The strange NASA map

Given what has been analyzed and shown so far, given ordinary casual observations, given common sense we should have a fair understanding what clouds do. Clouds interfere with and thus reduce both radiative fluxes, whether it is solar radiation coming in or LWIR going out. Accordingly over the course of the day temperatures remain very stable under a cloudy sky, which common sense tells us anyhow.

As shown this pattern also translates into more complex scenarios. During spring clouds are correlated with lower and in autumn with higher temperatures as clear skies, which is due to the same reason. This seasonal pattern is due to surface temperatures lagging behind solar intensity, so that clouds relatively speaking block more solar radiation in spring, and more LWIR in autumn.

That again is to be distinguished from the average and overall momentum, which shows a positive correlation between clouds and temperatures. As named before, this is not to be explained by the basic and simple fact that clouds do interfere with radiative fluxes (or that they would show preference to one of which), but rather due to the "side effect" of elevating the photosphere. All of this will be very important to keep in mind when we look at the upcoming data.

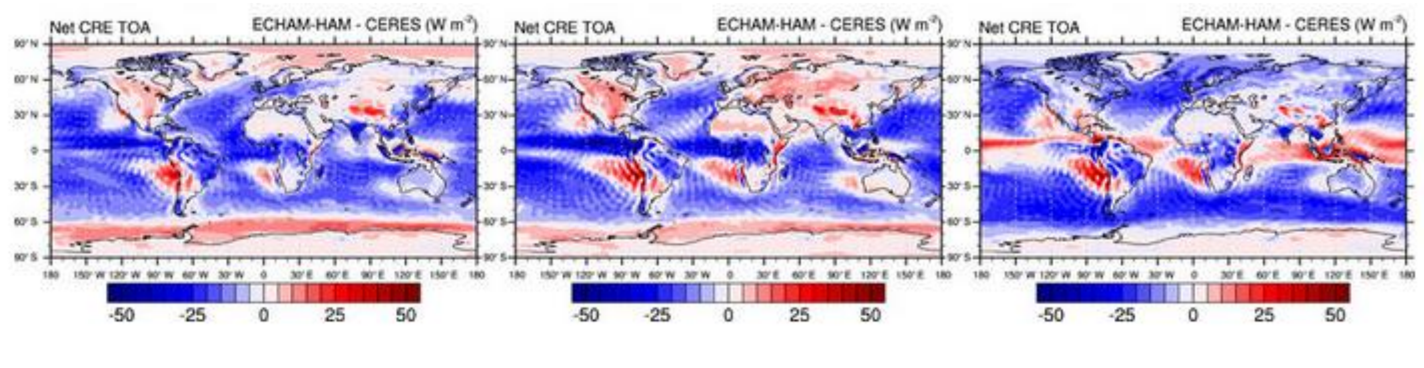
In its first assessment report the IPCC stated 44W/m2 in negative cloud (or albedo-) effect, 31W/m2 in positive forcing, and accordingly a net negative effect of 13W/m2. It seems a bit unclear to me where they took these figures from back then, since the references below were more about speculations on cloud feedback (due to global warming). Anyhow, these figures have morphed to -50W/m2, +30W/m2 and thus a net -20W/m2 in the 5th AR of the IPCC.

I think it is quite obvious such a preference for even numbers is of human nature, and does not reflect an increase of certainty or precision on the subject. Rather, and that is pretty odd, the IPCC after 25 years of additional research stepped back on its initial claim and now gives a much looser estimate on what is a backbone of the GHE theory.

Way more interesting than those blunt IPCC figures are the far more precise data given by various satellite driven projects like ERBE or CERES. They show a surprisingly complex situation, with a CRE (cloud radiative effect) spanning from slightly positive to strongly negative depending on the region. Most of all over ice shields, but also deserts, the CRE would be neutral to positive. In general over land the CRE would tend to be close to neutral. Over the ocean however the CRE is meant to be mainly negative and massively so in some regions.

