Numerical Uncertainities in Cloud Climate Feedbacks: Lessons from CGILS Intercomparision Study!

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De Bilt, 30 September

The story so far …..

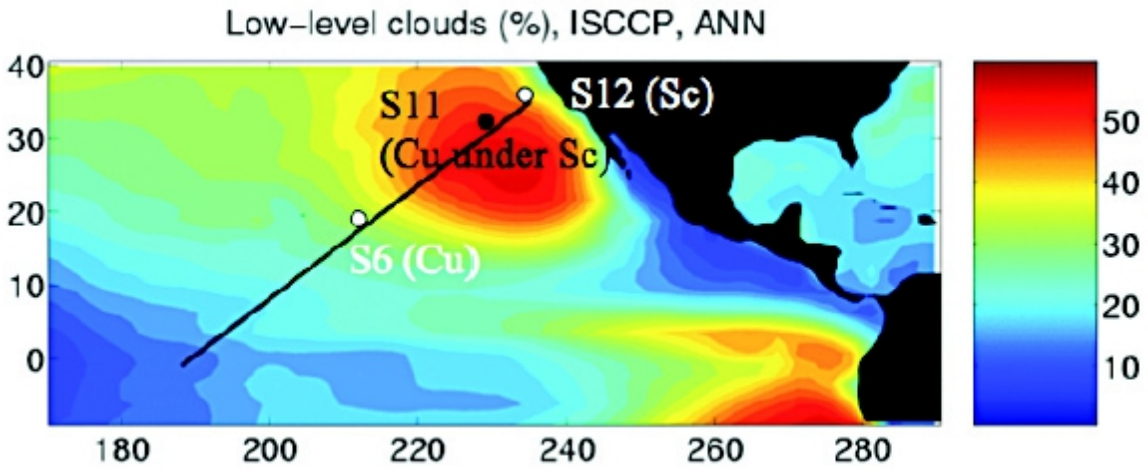
Low cloud-climate feedbacks play a key role in determining climate sensitivity of a general circulation model (GCM).

Single column modeling is a popular strategy used by the community to understand and develop these low cloud regimes in a GCM.

Outline:

- Nature of solutions produced by a single column model.
- How sensitive are low-cloud feedbacks to numerical formulation of a model?
- (missing?)Links between a single column model and a GCM.

The game plan …..



