Climate Feedbacks CAM4 & CAM5 (dev)

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Thanks to: R. Neale, C. Hannay, J. Kiehl

Methodology

- Use Radiative Kernel Method following Soden et al 2008, Shell et al 2008

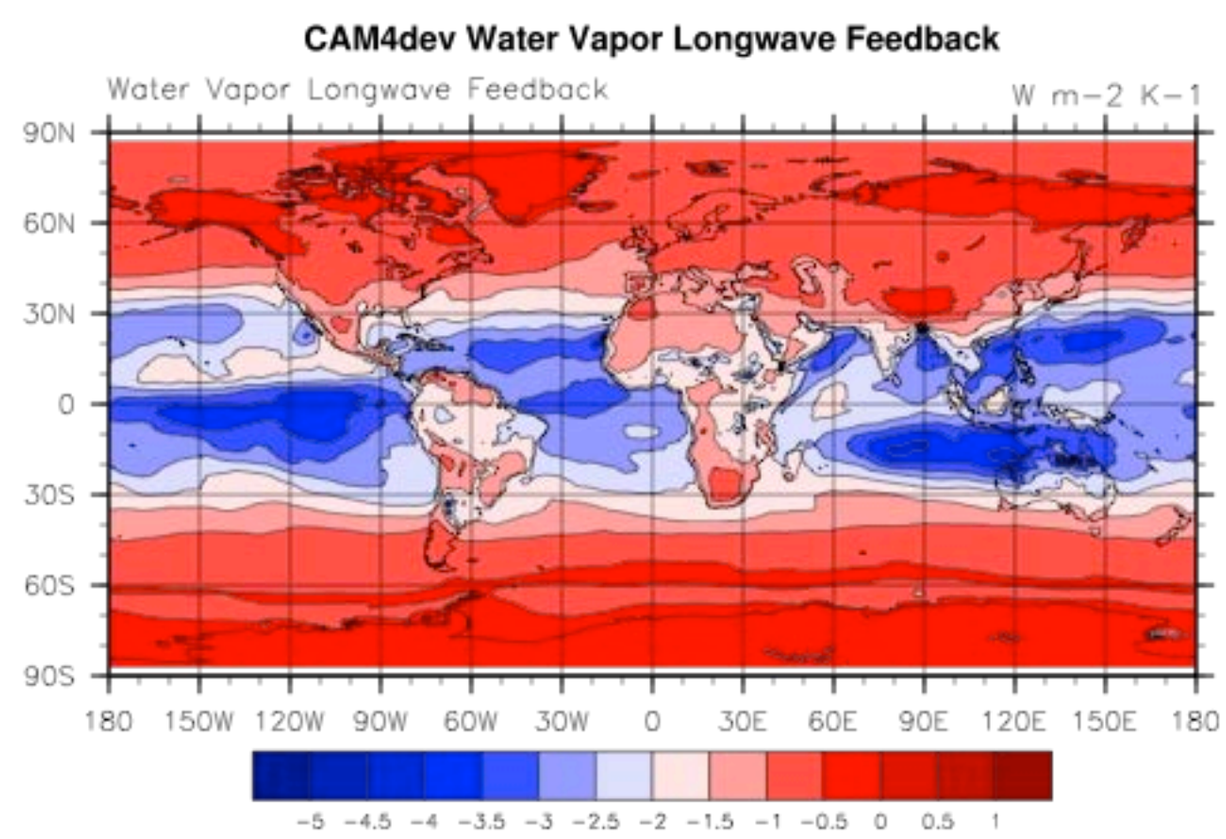
  $\lambda_x (x,y,z,m) = (dF/d_x) (dx/dT_s)$