Basically there are some intrinsic logics which are easy to follow. For instance a cloud over an ice shield will, just like everywhere else, deflect a lot of solar radiation. But since ice and snow are similar bright, they would deflect most sun light anyhow, and cloud albedo will not make so much difference then. In other words, the brightness of the surface underneath will have to play a significant role to the effective cloud albedo. Over the ocean on the other side, which is relatively dark, clouds deflect a lot of light which otherwise would be absorbed.

So far, so good. Yet if we take a deeper dive into these data we are going to encounter some serious problems. Probably people would have trouble understanding how satellite data could be put into question. Obviously it seems to be the most accurate and sophisticated way to investigate almost any question of life, right? Well, it is not that simple! First of all, and this is well represented in the scientific literature, there is a significant spread in these "measured" data, which brings up some obvious questions.[1]



All these graphs are meant to give the CRE based on the same satellite data, yet they show significant differences. Blue areas turn to red, red areas turn blue, how can it be? The thing is, satellites only provide some raw data which will then be fed into a model. A lot of variables required to run the model are actually unknown. The "Unkowns" are then substituted with assumptions in order to get a final result. It turns out the seemingly undisputable "satellite data" are rather the result of a guessing game. It is all about what the modellers assume to be true in the first place and as the graphs show, they are not quite certain, even by their own standards.

There seem to be a lot of loose ends in this, with the only one being fixed over the years is the final result of a negative CRE all over. It is certainly only incidental this "final result" is pivotal to the whole global warming narrative.

[1] https://www.researchgate.net/figure/Comparison-of-annual-mean-SW-LW-and-net-CRE-of-E55H20-E61H22-and-E63H23-to-CERES-40_fig2_335351575

Apart from changing the parameters (aka the assumptions) of such models, there seems to exist an interesting story underneath it all. Let me introduce you to Anand Inamdar! It seems he played a vital role in developing the basic algorithms to analyze and interpret data from various sources in order to get a fair estimate on the total CRE.

> *" One of his primary contributions to the CERES was the development of the algorithm which estimates the surface LW radiation budget from measurements of top of atmosphere window and non-window spectral channels as well as other ancillary meteorological variables over both ocean and land surfaces, which is currently in operational use."*[2]
>
> *"Anand Inamdar played a critical role in facilitating the transition of the ISCCP data from NASA's Goddard Institute for Space Studies to NCEI and has made significant scientific contributions to the efforts to update and reprocess the data. As a result, much of Anand's work has focused on the meticulous data calibration efforts required to compile an accurate and consistent record of cloud cover information from these different sources. This includes comparing time series of ISCCP-implemented calibration coefficients for geostationary satellites with those derived from the Advanced Very High Resolution Radiometer (AVHRR) PATMOS-x reference for both the base period (1983-2009) and the extended period (2010-2015). Anand has also worked on the creation of tables to convert raw data into estimates of radiance and brightness temperatures.*
> *The project also requires extensive quality control (QC) efforts to ensure the validity of the data. Anand developed software packages to automate QC of the AVHRR Global Area Coverage (GAC) data, which are core inputs to the next generation H-series ISCCP cloud products. He also was responsible for manual visual inspection of the ISCCP B1 and AVHRR GAC imagery."*[3]

I am no way trying to discredit the work of Dr. Inamdar. But what these sources claim is, that he more or less alone developed these algorithms. And since this might be an obvious weak point, which will require extensive quality control, he was in charge of that too. And no, I am not making this up! It certainly does not help Dr. Inamdar gained most of his reputation as junior colleague of Veerabhadran Ramanathan, a well reknown climate expert who himself made a lot of predictions (also on the CRE), which desirably should be confirmed, not dismissed.

Let us have a closer look on the geographic distribution of the CRE, as presented by Harvard, based on ERBE[4]. The colour scheme is a bit odd, since blue represents a positive (thus warming) and red a negative CRE (thus cooling). Anyhow, we see most blue over the Antarctic, the African-Asian desert regions and the Arctic.

