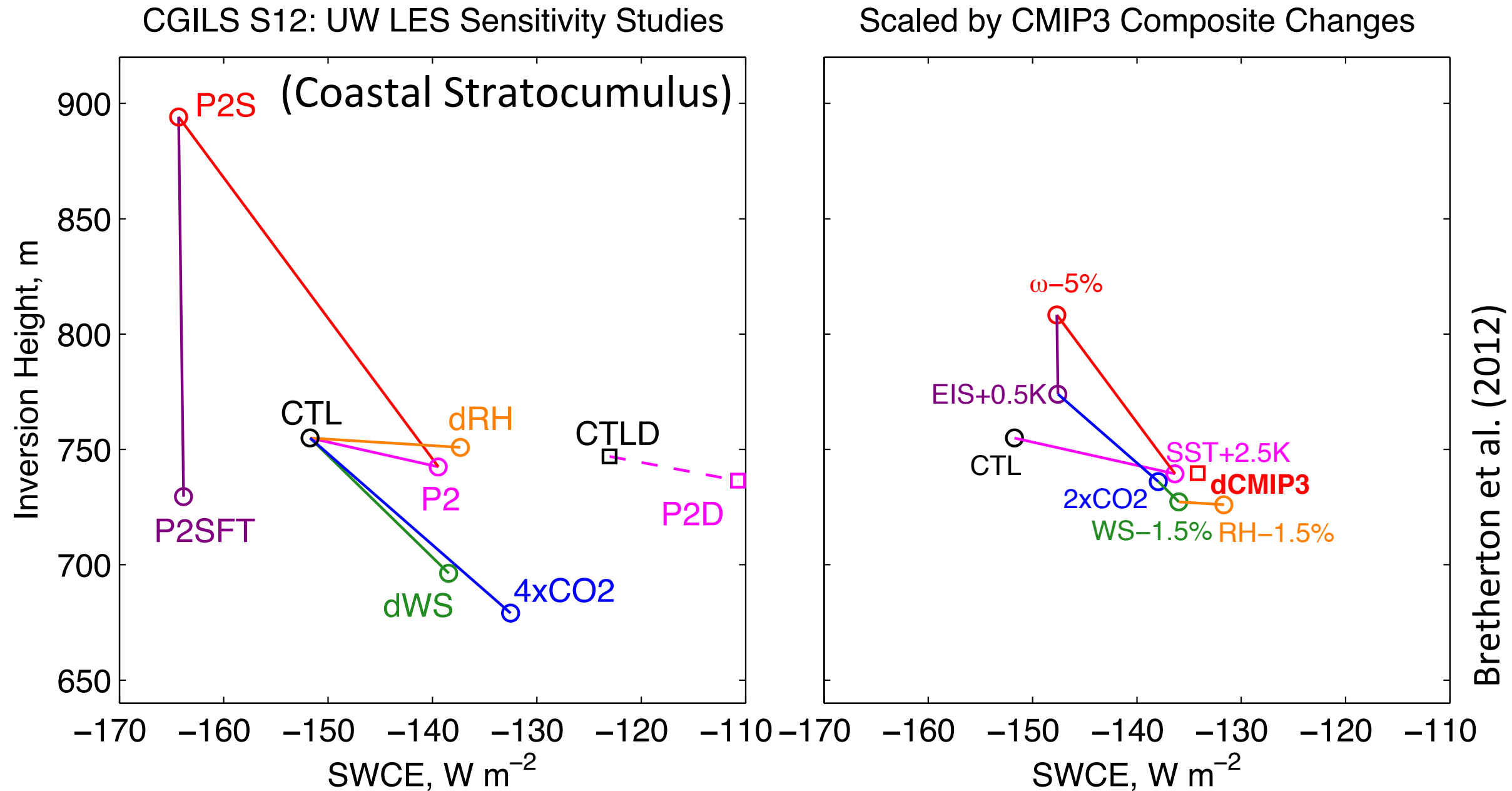


SWCRE = Shortwave  
Cloud Radiative Effect  
= SWCF = Shortwave  
Cloud Forcing



- Reasonable agreement on control cloud SWCRE
- With moist adiabatic warming (CTL→P2), all LES thin cloud layer.
- A reduction in subsidence leads to a thicker cloud (P2→P2S). Also seen in observations by Myers & Norris (2012, submitted).
- $\Delta$ SWCRE for composite climate change (CTL→P2S) has uncertain sign.