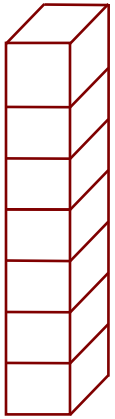
CGILS case study

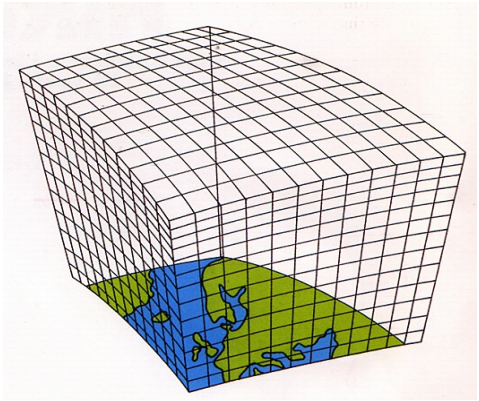
Idealized

→ Control(ctl) Climate

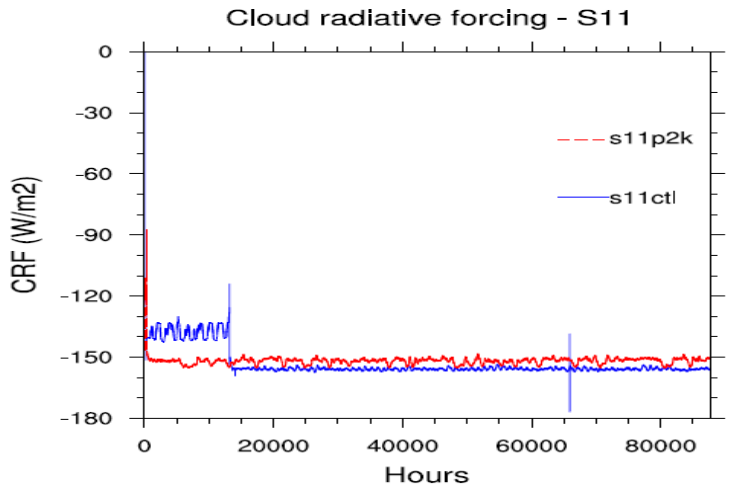
→ Perturbed(p2k) Climate

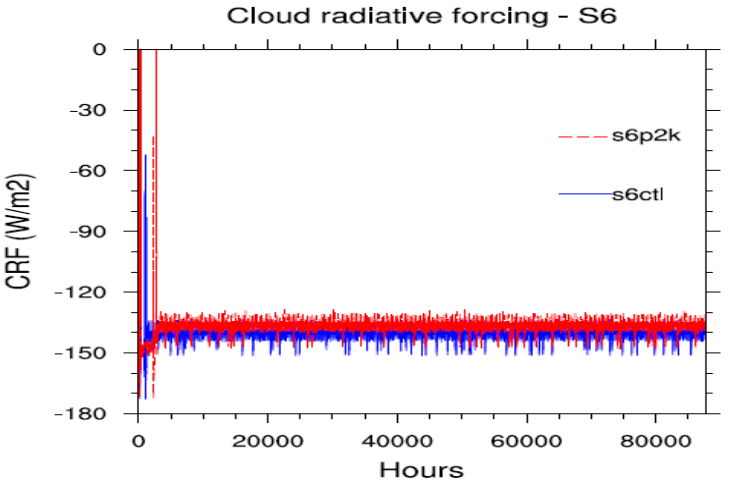
ECHAM6 SCM





The standard way ….