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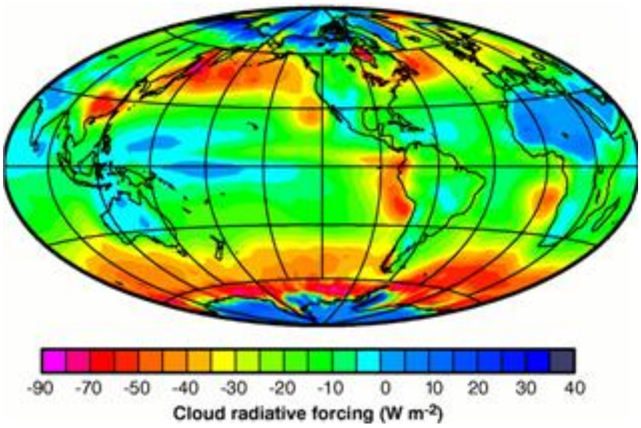

This blue (as opposed to turquoise which already indicates a negative CRE) does not mean a lot of warming, it is mainly just in the 5 to 10W/m2 range, and up to some 20W/m2 in the Antartic. Yet we need to remember, these are very dry areas with very little cloud cover, typically <10%. Of course any CRE requires the presence of clouds, as clouds will not have any effect if they are not existing.

For instance, if there is a +15W/m2 of average CRE and average cloud cover is only 5%, then we would have some +300W/m2 (=15/0.05) in CRE when there are clouds. Given temperatures are so low on the Antarctic continent and surface emissions are only in the 120W/m2 range, any CRE in this magnitude seems off limit. Sure, the numbers I picked are only educated guesses, but they are not far off reality and it is hard to see how this chart could be accurate (and it is not according to later editions..).

We have a similar issue with the Sahara desert, where average cloud cover is between 5 and 10%. Sure, with average surface emissions ranging in the 450W/m2 class a positive CRE of a 100W/m2 "per cloud" or so could easily be argued. The problem is just, that there is also intense sunshine and the cloud albedo effect will not be offset by a similar bright surface. Accordingly clouds should also have a strong cooling momentum making it hard to yield a high positive net CRE in the end.

Of course my primary suspicion over these data is not about the size of a locally positive CRE, but the all over negative CRE. There are some deep red, even purple areas on the chart, indicating a massively negative CRE. The most notorious one is close to the Antarctic continent beyond -60° latitude, where the CRE is meant to have some -80W/m2. So let us try to understand the basic situation there. Temperatures are close to freezing (unless the water should actually freeze, then temperatures might drop much

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[2] https://ncics.org/people/anand-inamdar/

[3] https://ncics.org/cics-news/updated-international-satellite-cloud-climatology-project-isccp-data/

[4] https://www.seas.harvard.edu/climate/eli/research/equable/ccf.html

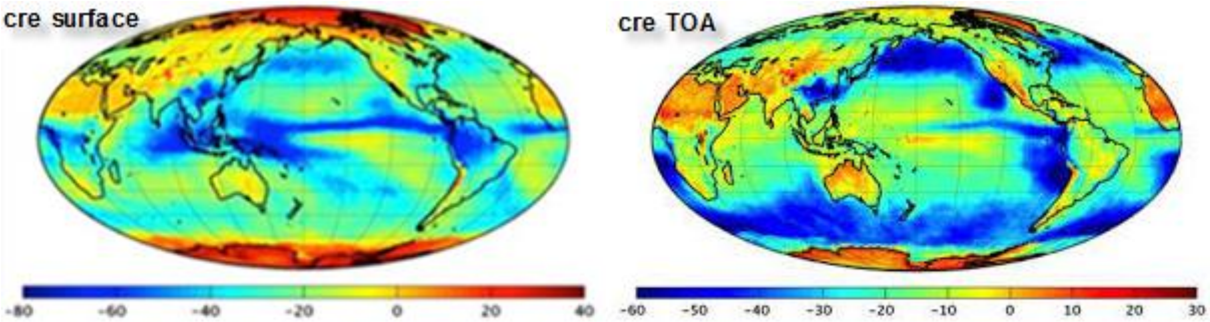
lower), so that average surface emissions will be around 310W/m2. This is still relatively much as compared to only about 220W/m2 of solar irradiance TOA at these latitudes. Of course it is relatively warm due to the convection of ocean water.