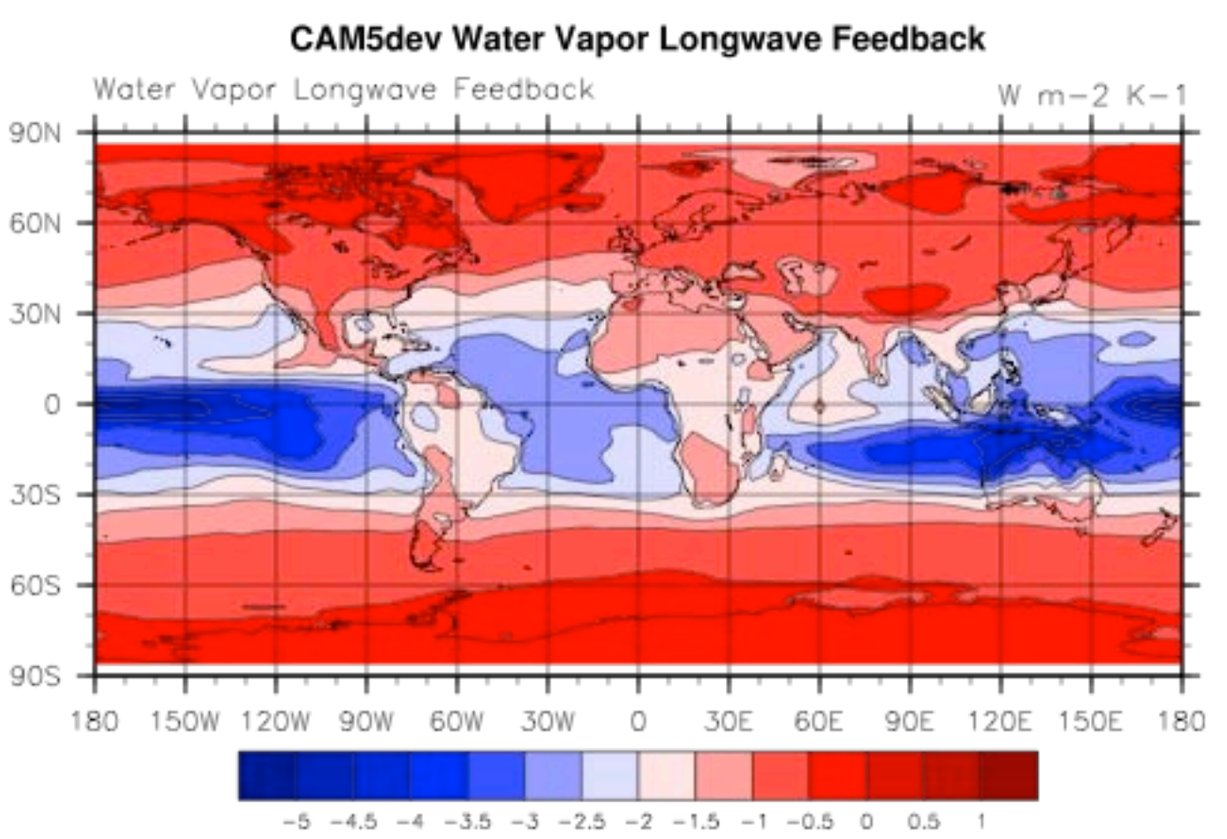
  Kernel = $K_x(x,y,z,m) = dF/d_x$
- CAM3 Kernels from K. Shell (OSU)
- H2O perturbation is ‘made up’ from run
- Cloud feedbacks are a residual using this method: Still trying to sort out cloud feedbacks

Model Simulations

- SOM runs, last 20 (stable) years of 60 year runs.
- CAM4dev = near final CAM4/CCSM4 code
- CAM5dev = CAM5 code

WARNING: Draft versions & development code.
Magnitudes preliminary
Not for citation or attribution!





