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Models get cloud feedback wrong, but *only* by 70W/m2 (that's 19 times larger than the CO2 effect)

Yet another paper shows that the climate models have flaws, described as “gross” “severe” and “disturbing”. The direct effect of doubling CO2 is theoretically 3.7W per square meter. The feedbacks supposedly are 2 -3 times as strong (according to the IPCC). But some scientists are trying to figure out those feedbacks with models which have flaws in the order of 70W per square meter. (How do we find that signal in noise that's up to 19 times *larger*?)

Remember climate science is settled: like gravity and a round earth. (Really?)

Miller et al 2012 [\[abstract\]](#) [\[PDF\]](#) find that some models predict clouds to have a net shortwave radiative effect near zero, but observations show it is 70W per square meter. Presumably, cloud shortwave radiative effect means the sunlight bounced upwards off the surface of the clouds and out into space.

What's especially interesting about this paper is the level of detail. They test shortwave and longwave radiation, precipitation flux, integrated water vapor, liquid water path, cloud fraction, and they have observations from the top of the atmosphere and the surface. With so much information they can test models against short wave and long wave radiation, to see how well the models are really simulating clouds.

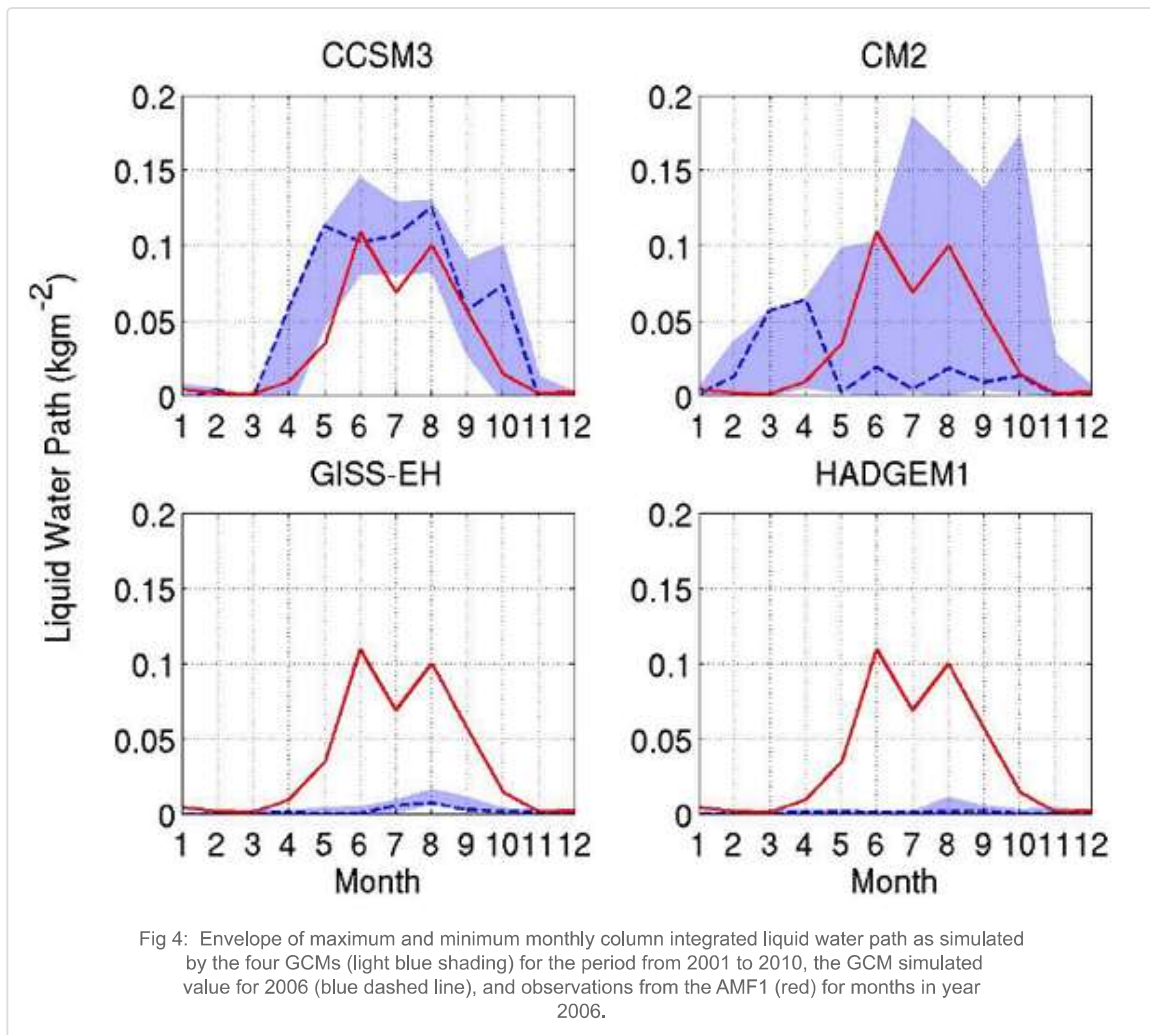
We can also see how four models appear to do well on one parameter, only to invariably fail on another. It is easy to see how a not-so-diligent researcher could “verify” some aspect of each and every model but without testing and comparing *all the aspects*, these single point “successes” are meaningless.

