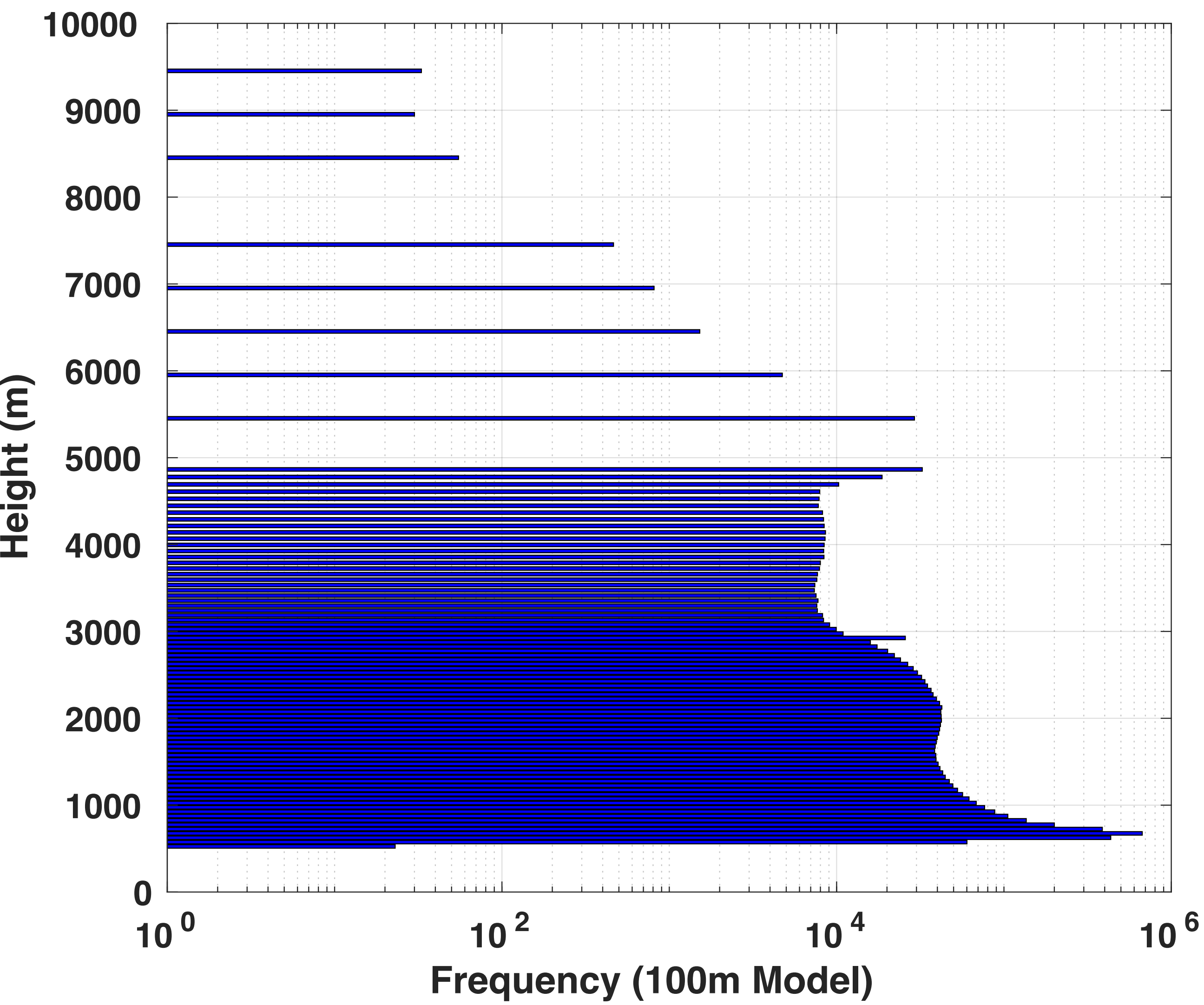
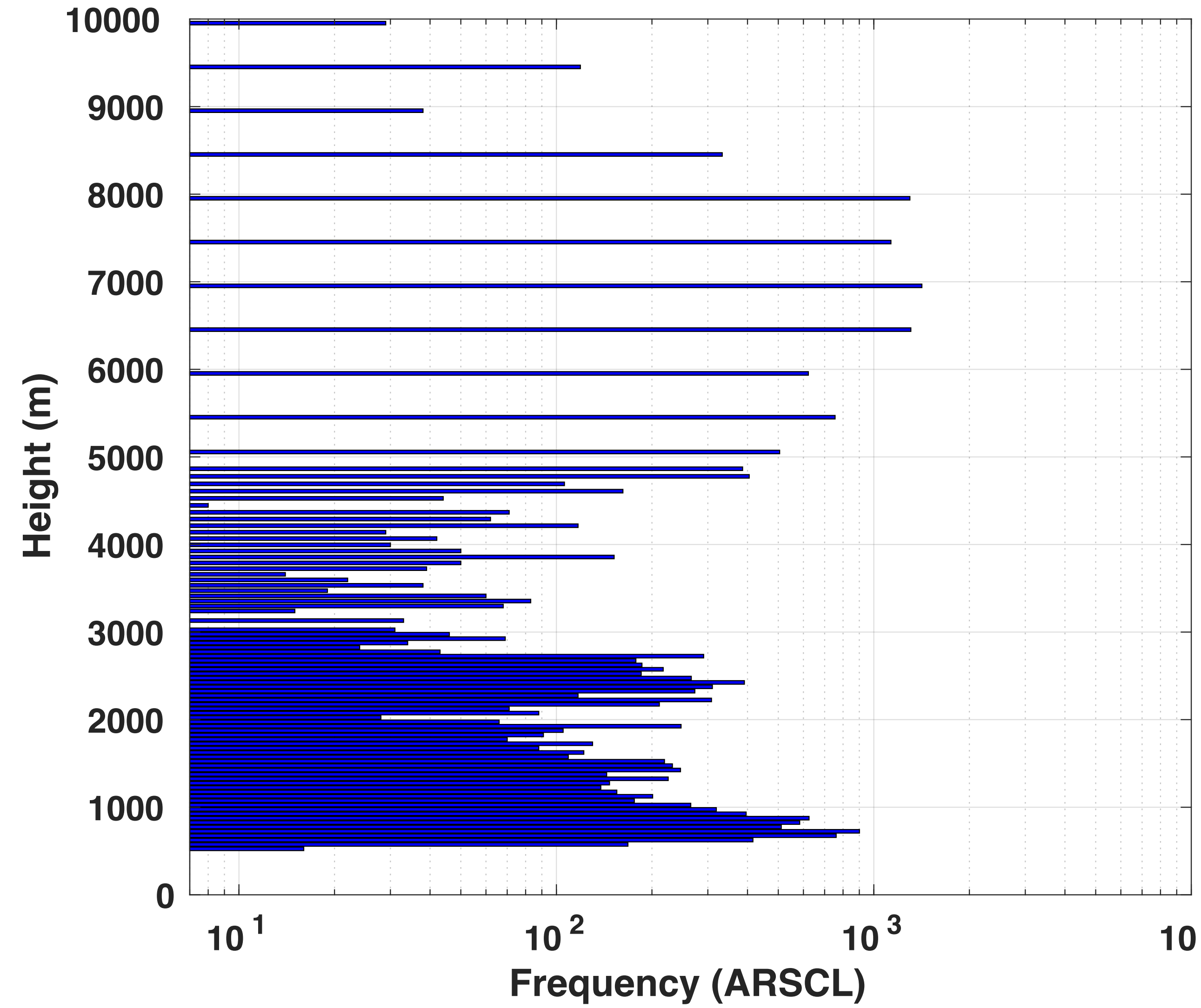
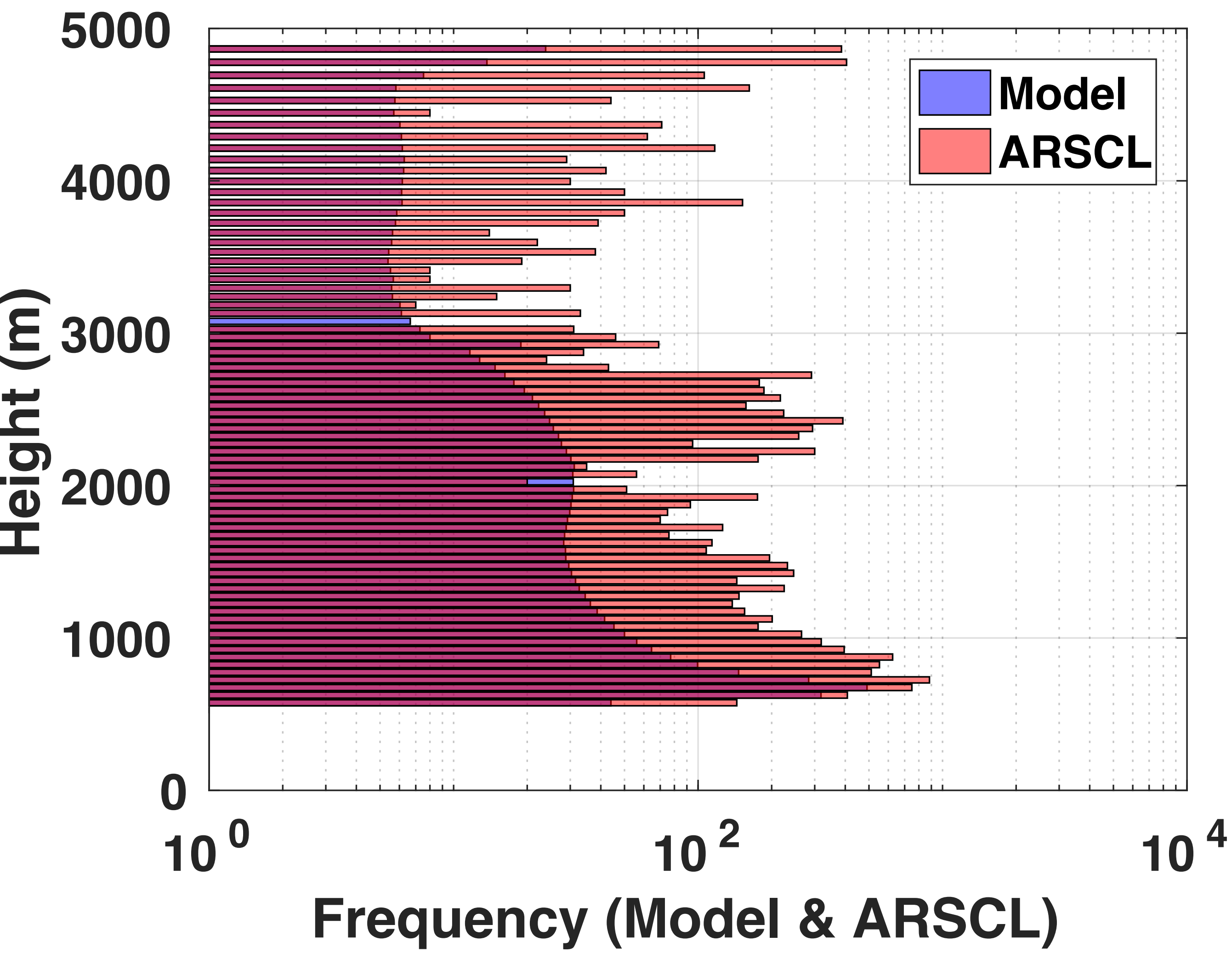
Previously I'd shown these plots of the model and ARSCL frequency of detected reflectivity based on model height midpoints (binning ARSCL accordingly).