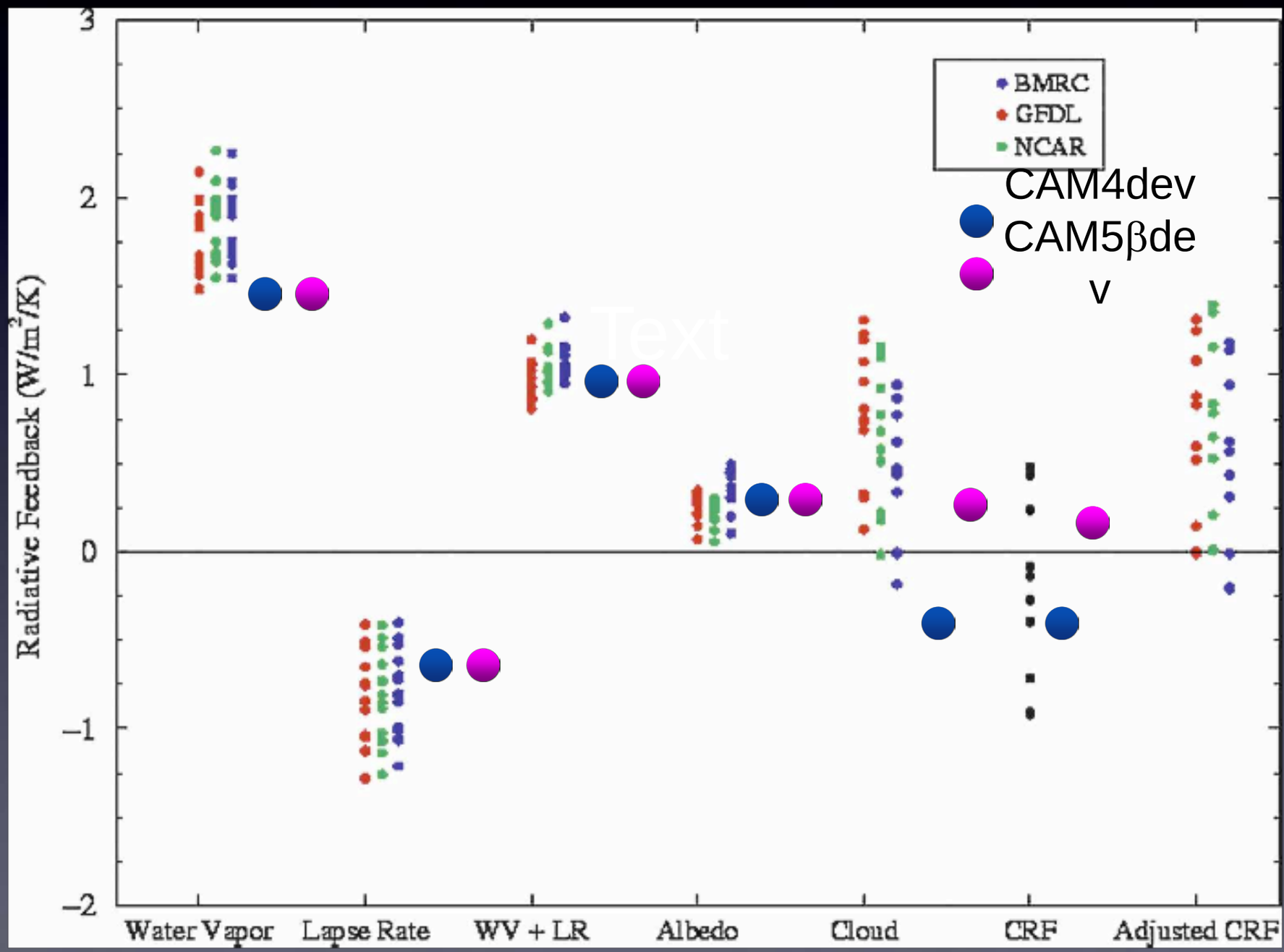
LW Water Vapor Feedbacks

Global Mean Results

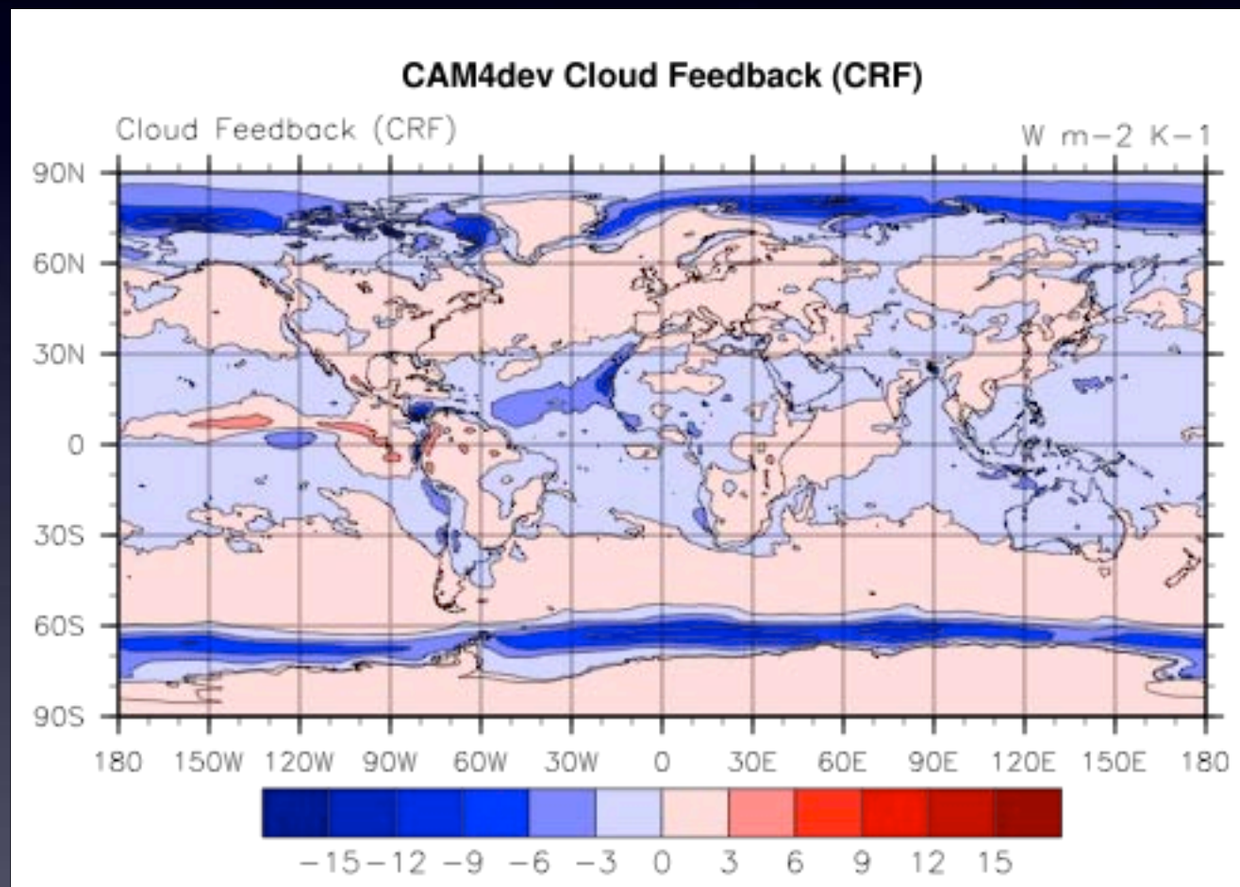
		53f	50f	58f
Feedback ($Wm^{-2}K^{-1}$)	CAM4dev	CAM5α	CAM5α2	CAM5β
λ (sensitivity)	3.5	4	5	4.5
Albedo	0.34	0.31	0.29	0.28
T	-3.04	-3.06	-3.01	-3.03
Lapse Rate	-0.59	-0.65	-0.60	-0.62
Q (-LW+SW)	1.82	1.83	1.79	1.81
Cld Residual	-0.50	0.03	0.50	0.37
ΔCld Rad Forcing	-0.48	0.09	0.23	0.20
ΔCRF LW	-0.28	-0.40	-0.49	-0.47
ΔCRF SW	-0.20	0.48	0.73	0.67