Critics will say this study was just one year in one region (2006 over the African Sahel) but if global climate models don't understand cloud microphysics and the radiative effect of the condensed water vapor that covers 60% of Planet Earth, then they can't predict the climate anywhere. And no, the pretense that predicting climate 100 years in advance is somehow easier than predicting a single year is bollocks... 100 years of climate modeling means adding up 100 years of errors. The errors don't cancel out, they *accumulate*.

Even though the models are tested below with one year (2006) as the dotted blue line, the blue bands are envelopes of model outputs for 2001-2010, and we would hope that even if the models got the year wrong, the observations would at least fall within the extremes of the decadal predictions, but frequently they didn't. Indeed the authors note that the decade itself was not that critical saying “*virtually the same results are obtained when the GCM solution envelope is stretched to thirty years.*”

The four global models tested are: **CM2, HADGEM1, CCSM3 & GISS-EH**

H/t to the [Hockey Schtick](#)



If the graphs look a bit complex, just focus on the the red solid line — the observations. The blue dotted line is what the models estimate happened, so it's supposed to be similar. At the very least, the red line ought to fall within that paler blue band called the decadal “envelope”. Where the red line is outside that band it tells us that the observations were outside the full range of what the models expected during the decade.

These are select quotes from the *pre-print*. (I've replaced many acronyms with their full terms to improve readability).

In the world of climate models, clouds without either liquid water or ice can produce “reasonable estimates” of rain.

“A particular focus was placed on the detailed role of clouds and clear-sky in modulating the cross-atmosphere radiative flux divergence in two global climate models that provided the necessary output to facilitate the analysis: CM2 and HADGEM1. Precipitation flux magnitude and wet-season signal shape were deemed superior in GISS537 EH and HADGEM1, but they display inconsistencies in their depiction of cloud microphysics despite their relative accurate depictions of precipitation. For example, GISS-EH produces clouds that are predominantly composed of ice water, which is why so little liquid water is indicated in Figure 4. Ironically, HADGEM1 produces too few clouds and a miniscule amount of total water, which is to say that there is neither liquid or ice in the clouds, yet the clouds produce a reasonable amount of precipitation.”

Hmm, “grossly underestimate”:

“Of the four global climate models, CCSM3 provided the best estimate of cloud LWP, though it significantly overestimated precipitation, while CM2 produced suspiciously large variability in liquid water path (LWP) and GISS-EH and HADGEM1 grossly underestimated the liquid water path.”

A “potentially severe problem”?