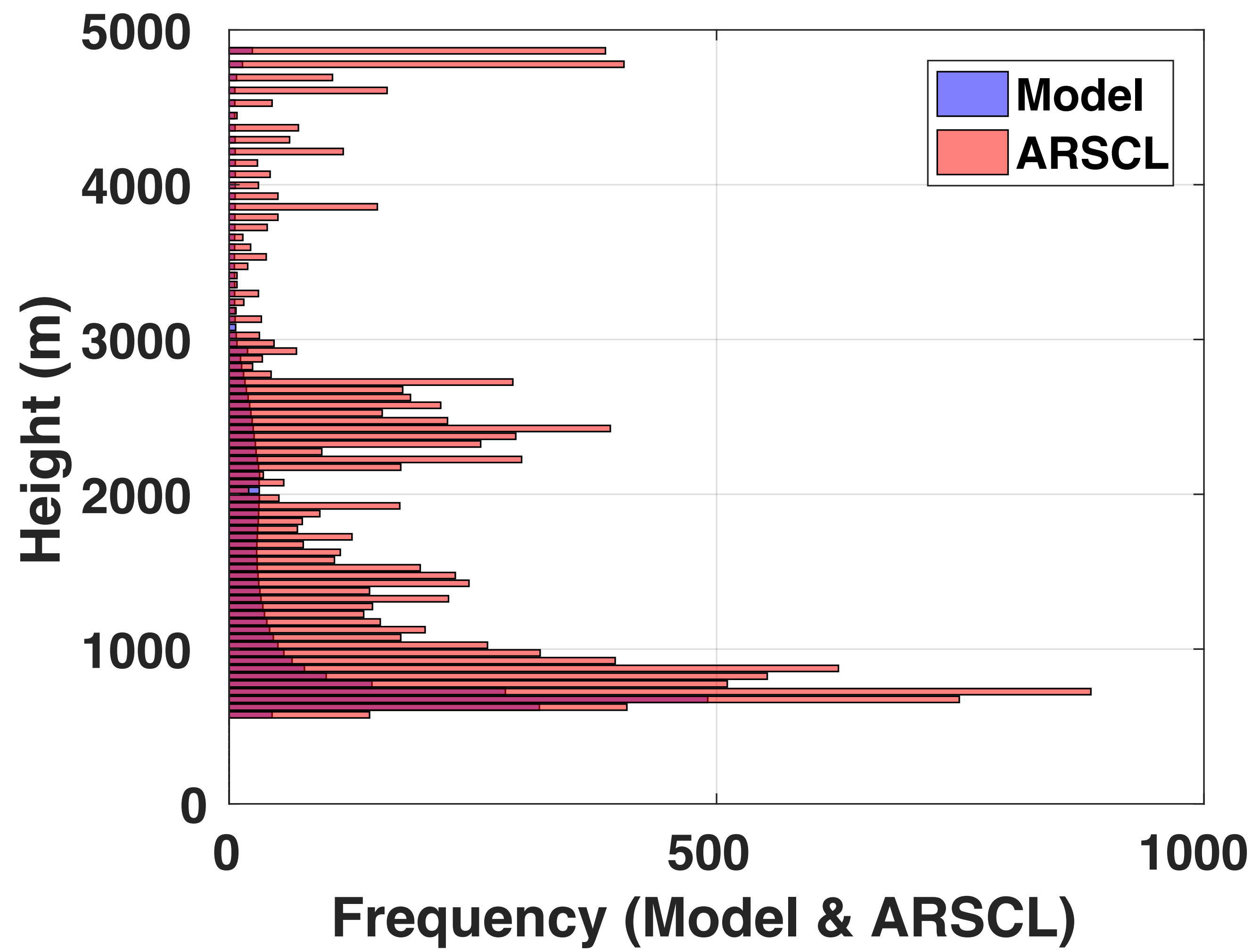




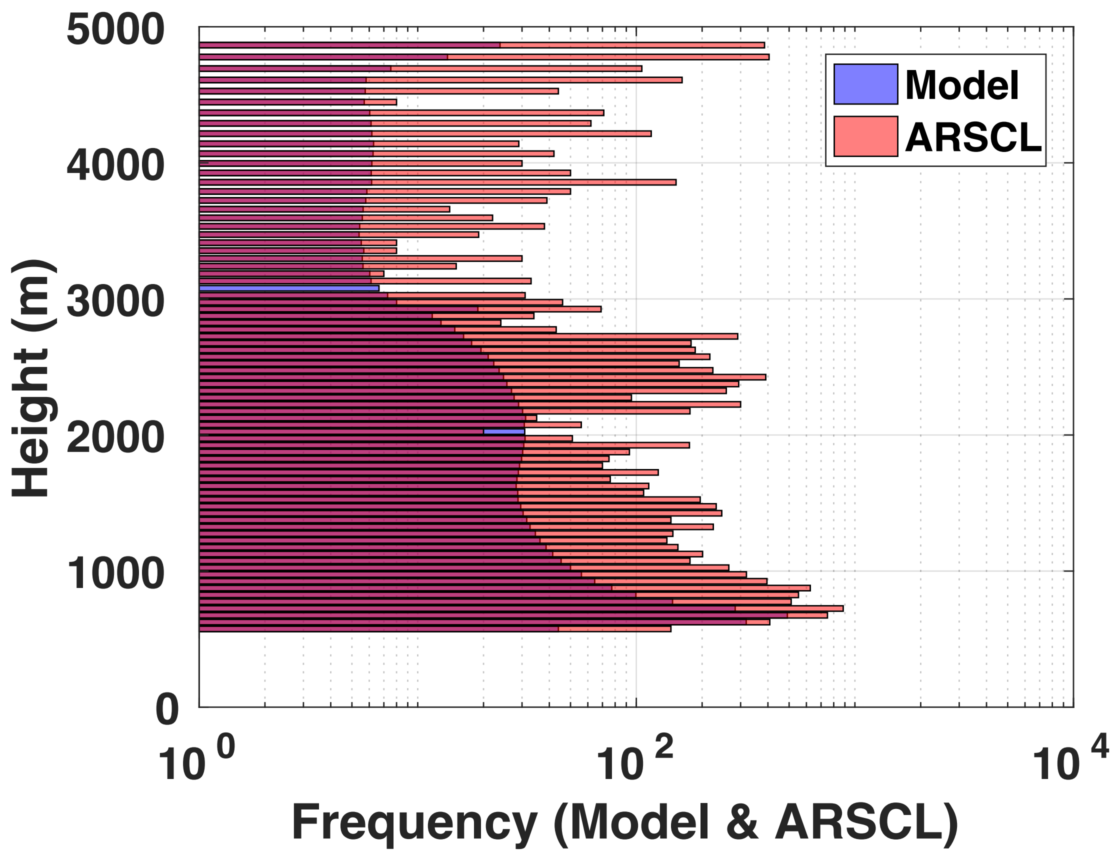
I needed to adjust for the differences in time frequency (75x in ARSCL) and the number of locations in the model (320x320).

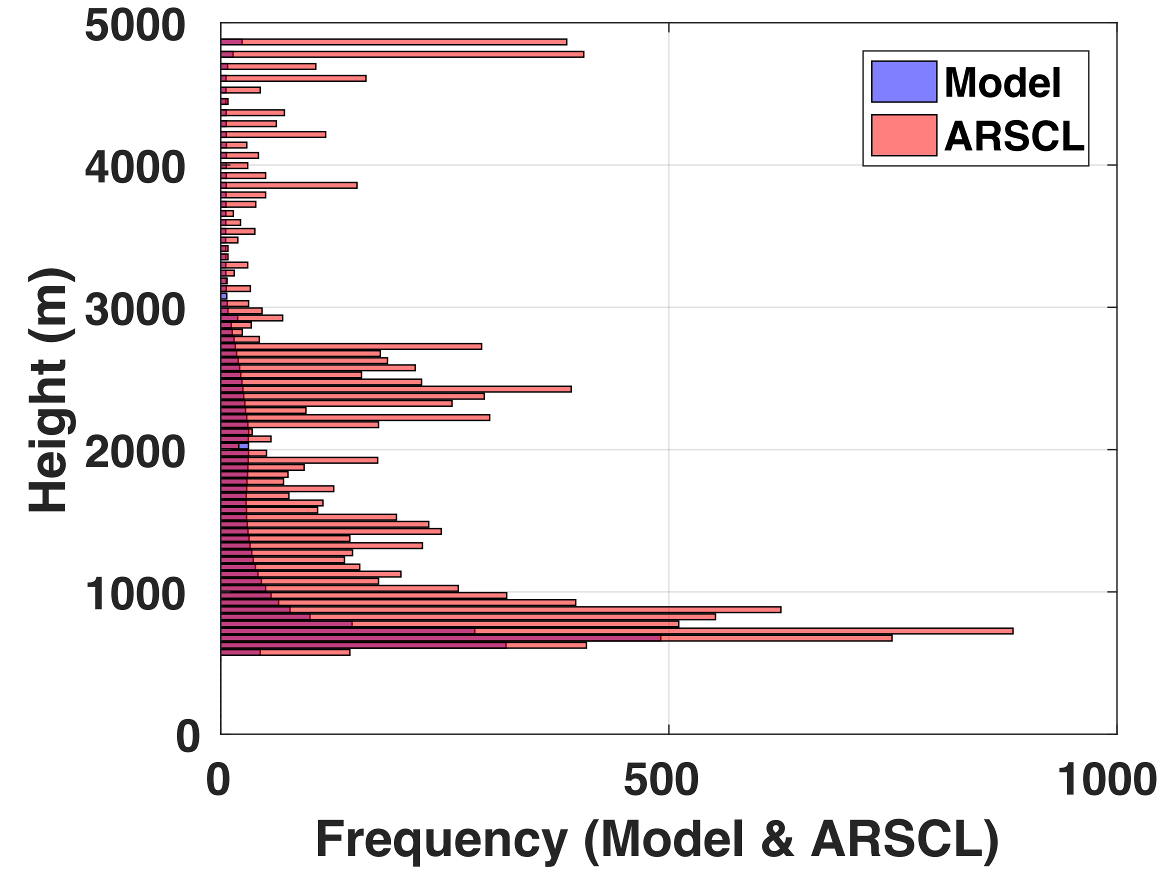
So I did that, plotted them together, and have this (log plot on left, linear on right).

