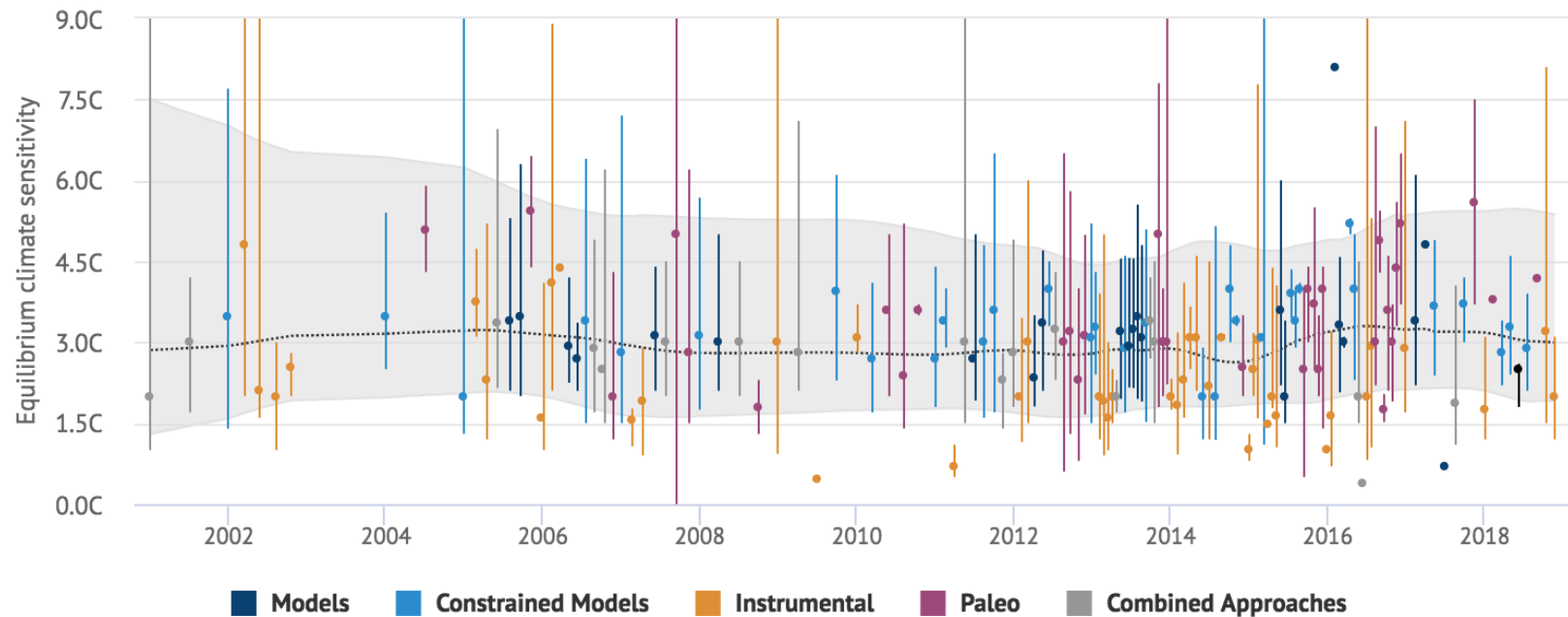


# Equilibrium Climate Sensitivity (ECS) estimates

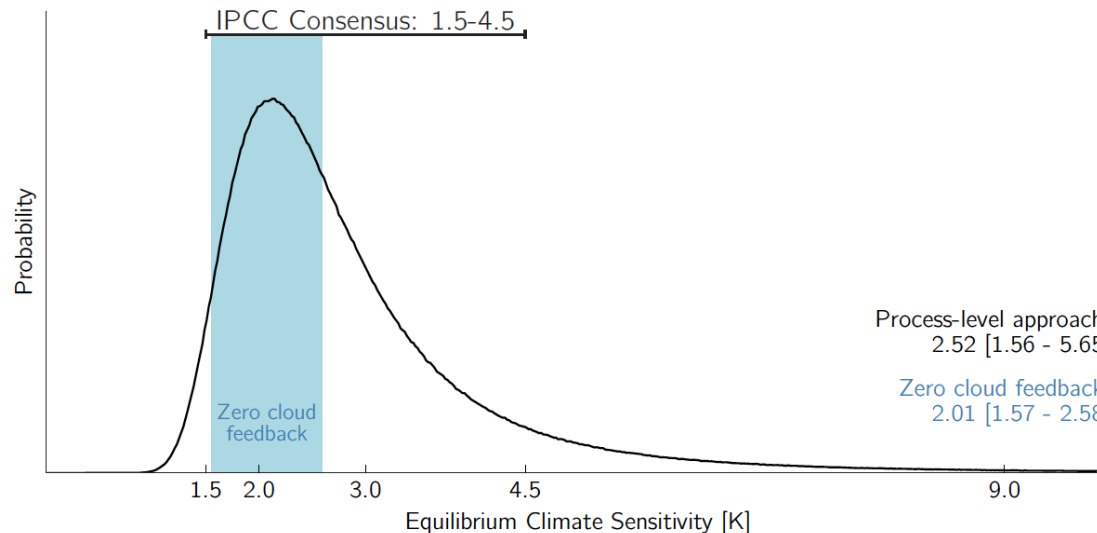


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University of Stockholm

# ECS Uncertainty largely due to Clouds...

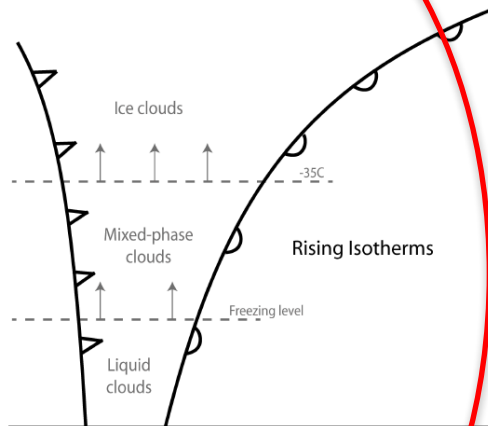