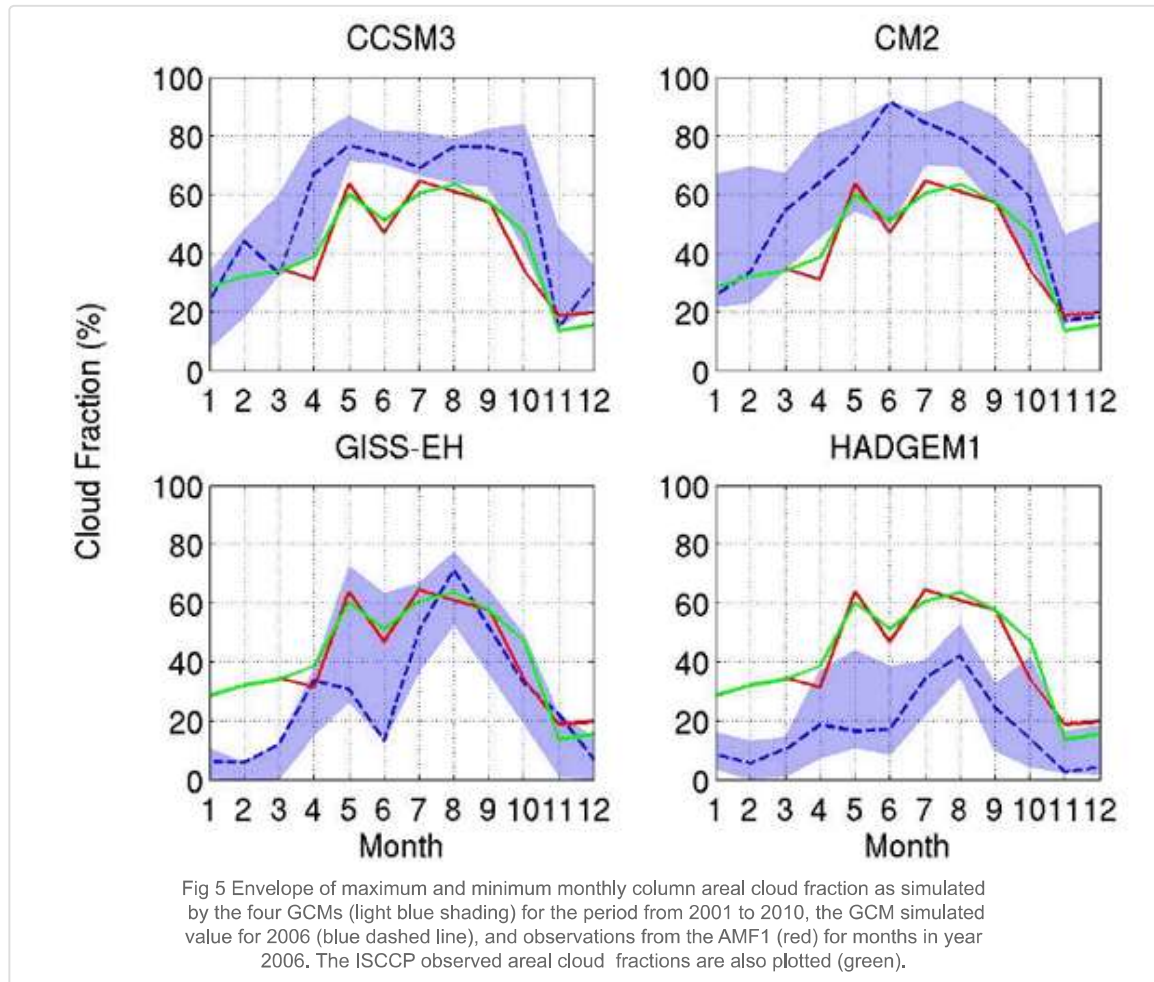
“Production and partitioning of cloud water and ice and the generation of precipitation from clouds seem problematic in all four GCMs considered in this study. Insofar as these characteristics are intricately related to radiation throughput in West Africa it seems that this is a potentially severe problem.”

Errors in long wave cloud radiative forcing (CRF) are “particularly disturbing”:

“Both global climate models [CM2 and HADGEM1] struggled to accurately characterize the surface cloud radiative forcing; they underestimated the SW cloud radiative forcing and produced approximately a zero surface LW cloud radiative forcing. This latter comparison is particularly disturbing because the measured surface LW cloud radiative forcing is significant ($\sim 30 \text{ Wm}^{-2}$). Intuitively and quantitatively this is an important omission; when humid and cloudy conditions are present, these two GCMs treat LW radiation as if it were dry and clear.”