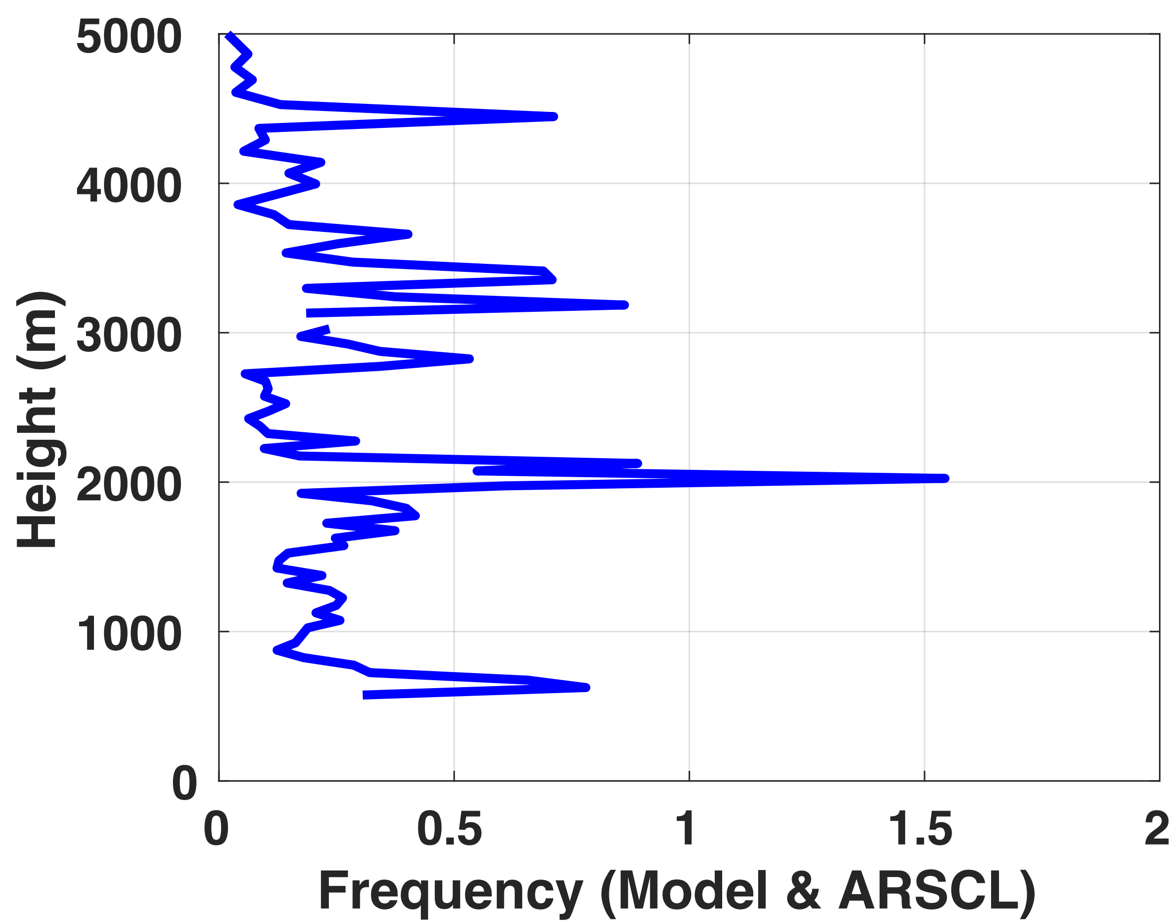




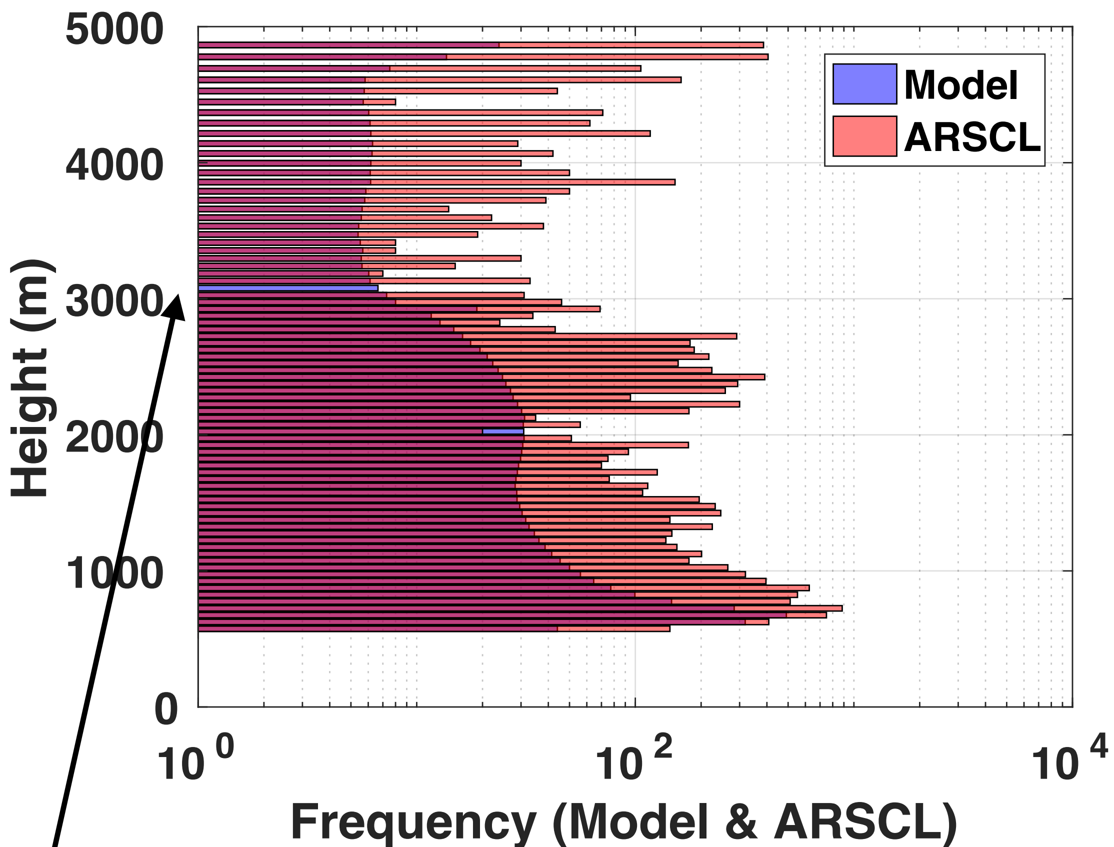
The frequency in the ARSCL is much higher than in the model. I can represent that with a ratio between the two.