With about 310W/m2 emitted from the surface and only 220W/m2 coming in from the sun, we have to figure out how there could be a CRE of about -80W/m2. All we have seen so far by analyzing clouds is, that their primary effect is relative to these radiative fluxes. More going out than coming in, clouds will be warming, more coming in than going out, clouds will be cooling. It is just like in the very trivial day-night cycle. And overall there are only 220W/m2 of solar radiation that can be reflected. We can actually put this into a formula, where x is the percentage of average cloud cover, a is the rate at which they reduce LWIR emissions and b rate by which they reduce SWR.

$x * a * 310 - x * b * 220 = -80$

Since it is very cloudy there we may assume a fairly high x, let us say 70%. Of course x must be high for this equation to be even valid, since all variables are percentages between 0 and 100%. If we then assume a reasonable cloud albedo of 0.7, a will be 0.13. In other words, under these assumptions, clouds (when they are present!) would reduce LWIR emissions by only 13% in this region. Even if we change these parameters, we would still have the same problem that for getting to -80W/m2 in CRE, there must be almost no LW CRE. This is very unlikely and suggests there is something fundamentally wrong with the whole model.

Of course my claims have very much been vindicated by history. Later CERES versions of the CRE show a very different situation in the Antarctic sea. Relative to the previous ERBE graph the colours have been inverted here and now red is warm and blue is cold. The indication has changed to a +20W/m2 in these Antarctic waters, as opposed to a -80W/m2 in ERBE graph. That is a whopping 100W/m2 of "change of mind", or rather intrinsic model uncertainty.



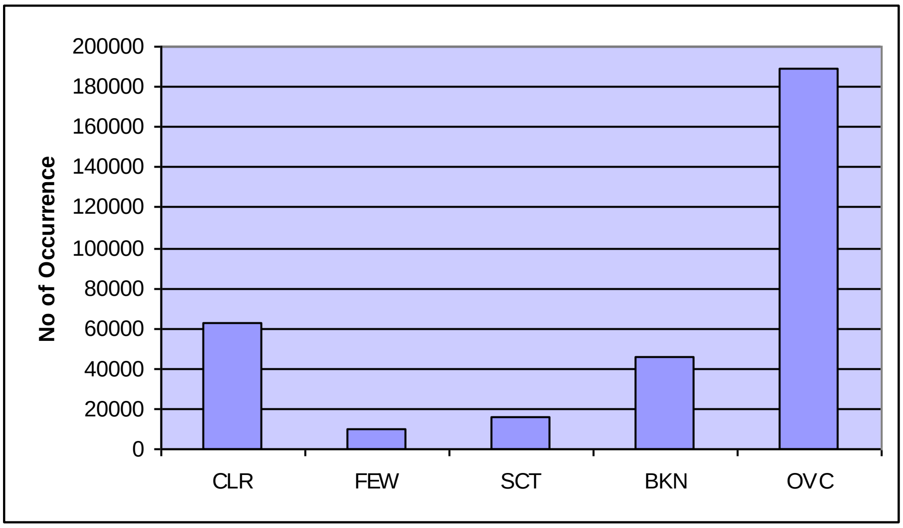
I have to admit though, that at least now there are two different CREs, one top of the atmosphere (TOA) and one for the surface (as shown above) and they differ somewhat. We do not know what kind of the ERBE graph should represent, or if back then there was even differentiation between the two. But even then, the CRE TOA would only amount to some -10 to -20W/m2 in the questionable region. Anyhow, the northern pacific in the other side, by all means, is meant to have one the most negative CREs throughout these models. And that is going to be of specific interest.