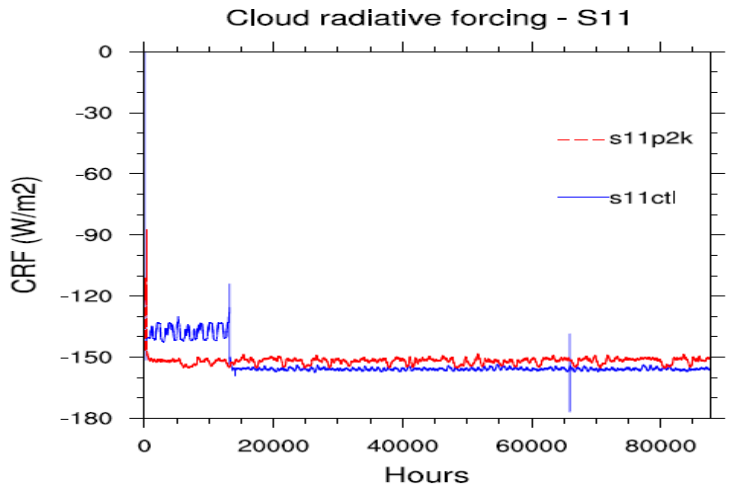


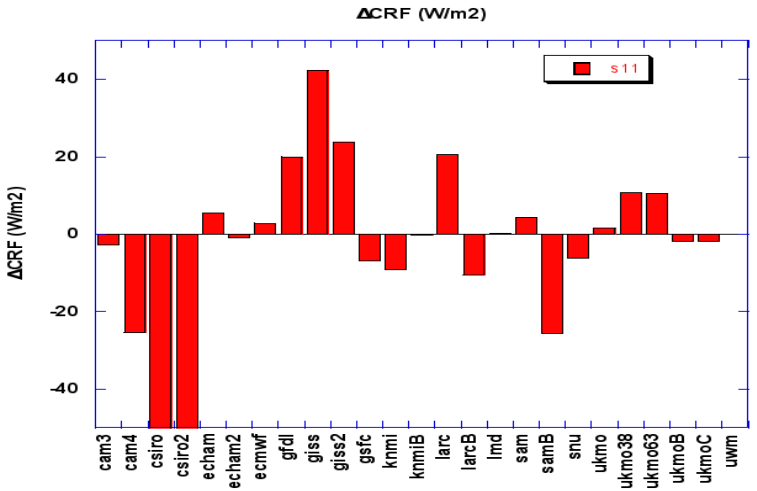


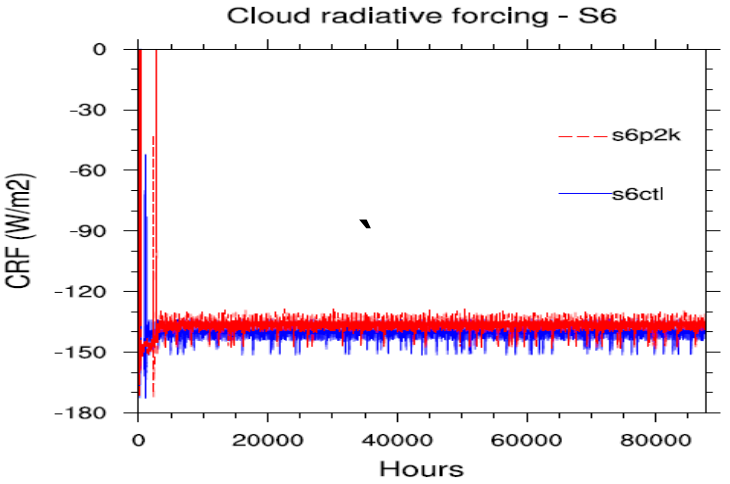
CRF ~ Net radiation change at top of the atmosphere due to presence of clouds.

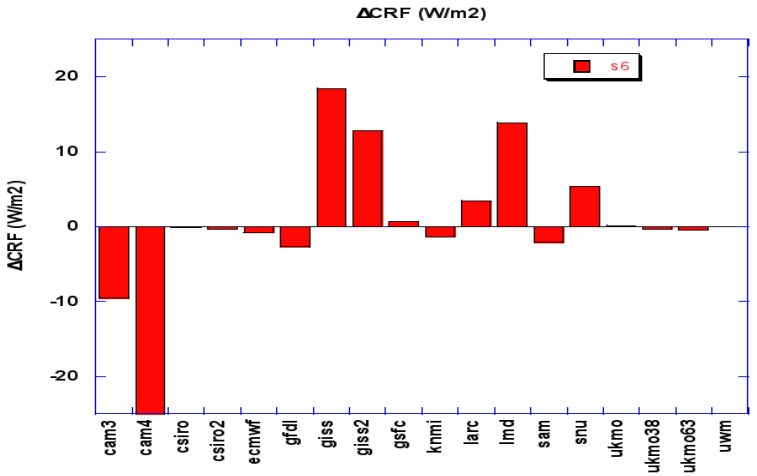
More negative CRF means more cooling

The standard way ….