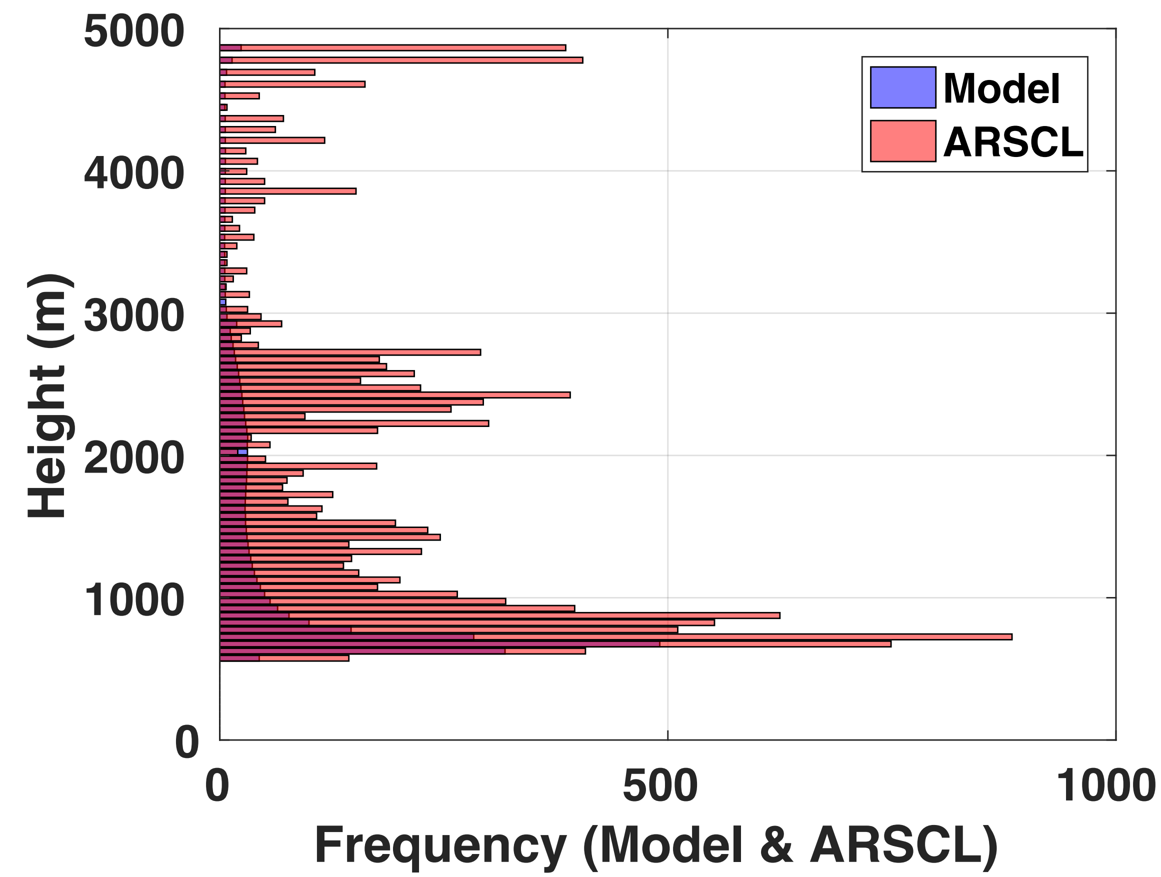






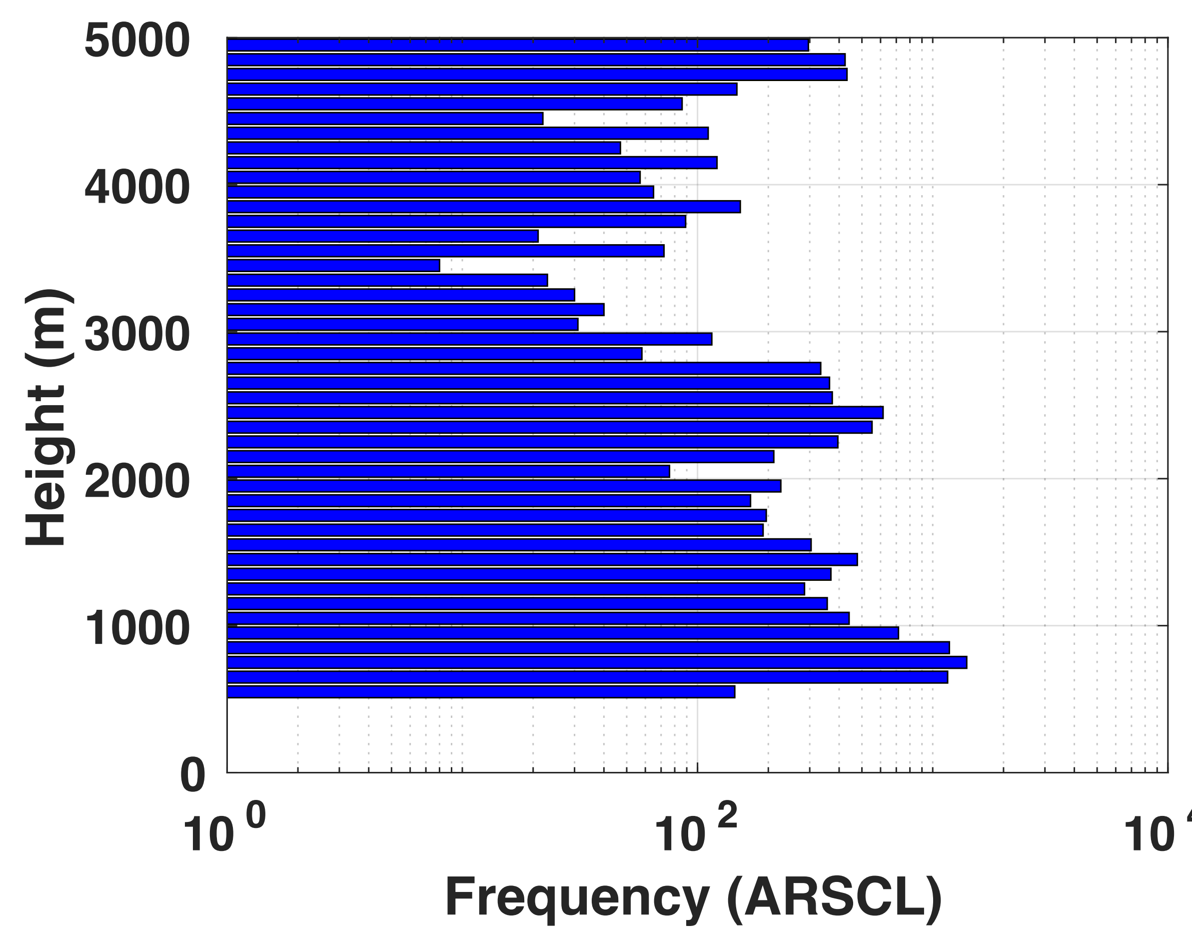
The most common ratios for ARSCL are around 3-4x the frequency in the model.





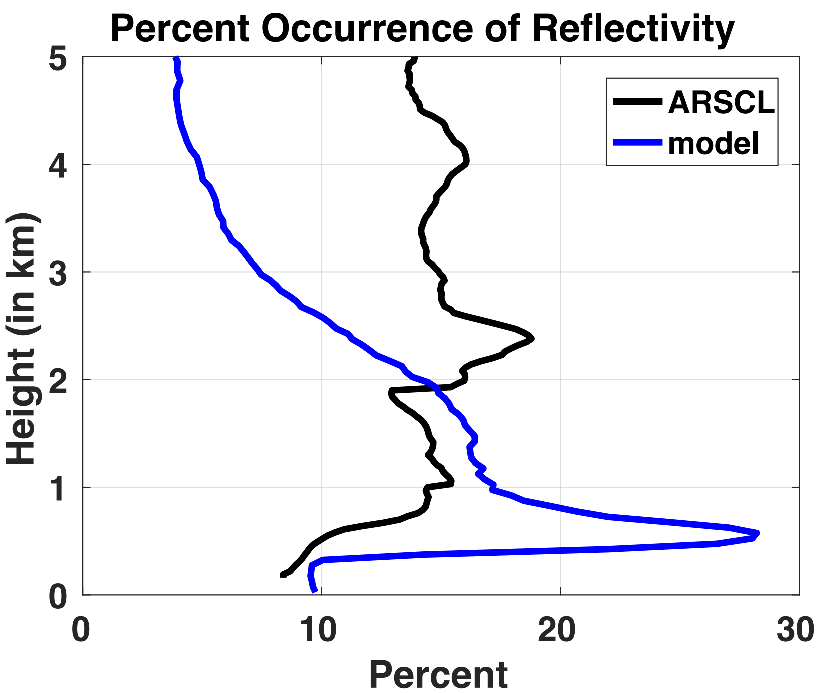
As for that little non-existent ARSCL mark around 3k… that’s just an artifact of interpolating one to the grid of the other.