My concern was to test this model (or rather its results) against the real life METAR data I had acquired from the NOAA. There were two major problems. First of all the data I have analyzed so far showed a positive CRE, but they originate from land based stations. Even though the ERBE data above suggest a negative CRE instead over land, it is relatively moderate and thus not in strong contradiction to my findings. Also, if we consider the flip-flopping or imprecision within these models and certainly some statistical space in my own data, it seemed insufficient to falsify the model outright.

The other problem was, the data set contained no stations on the ocean, especially not from the Antarctic waters that I was most interested in. After some frustrated inactivity it caught my eye, there was another "red zone" in the northern pacific with a chain of islands right in the middle - the Aleut islands, which happen to be US territory. Once the thought transpired it seemed logical there should be stations located there within my NOAA data set. Indeed I could identify a total of 10 stations which were accurately located and consistently reported cloud conditions next to other meteorological data.

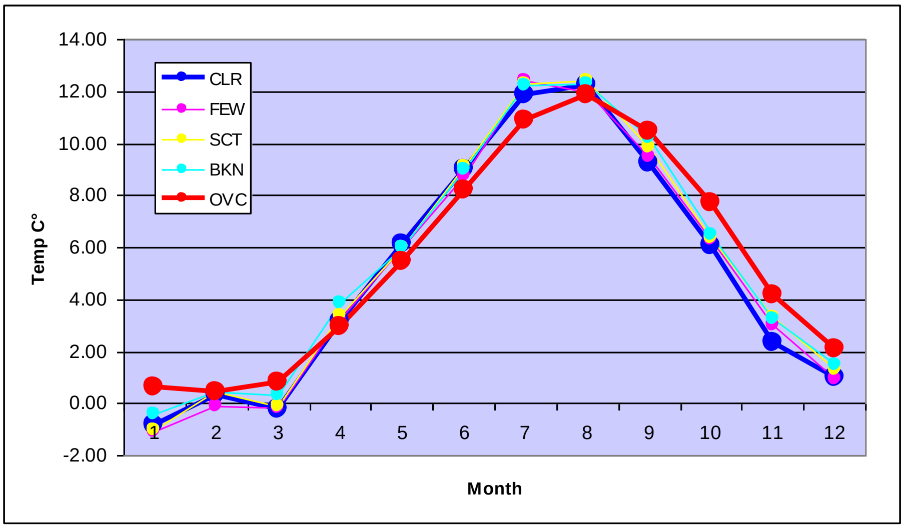
WBAN	Location	Latitude	Longitude	StationHeight
00110	NELSON LAGOON AIRPORT	56.017	-161.167	
25518	CHIGNIK AIRPORT	56.31139	-158.37306	16
25616	DUTCH HARBOR AIRPORT	53.895	-166.5433	13
25617	SAND POINT AIRPORT	55.31944	-160.52083	21
25624	COLD BAY AIRPORT	55.22083	-162.7325	103
25628	ST. GEORGE AIRPORT	56.6	-169.565	125
25704	ADAK NAS	51.88333	-176.65	19
25713	ST PAUL ISLAND AIRPORT	57.15528	-170.22222	28
25715	ATKA AIRPORT	52.22028	-174.20611	56
45715	EARECKSON AIR STATION AIRPORT	52.71667	174.1	97

Finally the question how a supposed CRE of some -50W/m2 would look like in real life data was to be answered. So, without further ado, let us dive into the facts. First of all this region is indeed very cloudy, about 60% of all reported conditions over the years 2016 & 2017 were overcast.