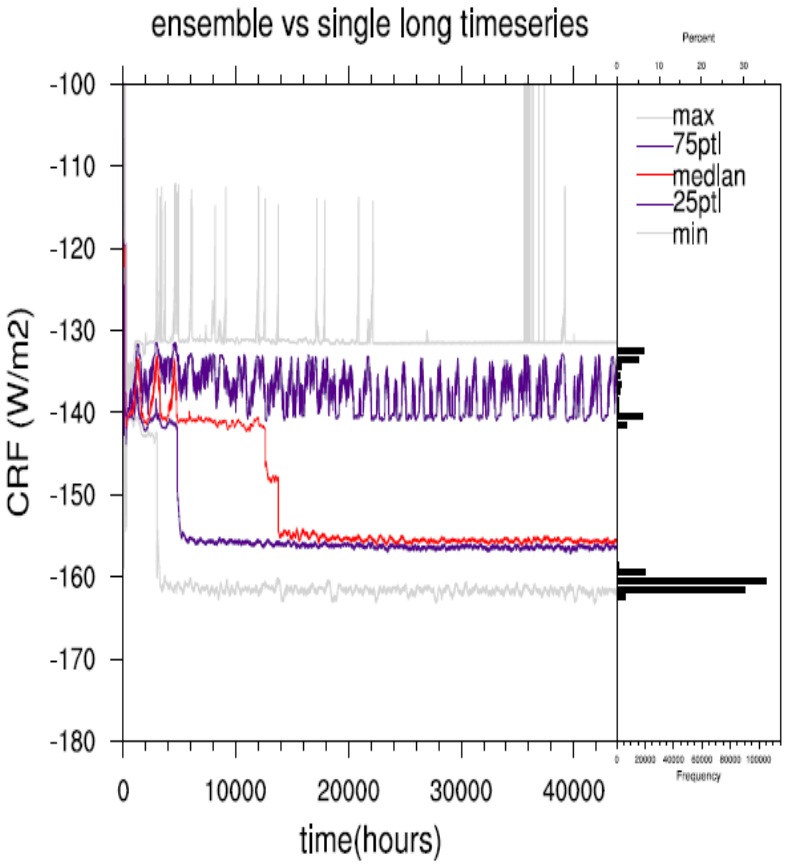






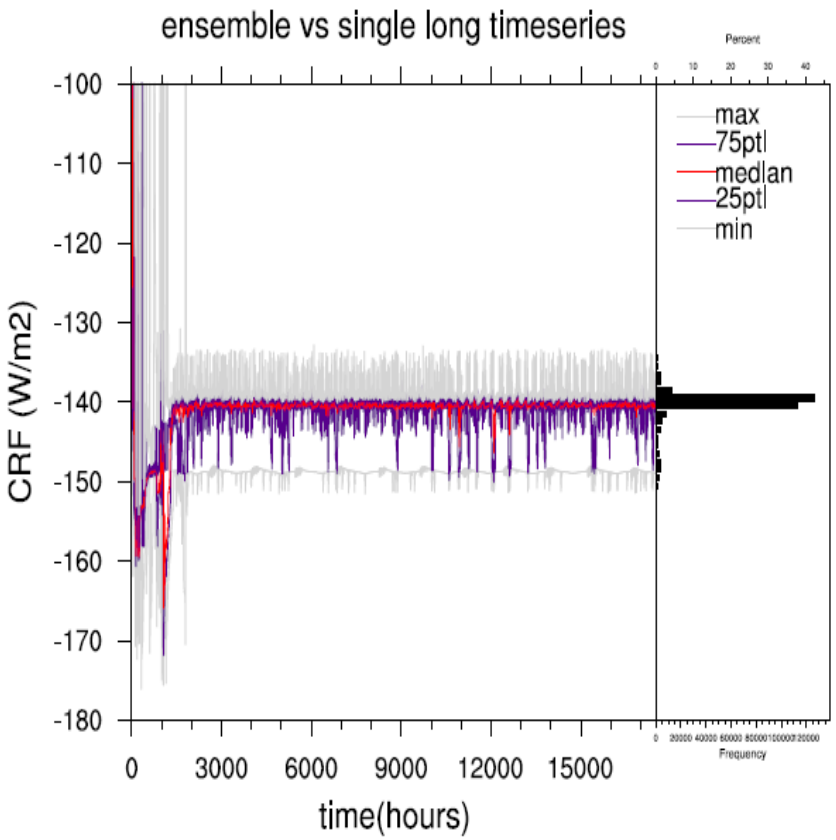


Twist in the tale...



S11

Multiple equilibrium!

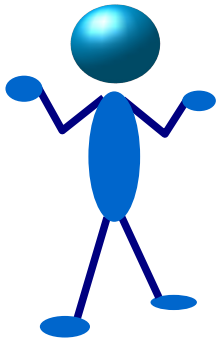


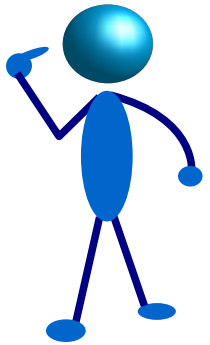
S6

Ergodicity works!