# UW LES: Response to a variety of climate perturbations

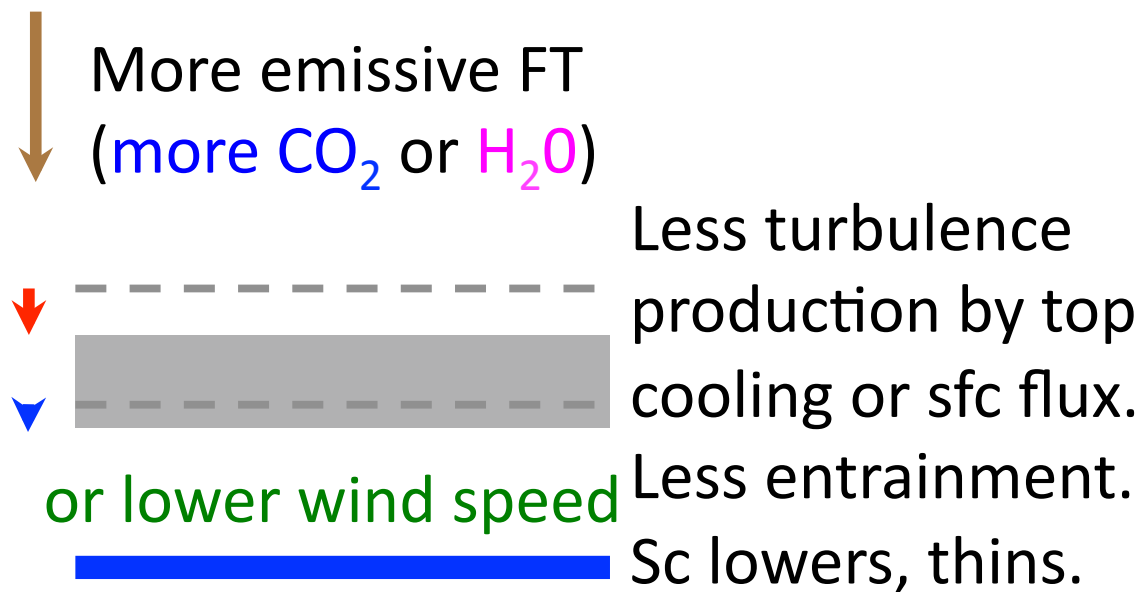


Bretherton et al. (2012)

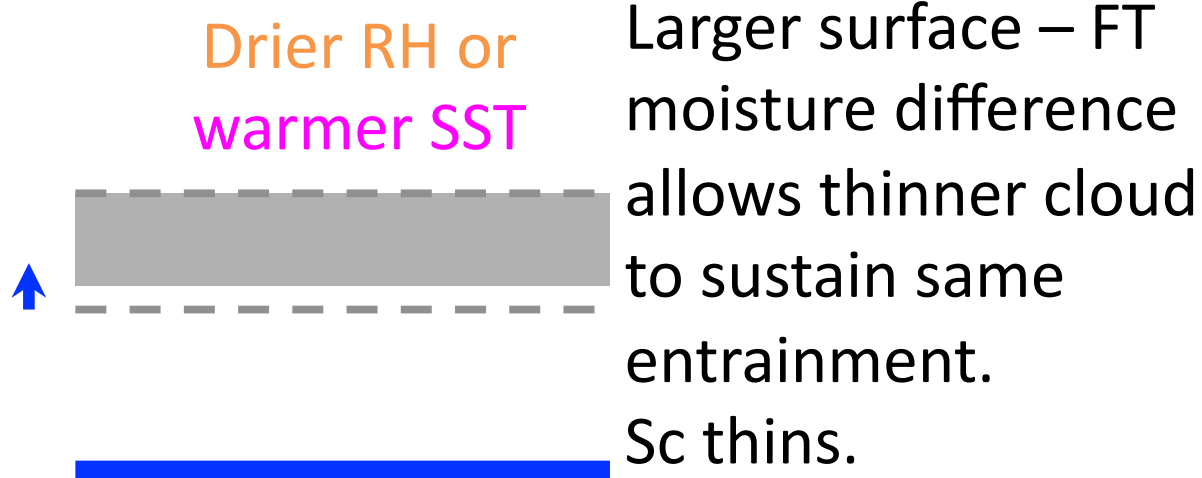
- Explore the cloud response to individual climate perturbations.
- Note that response to warming similar with or without diurnal cycle.
- Then, evaluate response to CMIP3 2xCO<sub>2</sub> multi-model mean perturb.
- A lot of cancellation, but net 20 W m<sup>-2</sup> reduction in SWCRE for CMIP3 perturbations.