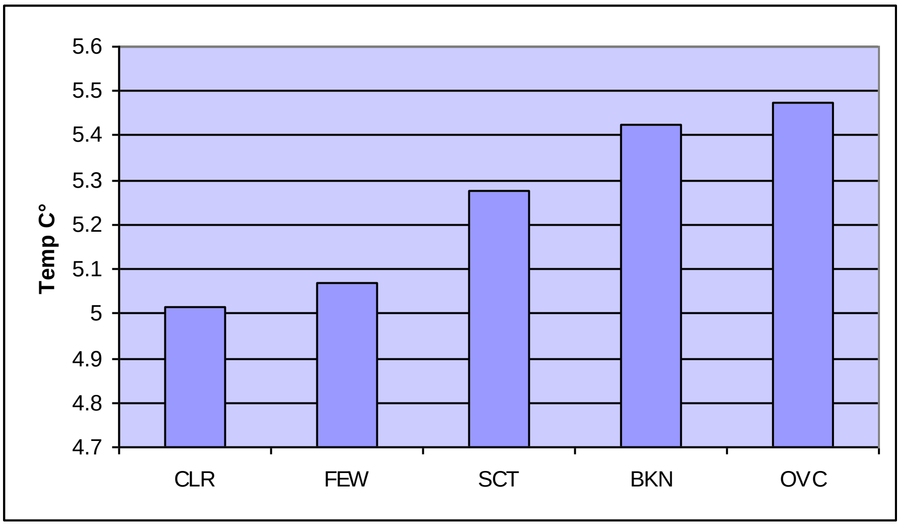
Seasonally we see a familiar pattern. As surface temperatures lag behind solar intensity, even more so in a strict maritime climate (by almost 2 months), clouds are associated with lower temperatures during spring to mid summer, while they provide significantly higher temperatures during the rest of the year.

It might be interesting to know, that this lag can amount to some 7K around the Equinox in this region, which means about +/-10% LW surface emissions relative to solar irradiance. This relative delta then again is responsible for the primary, seasonal net CRE which varies accordingly. This suggests a very high sensitivity of the CRE towards elevated or lowered surface temperatures which is not equilibrium with solar intensity. As we have previously discussed the relatively warm Antarctic ocean (warm due to convection), we should now understand how it can not possibly have a negative CRE at all.



There is even more to it, as theoretically it should be possible to derive the LW CRE directly from such data. Let me try it schematically at this point to show how it should work. With a variation of roughly +/-10% in LWIR surface emissions we get a delta of about 2.5K (-0.9K in spring, +1.6K in autumn) due to the LW CRE. That would suggest the total LW CRE to be 2.5K / 0.2 = 12.5K. Of course this would only represent a first step in an iterative process, since the common alterations between cloudy and clear skies, together with the inertia of temperatures, means the delta is only indicating the direction, not the final result. The total LW CRE will yet need to be significantly higher, which means it would cover almost all of the "GHE". A result very consistent with all the other findings.

As we are going to look at the aggregate result, I can promise a Eureka moment, reader discretion advised. On average, over the year, only seasonally adjusted, we see an almost linear correlation between cloudiness and temperature in the Northern Pacific. The more clouds, the warmer it is! This is what the NASA pretended negative CRE of -50W/m2 looks like in real life data. At this point, I am afraid, it is safe to say the NASA data are a hoax, and so is the GHE with it.



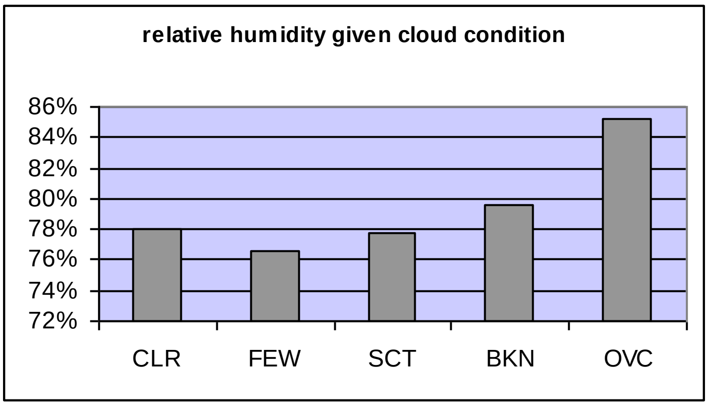
If clouds are obviously warming even where we should have one of the most negative CREs, then we can stop searching. Real life data show there is not the slightest support for the bogus claim of cooling clouds. Rather all the evidence points the other way. Sure, falsifying common believes will instantly provoke disregard, disbelieve, objection and protest. Some scientists, like myself, call this quality control, and it is welcome. Till then, let us consider thinkable alternative explanations.