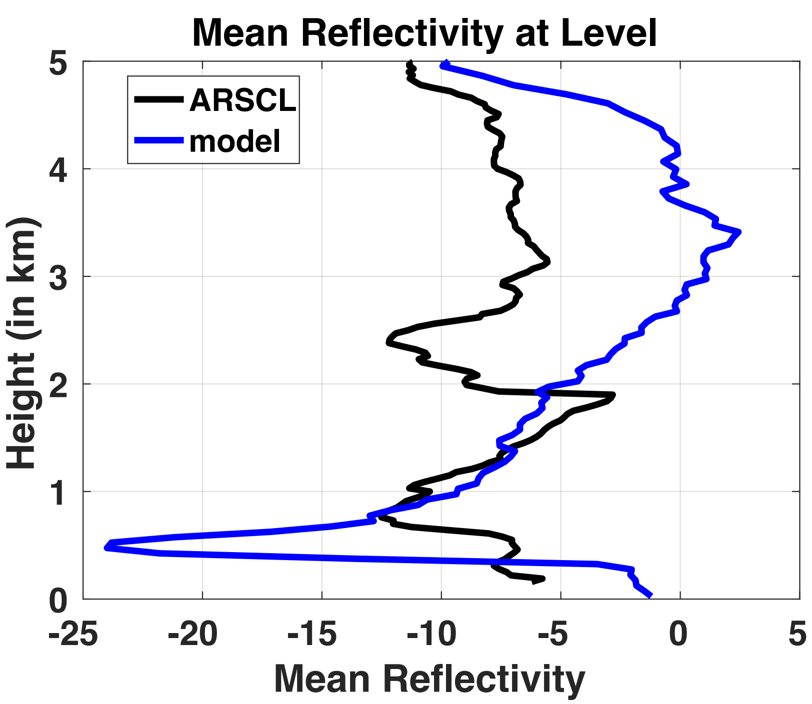
Using 100m bins instead of model bins for the ARSCL itself looks like this.



Varying Reflectivity Thresholds

-60 dBZ threshold



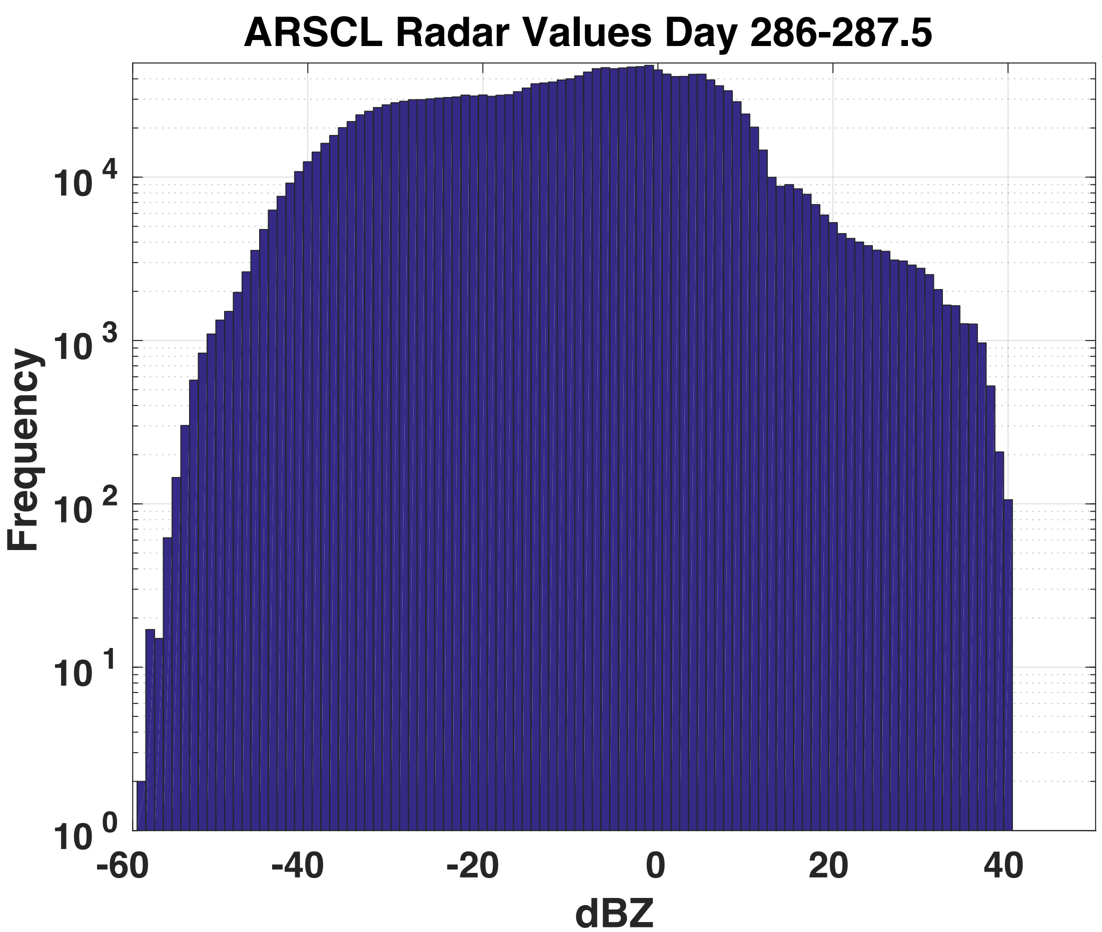


Previously I'd shown these plots and one of the questions for it was whether I was just taking in too much from the model at the lower reflectivities.