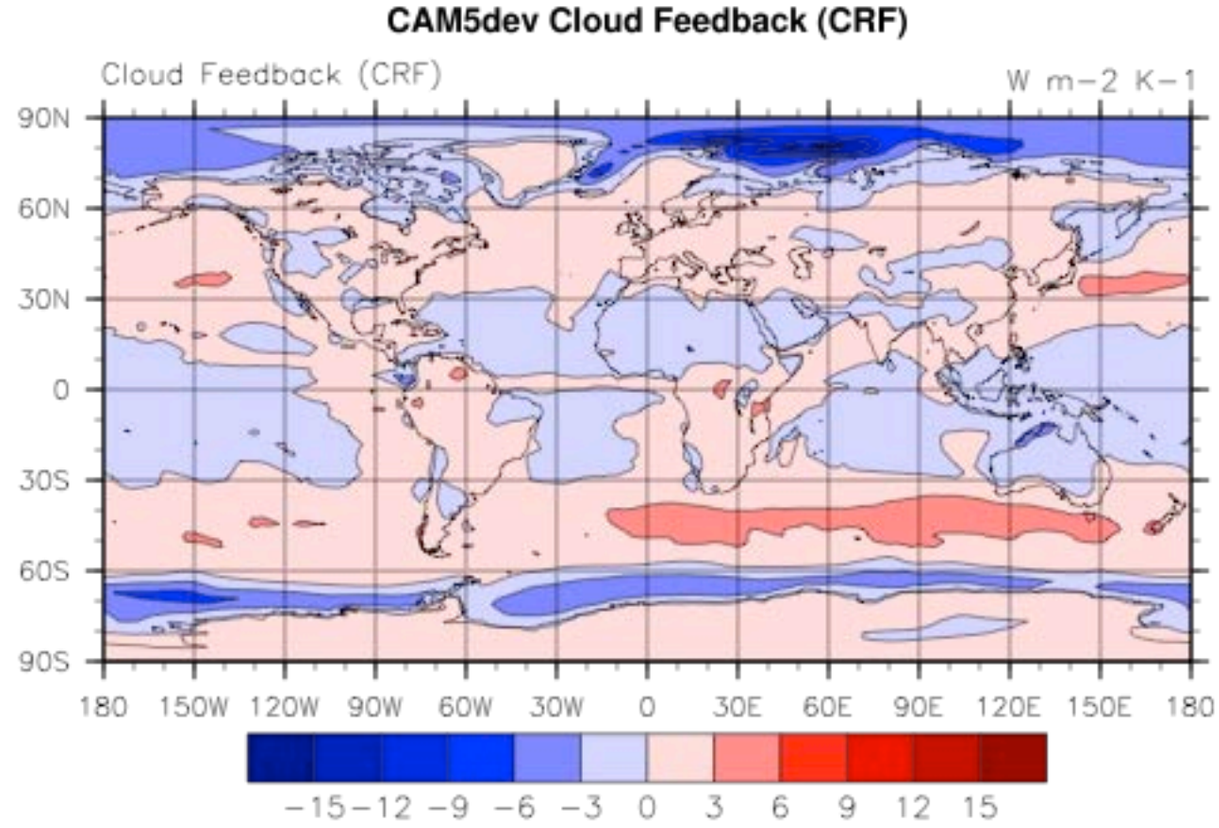
Comparison

Soden, 2008 (also Colman, Bony)