Discussion:

1. After all these weather stations are located on islands, thus on land, not on water, so they might not reflect true regional CRE. In fact all these stations are no more than 1 mile off the coast. The islands themselves are small enough so that their climate is totally maritime, well represented by the minimal spread between day and night time temperatures of no more than 6K. It is simply not possible to have significantly different temperatures (given any cloud condition) as on the sea surrounding it.

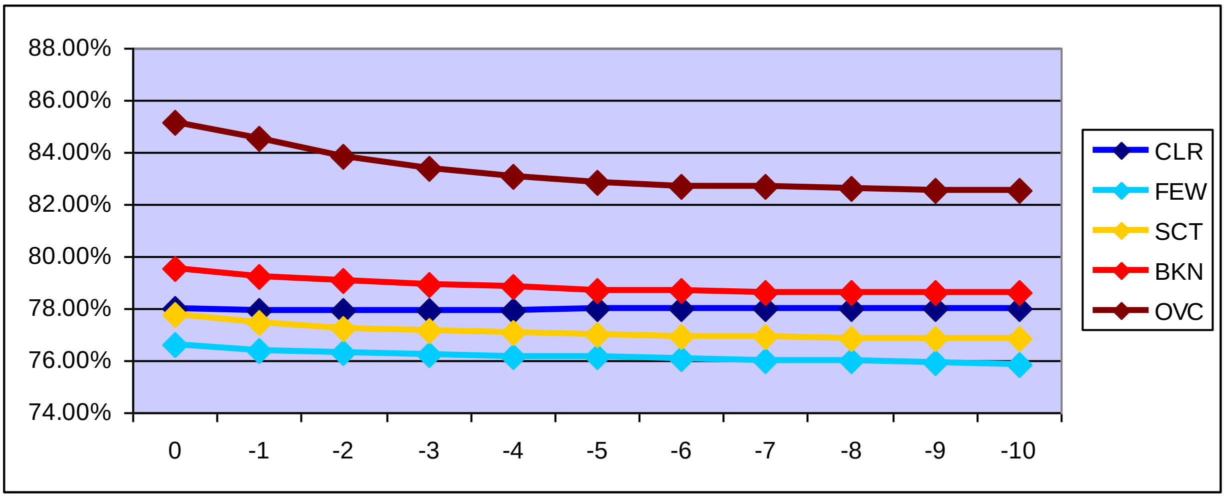
2. Maybe it is not clouds driving the observed temperatures, but another factor which is only correlated with clouds. In other words, correlation does not necessarily mean causation. First of all we should see that a suggested massive negative CRE would then need to be more than offset, so that despite cooling clouds we would actually get higher temperatures in the end. This alone would be kind of absurd and very hard to imagine.

Then of course we must consider vapour, because it is meant to such an important GHG and it is likely correlated to cloudiness. The only data we have available on this subject is relative humidity. Indeed there is certain correlation, with 85% rel. humidity in OVC situations and only 78% with CLR. If you wonder why rel. humidity is a bit lower with FEW and SCT, it is most certainly because these conditions get more often reported during day time (due to better vision) when rel. humidity is naturally a bit lower.



We can also analyze the situation by excluding records with rain, which is a main driver of rel. humidity close to the surface and of course correlated to clouds. The procedure is simply excluding any record where a rain flag is given and consecutively a certain number of records thereafter, when the surface is still wet and rel. humidity accordingly elevated. 0 would then represent the complete data set, -1 excluding rainy records, -2 excluding also the first record thereafter and so on.

We can see a good share of the elevated humidity associated with OVC is indeed due to rain. Excluding this factor OVC trends to below 83% in rel. humidity, just 5 percentage points above "CLR".