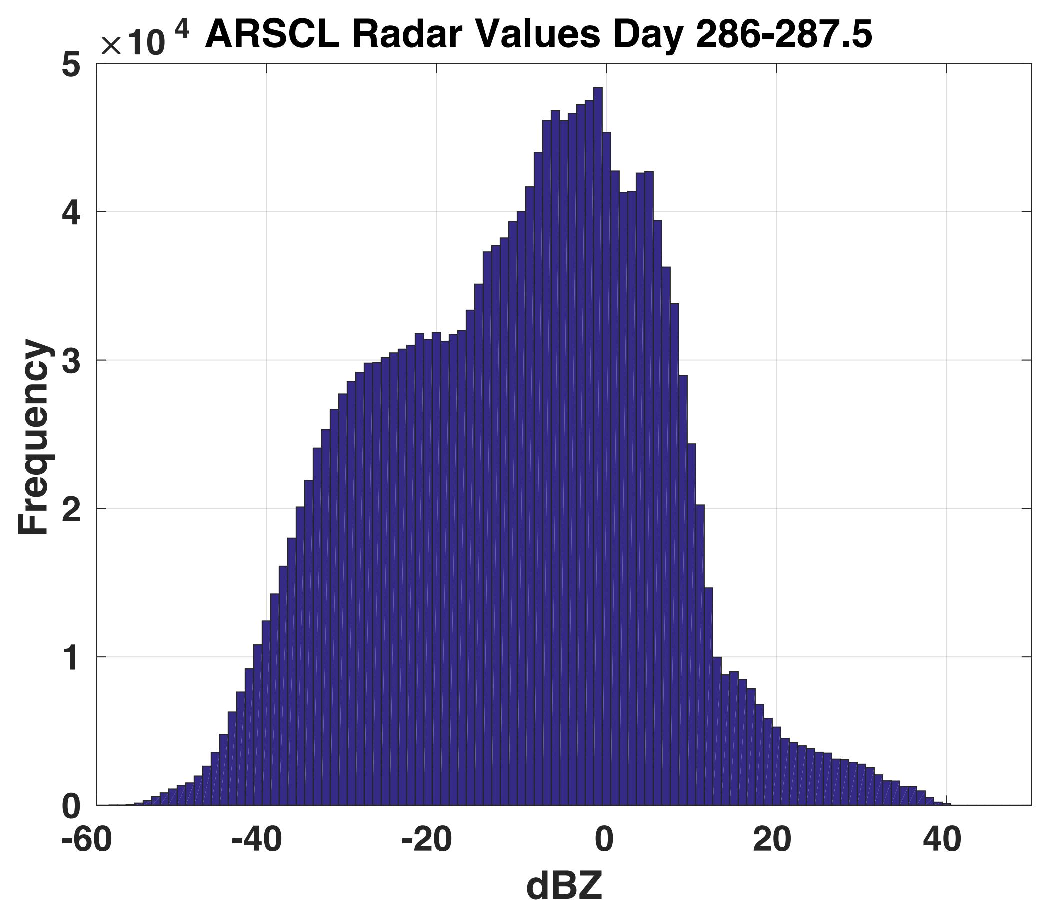
The lowest reflectivity in the ARSCL was around -59 dBZ but perhaps the model was seeing a lot of -50s and ARSCL can't detect many of those.

Looking up KAZR sensitivities (used for the KAZR-ARSCL product), it does look like -50 dBZ is the sensitivity value for it.

Just to make sure -50 seemed correct for a sensitivity I took all detected reflectivity values in the ARSCL at all levels and checked their frequency.