Then when the models get something right it's thanks to an error:

“Looking exclusively at the net surface cloud radiative forcing leads to the conclusion that CM2 is quite accurate in its assessment, but measurements show that this agreement is due to error cancellation...”



The solid red lines are the observations, the blue dashed line is the models estimate for 2006 and the blue band is the decade envelope for the models. TOA = Top of Atmosphere. SW = Shortwave. LW = Longwave. CRF = Cloud radiative forcing.

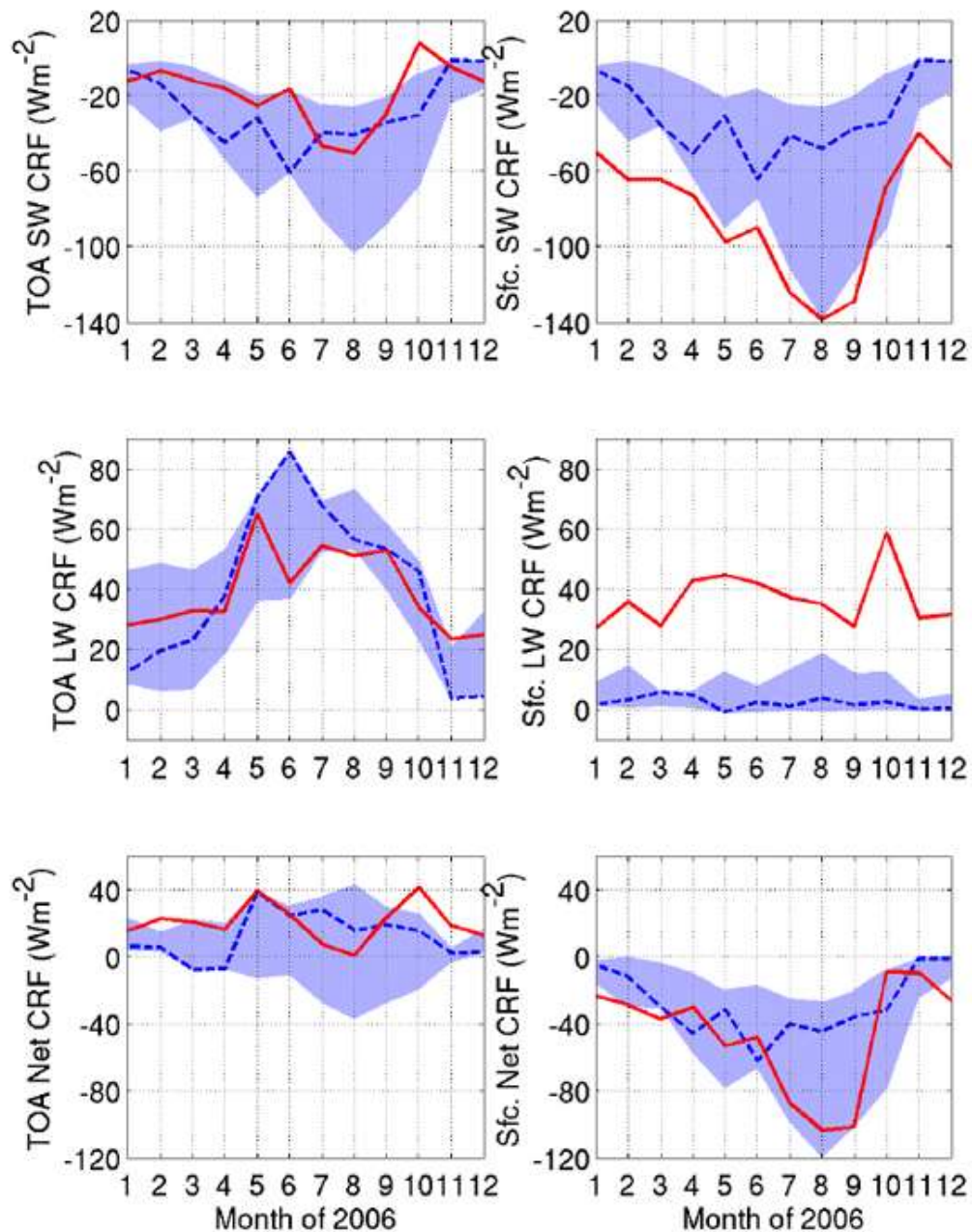


Fig -7 Envelope of maximum and minimum monthly averaged TOA and surface cloud radiative forcing (CRF) as simulated by CM2 (blue shading) for the period from 2001 to 2010, the GCM simulated value for 2006 (dashed blue lines), and observations from the AMF1 (red lines) for months in year 2006.

Again, the solid red lines are the observations of cloud radiative effect. CM2 looks “decent” for the net effect, but it only gets a decent estimate because it underestimates the short wave radiation (by up to 70W / m2) and overestimates the longwave radiation. HadGem is “less awful”.