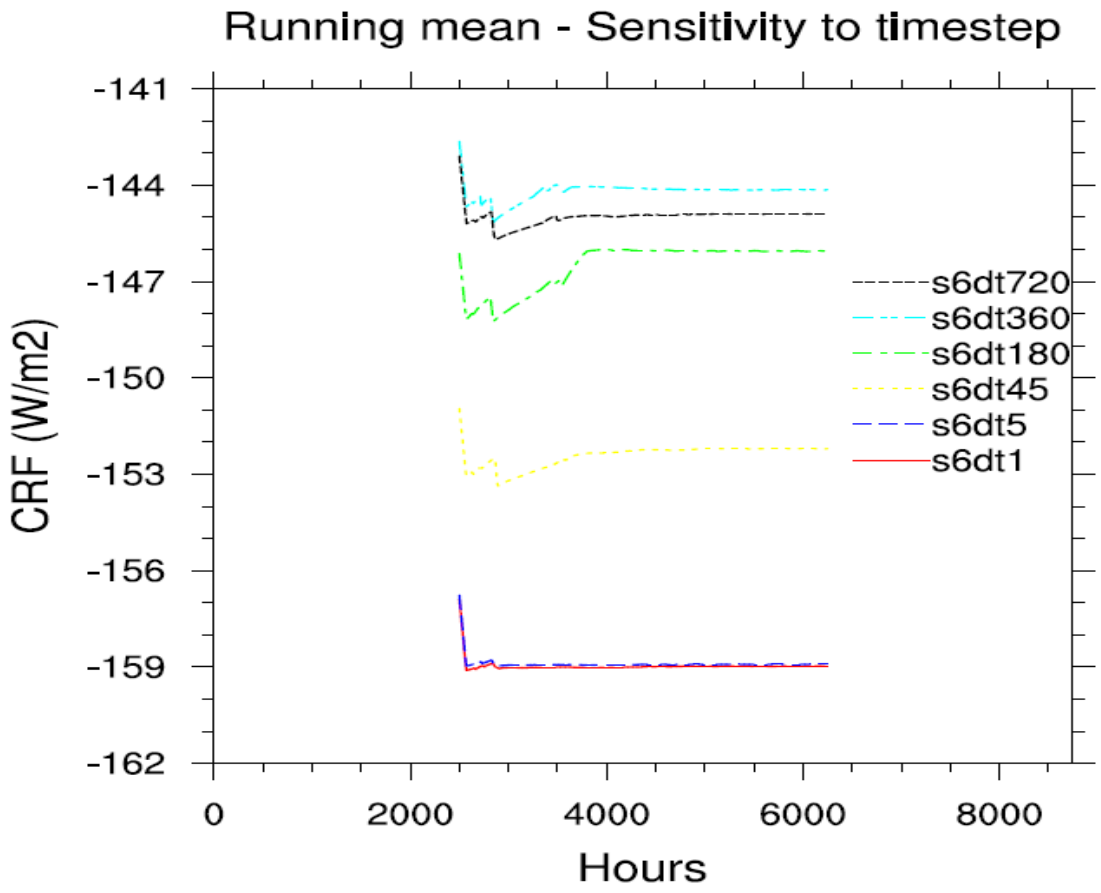
Summary

Solutions of a single column model(read ECHAM) are not necessarily unique(read simple)! Ensembles may be needed to quantify solutions.



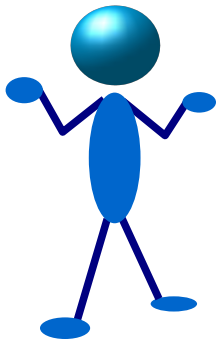


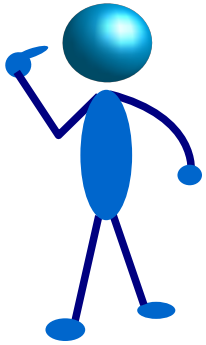
Sensitivity to temporal resolution : at s6