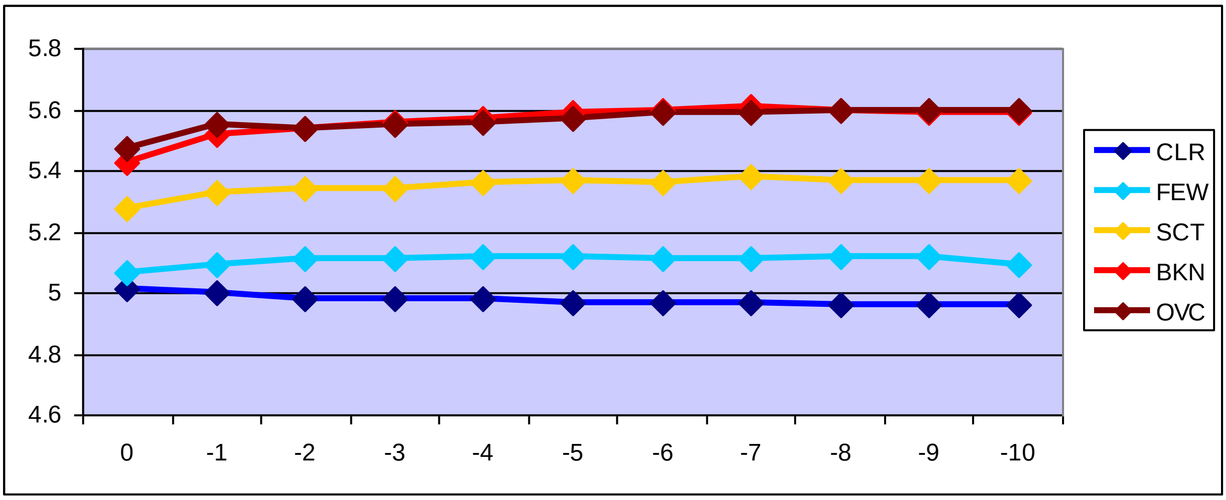


Sure we could deepen the analysis of possible biases here (like seasonal, day time..), but I guess the point is quite clear already. The variation of humidity given any cloud condition is very modest and simply not able to support the argument of any massive "radiative forcing" due to vapour, which could offset any accordingly large negative CRE.

3. Instead we have yet another bias with rain, as it directly affects surface temperatures and thus makes clouds look statistically colder than they are. We can apply the same procedure as above, only this time we look at how it affects surface temperatures. As to be expected the rain chill effect is tiny in such a region. Dropping records with rain only increases temperatures by 0.1K, both with OVC and BKN. Yet this only widens the gap and indicates the positive(!) CRE we see in the data is yet underrepresented.

Another strange detail is that CLR turns even colder as we reduce the rain chill bias. To understand this phenomenon we need to think around a few corners. One might think it is just an artefact and ignore it, but it has been observed in all the data sub-sets so far and thus is not incidental.

First of all this means we have rain falling from clear skies, which is not surprising if we remember there is a reporting ceiling of 12.000ft. So some CLR reports will actually be cloudy with the potential of rain. Then again eliminating rain should raise, not drop temperatures. However, by eliminating rainy records, we also eliminate a share of the false CLR reports, which are actually cloudy. Since any cloudy situations are much warmer than CLR, eliminating those false CLR reports dominates the rain chill bias and thus drops average temperatures even further.



4. Let us not forget the METAR data (usually) only cover clouds up to 12.000ft and thus will not report higher altitude clouds. As just demonstrated this causes some biases we can surmise. However, as previous analysis have shown, the CRE tends to be more positive the higher up clouds are anyway. A fact that is actually undisputed. Having our view restricted on low clouds, it is certain to say we do not see the full extend of the positive(!) CRE.

Eventually we can summarize that the positive CRE in the northern pacific is a solid fact, based on real life weather records which are, let us say, "democratic" in nature. Such records are collected by a lot of individuals operating single stations as opposed to satellite data, which are more or less a black box to the outside world. Of course the problem multiplies, given raw satellite data will be interpreted in the context of models which again require certain assumptions to be functional. Even though the NOAA decided to pull these precious raw weather records from its site, they are still available (or can be made available) and so are the analytic procedures hereto.