**Figure 1:** Estimates of ECS based on a process-level approach of Equation (1), Monte Carlo sampled from distributions derived from climate models [37]. The blue shading shows the range of ECS when cloud feedback is assumed to equal zero. Uncertainty ranges are the 5-95 percentiles.

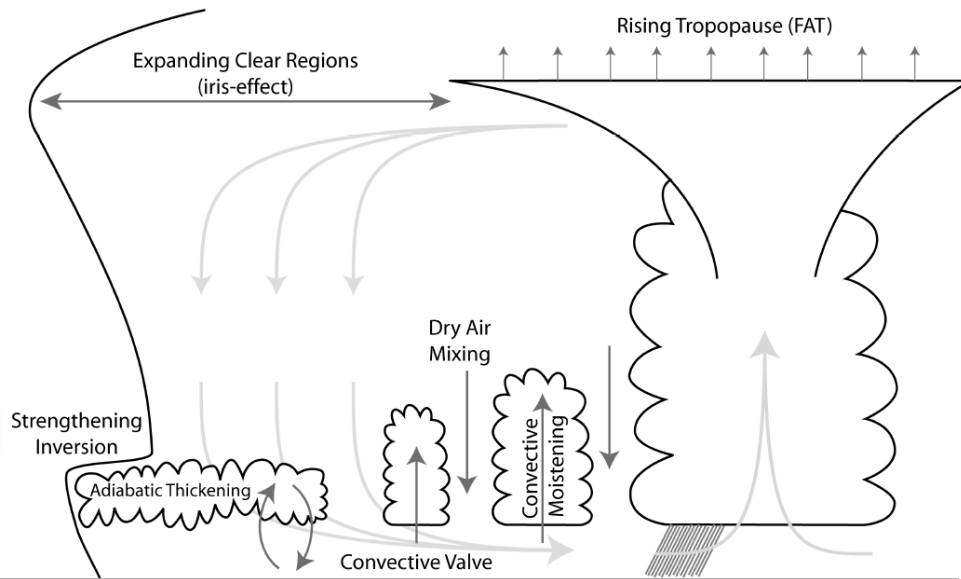
# Can we constrain ECS using paleoclimates and extreme cloud feedbacks?