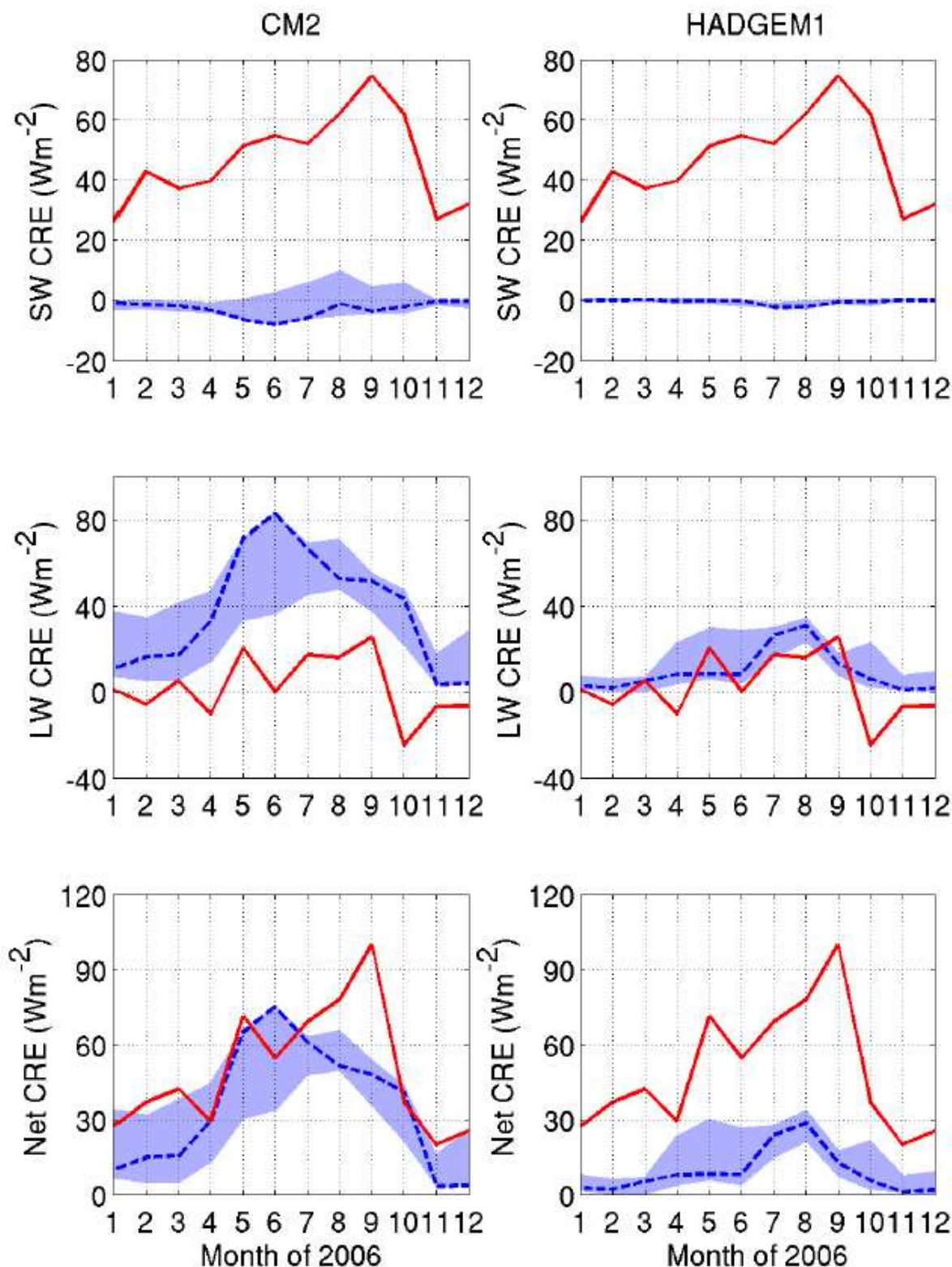


Fig 10 Envelope of maximum and minimum monthly averaged cloud radiative effect (CRE) for CM2 (left column) and HADGEM1 (right column) for the period from 2001 to 2010 (shaded blue areas), the GCM simulated value for 2006 (dashed blue lines), and observations from the AMF1 (solid red lines) for months in year 2006.

Isn't it time to admit the models don't work?

ABSTRACT

Continuous measurements of the shortwave (SW), longwave (LW), and net cross-atmosphere radiation flux divergence over the West African Sahel were made during the year 2006 using the Atmospheric Radiation Measurement (ARM) Mobile Facility (AMF) and the Geostationary Earth Radiation Budget (GERB) satellite. Accompanying AMF measurements enabled calculations of the LW, SW, and net Top-of-Atmosphere (TOA) and surface Cloud Radiative Forcing (CRF), which quantifies the radiative effects of cloud cover on the column boundaries. Calculations of the LW, SW, and net Cloud Radiative Effect (CRE), which is the difference

18/05/2024, 10:24

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between the TOA and surface radiative flux divergences in all-sky and clear-sky conditions, quantify the radiative effects on the column itself. These measurements were compared to predictions in four Global Climate Models (GCMs) used in the Intergovernmental Panel for Climate Change fourth Assessment report (IPCC-AR4). Reproducing the SW column radiative flux divergence was problematic in the GCMs and SW discrepancies translated into the net radiative flux divergence. Computing cloud-related quantities