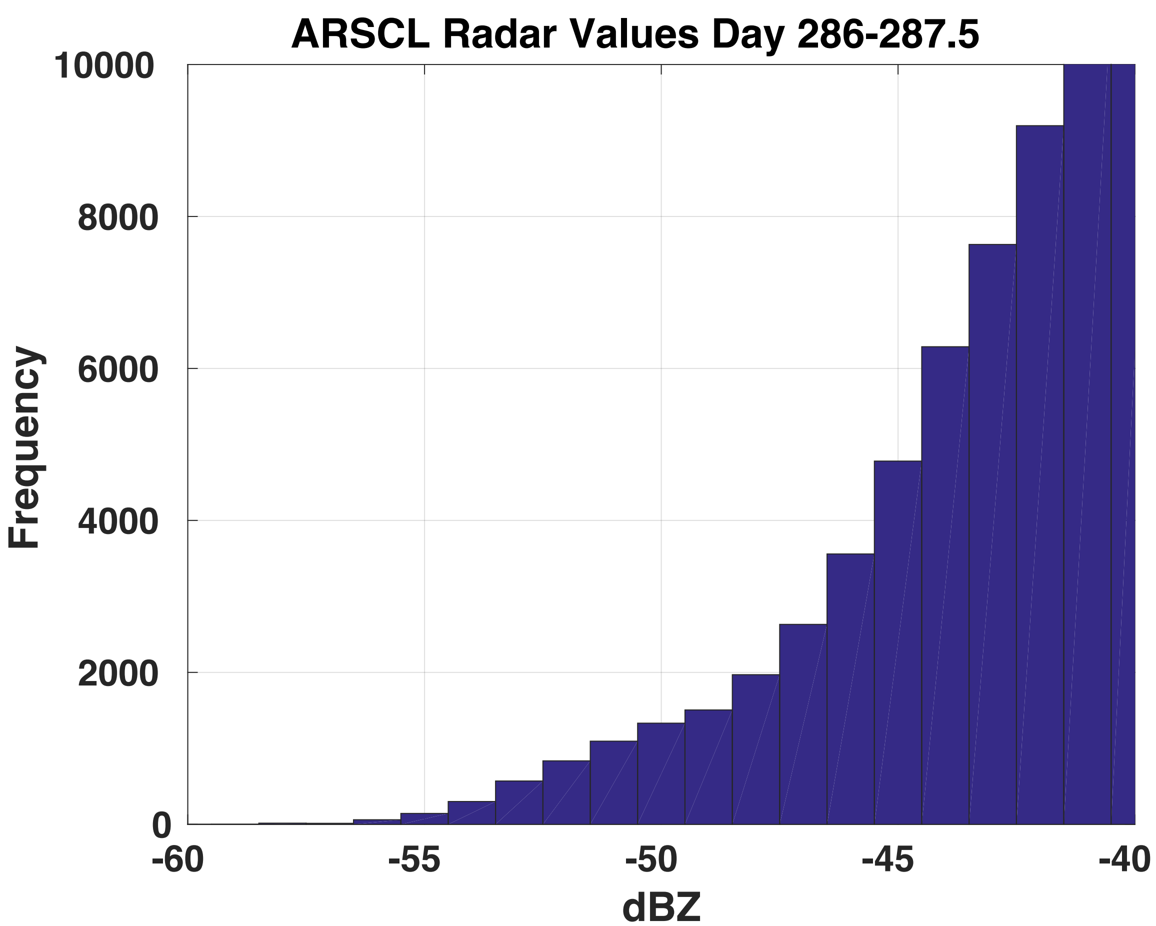


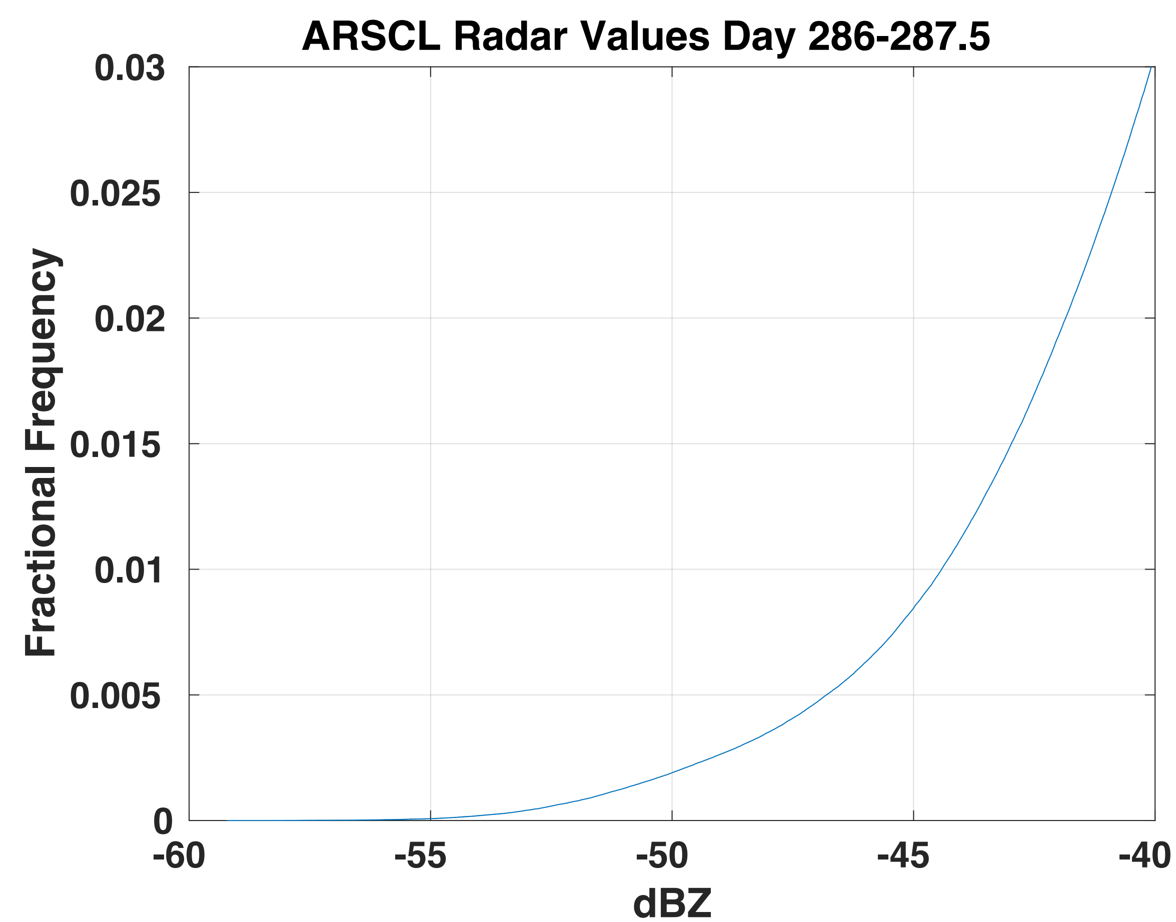
log



linear

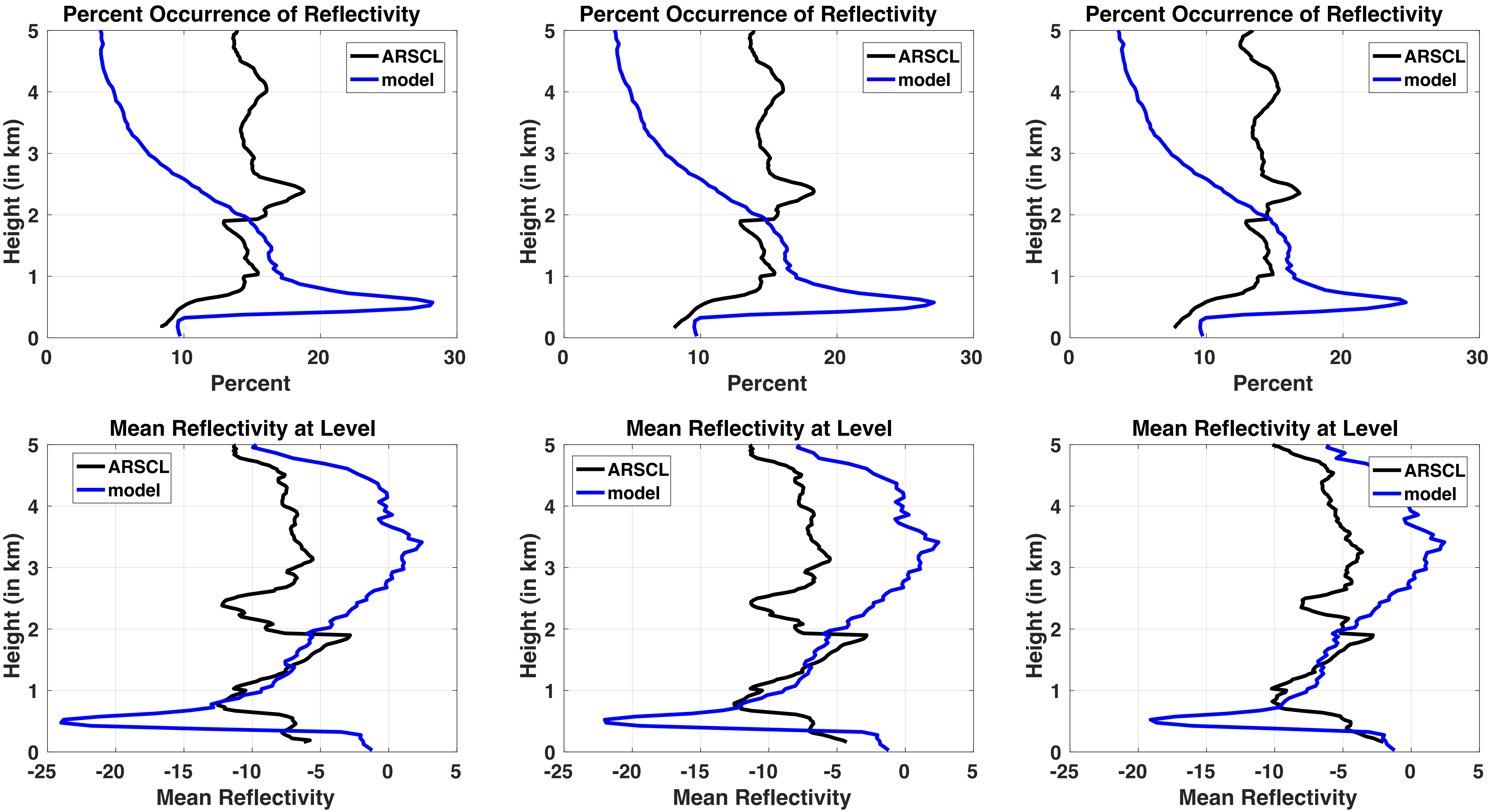
The values actually flatten out a bit around -50 rather than dropping off more rapidly but still the frequency of -50 or less was only less than 0.5% of the reflectivity values detected. Even -40 dBZ or lower was only 3% of the values detected.





So let's try them both (-40 and -50) as lower bounds and see what we get.