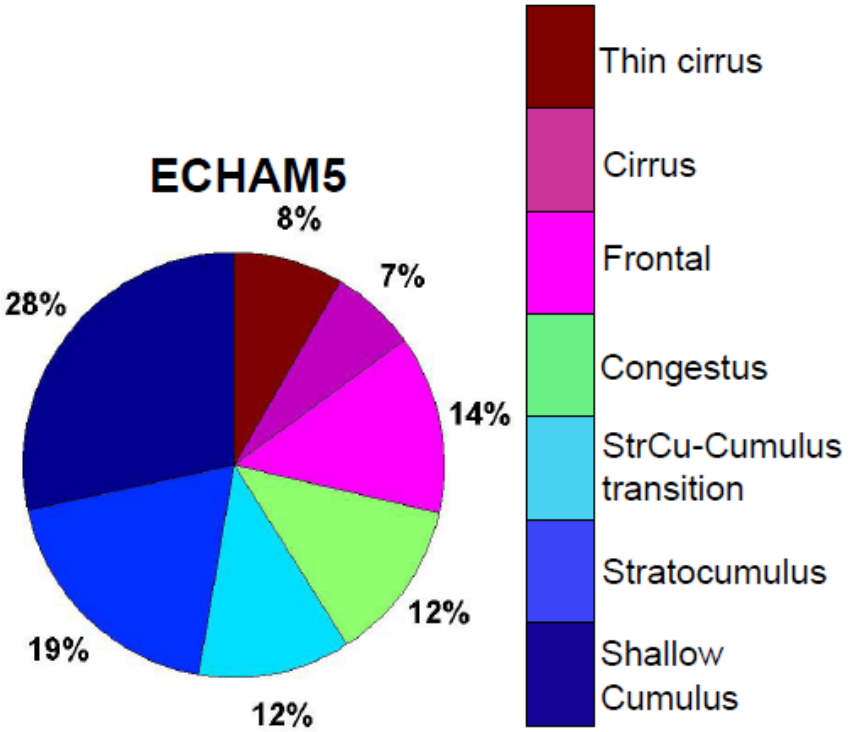
Summary

Cloud feedbacks do converge to temporal resolution, but we are too far from the convergent regime.

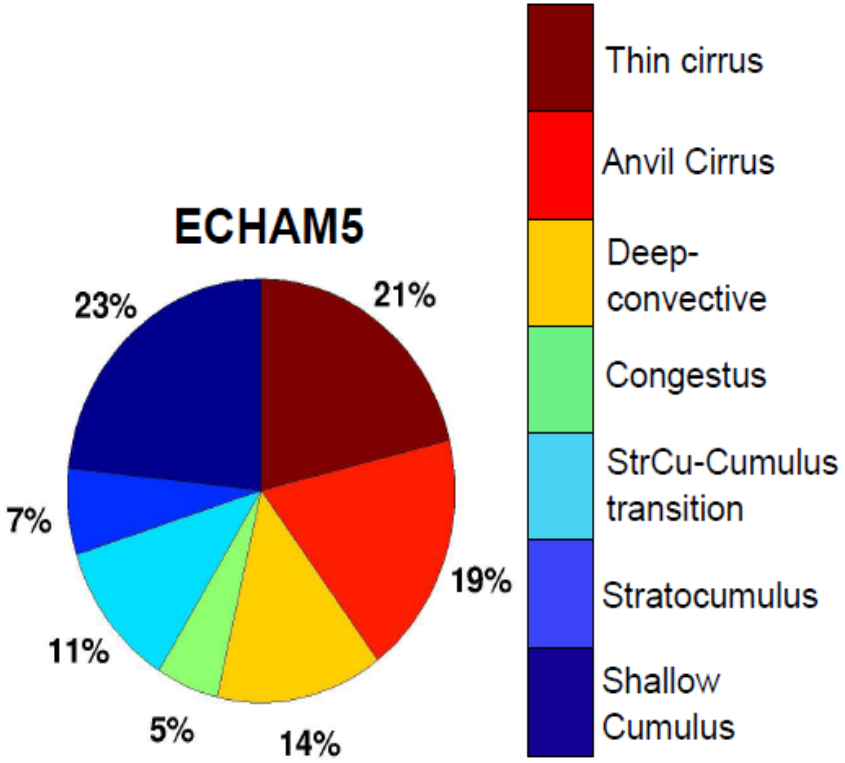




Cloud regimes in the GCM?



Extratropics



Tropics

***Swati Gehlot**

Climate sensitivity of a GCM

***Daniel Klocke**

Summary

Climate sensitivity of ECHAM5 GCM shows strong sensitivity to the timestep size used.

Understanding from the single column model can be useful.