from the measurements produced yearly averages of the SW TOA CRF, surface CRF, and CRE of ~ -19 Wm-2, -83 Wm-2 and 47 Wm-2 respectively, and yearly averages of the LW TOA CRF, surface CRF, and CRE of ~ 39 Wm-2, 37 Wm-2, and 2 Wm-2. These quantities were analyzed in two GCMs and compensating errors in the SW and LW clear-sky, cross-atmosphere radiative flux divergence conspired to produce reasonable predictions of the net clear-sky divergence. **Both GCMs underestimated the surface LW and SW CRF and predicted near zero SW CRE when the measured values were substantially larger (70 Wm-2 maximum).**

REFERENCES

Miller, M., Ghate, V., Zahn, R., (2012) The Radiation Budget of the West African Sahel 1 and its Controls: A Perspective from
2 Observations and Global Climate Models. *in press Journal of Climate* [\[abstract\]](#) [\[PDF\]](#)

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The short killer summary: [The Skeptics Handbook](#). The most deadly point: [The Missing Hot Spot](#).



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#1



Otter
[August 15, 2012 at 2:31 am](#)

So, what have we got in the way of papers for negative feedbacks?
Cloud height?
Thermosphere? (correct me if I am wrong on that one)
Water vapor?
What else, that the models count as positive, is showing up in research as negative?

1 0



[Joanne Nova](#)
[August 15, 2012 at 2:53 am](#)

#1.

Otter, Water vapor (missing hot spot) and clouds dominate the feedbacks so much that everything else *could* be positive and the effect of these two could neutralize them...

1 0

Otter
[August 15, 2012 at 3:04 am](#)

#1.1.