Cloud Feedbacks

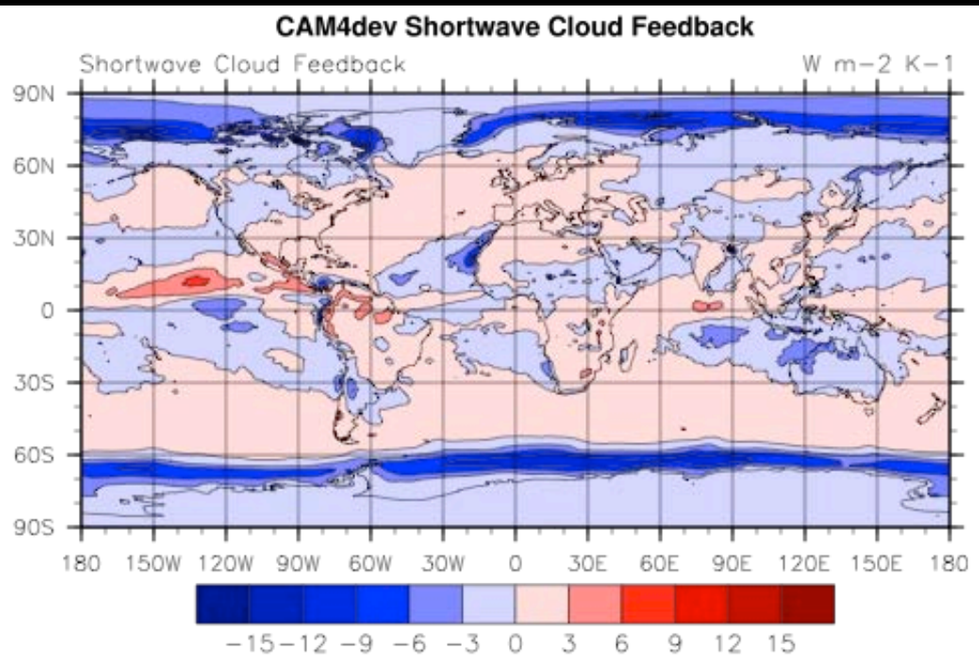




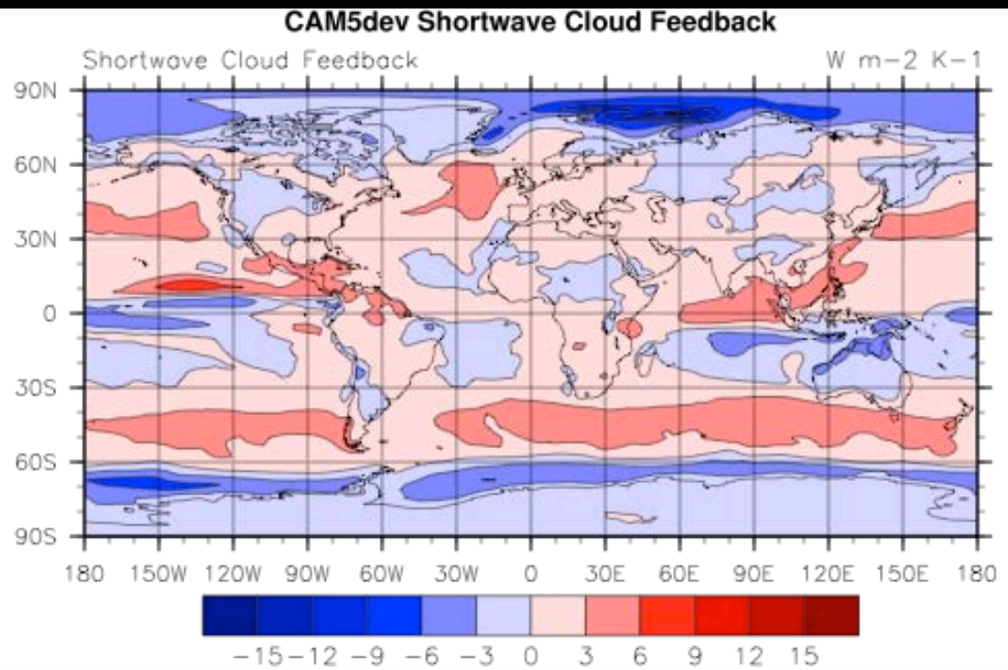
CAM4dev has stronger negative CRF

CAM5dev has +CRF in mid-latitudes

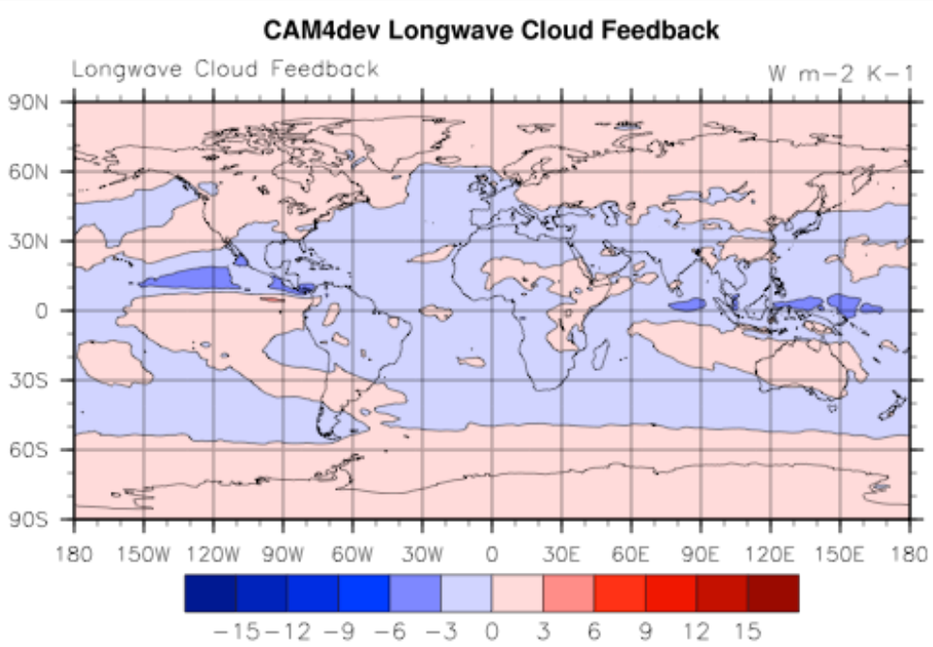
LW & SW Feedbacks



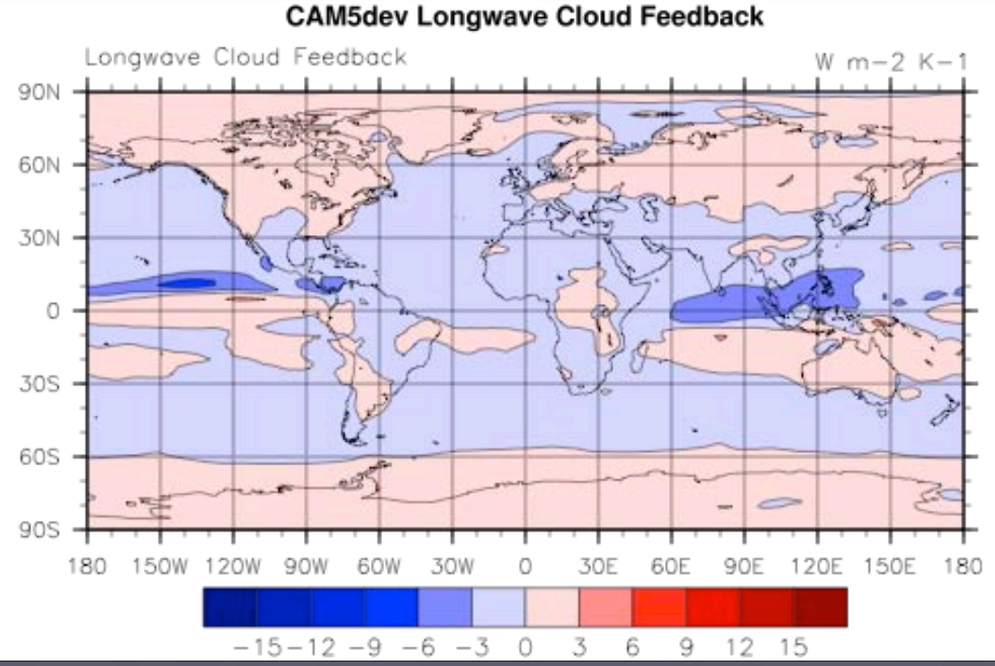
SW



Main Difference in SW: Interactions with ice edge



LW



Next Steps

- Sort out cloud information
- Run some other SOM experiments
- Take a look at AMIP runs (partial feedbacks: can I learn anything)
- Also: Obs or reanalysis?
- Thoughts?