- If models with varying ECS can all simulate the historical period, how can we differentiate them?
- Build alternative climate models which incorporate extreme cloud feedbacks and have a high ECS. These are then tuned to match instrumental record warming and then run for past climates.
- Using MPI-ESM (CMIP6 Model).
- LGM, Pliocene (and Eocene) climates.

# Cloud Feedback Mechanisms



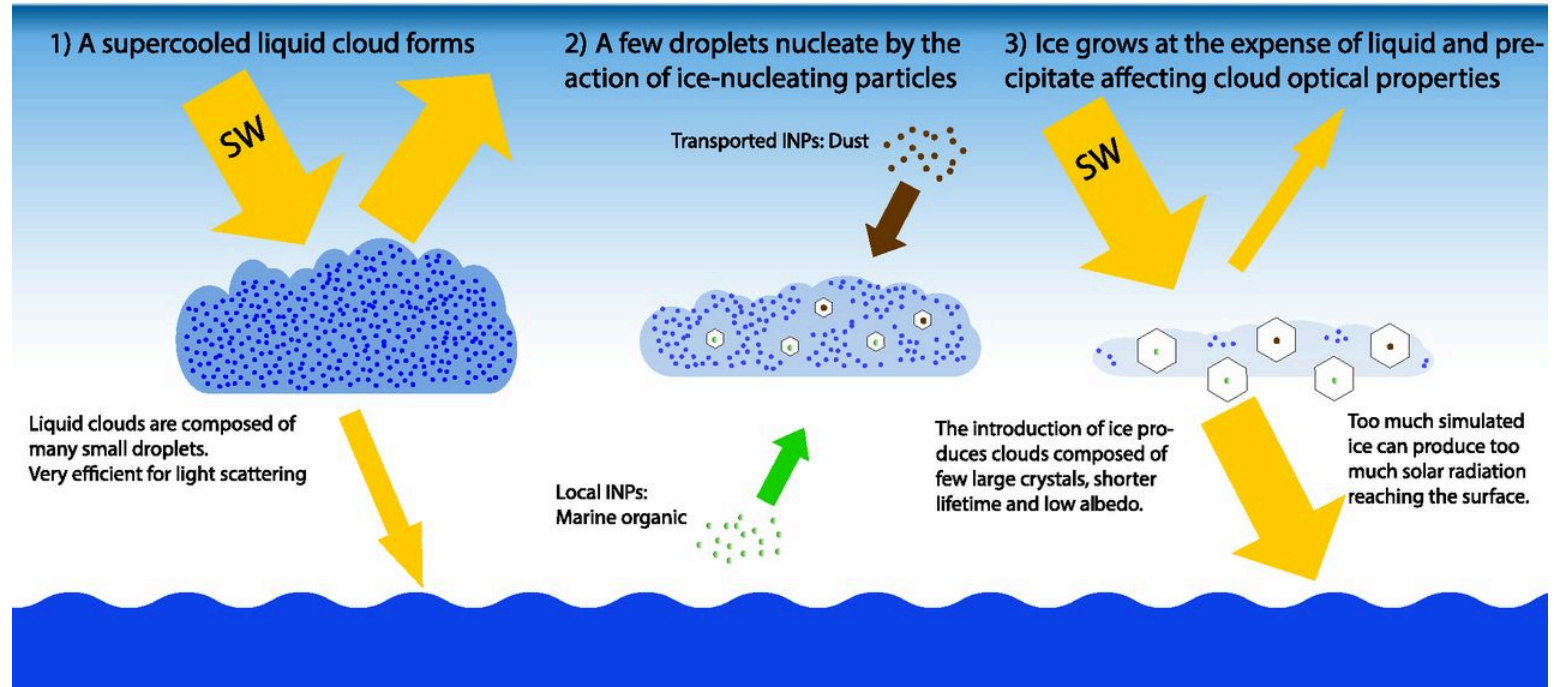
Mid-high latitude  
mixed-phase cloud  
feedbacks



Tropical low-level cloud  
feedbacks  
(inversion strength, adiabatic  
thickening, convective valve, dry  
air top-entrainment)

Tropical deep  
convective cloud  
feedbacks  
(FAT, iris effect)

# Mixed Phase Clouds



Vergara-Temprado et al., 2018 (PNAS)