# Mechanisms of Sc Cloud Response

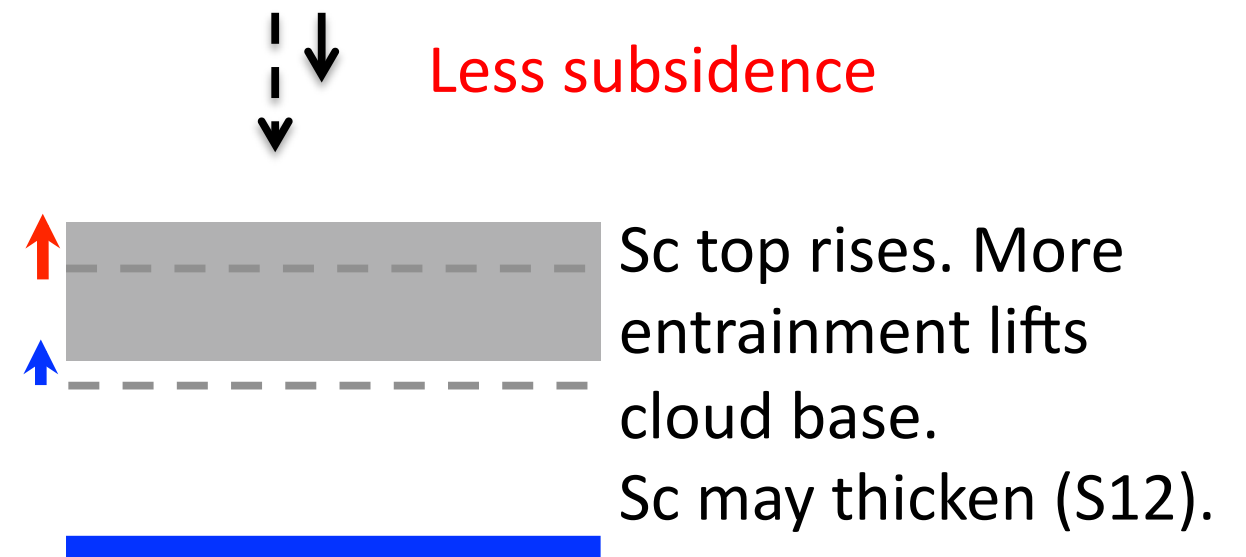
## Turbulence driving



## Moisture gradient

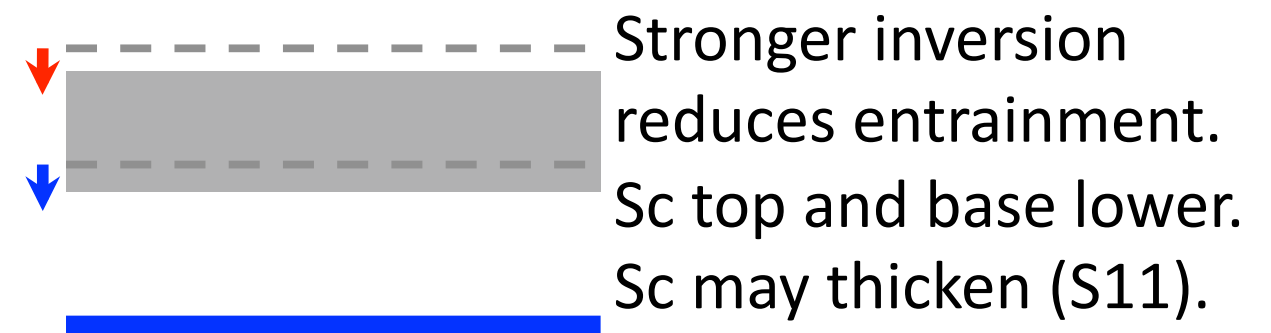


## Dynamic



## Inversion strength

FT warms more than SST



# Taking next steps from CGILS

1. Have LES models all run cases (S12, S11, S6) with 4xCO<sub>2</sub> and with composite changes based on the CMIP3 multi-model mean.
  - Steady forcings w/diurnally-averaged insolation.
2. Have a few LES models and the SCMs run longer (multi-month) simulations at trade cumulus location (S6) using transient forcings (ECMWF July).
  - SCM simulations with steady forcings suffered from grid-locking, making interpretation of climate sensitivity quite difficult.
  - Transient forcing (e.g., Brient & Bony, 2012) can produce a cloud climatology similar to model and may make comparison between LES and SCM easier.
  - May also facilitate comparison to observations.