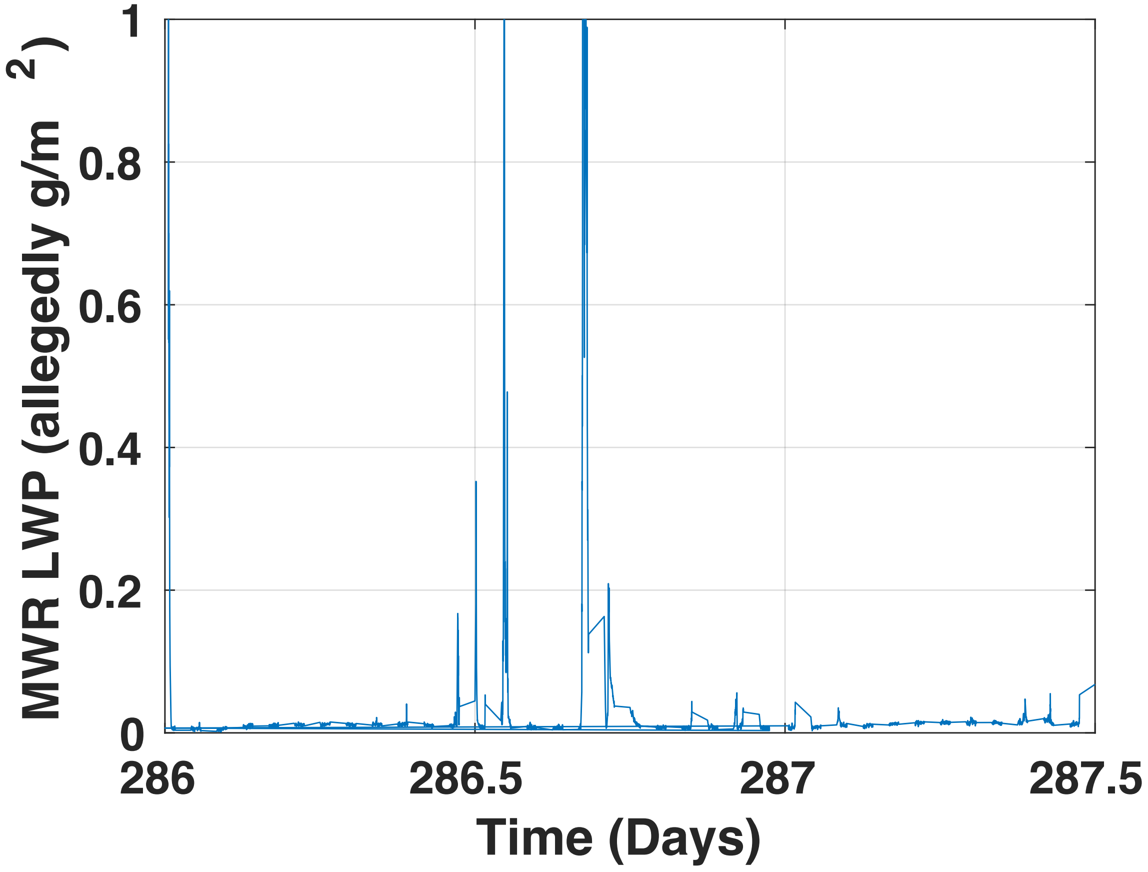
-60 dBZ threshold   -50 dBZ threshold   -40 dBZ threshold



Makes things a bit closer though the pattern remains pretty similar.

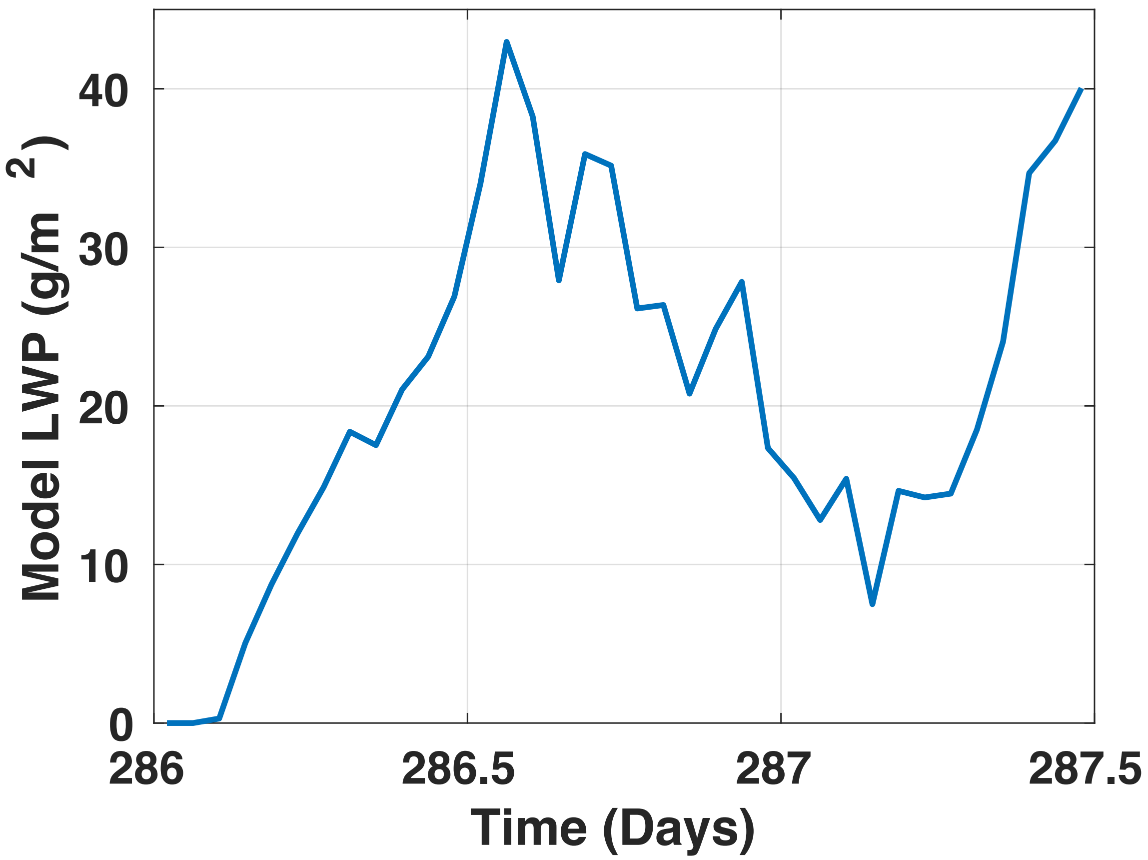
Microwave Radiometer (MWR) LWP

I downloaded some LWP data from a nearby (~10km west, ~10km north) microwave radiometer (MWR) instrument and my first impression was…, well… this isn't what it says it is.



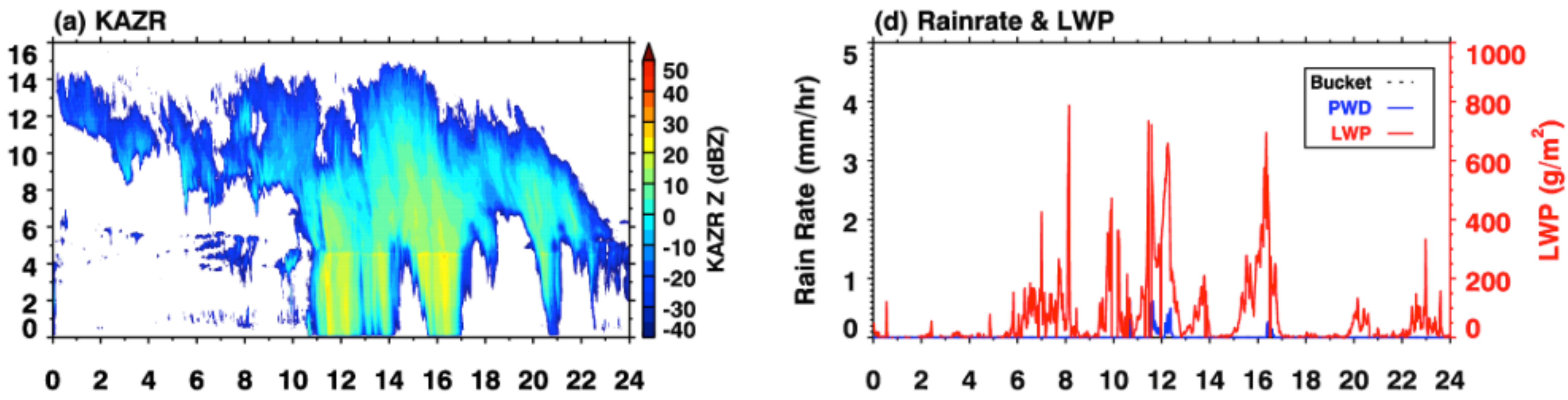
In the output it says it's in g/m2 but looks more like a kg/m2.

What does the model LWP look like anyway?



Certainly seems like it needs to spin up for a few hours, and then stays relatively low. Then again, what should this look like anyway?

So I found a poster for a meeting that looks at LWP for one of the DYNAMO days (obviously they aren't looking for shallow Cu but what this tells me is that I should expect relatively low values and some spikes with precip). That looks like what the MWR data showed me so if I just multiply the MWR LWP by 1000…

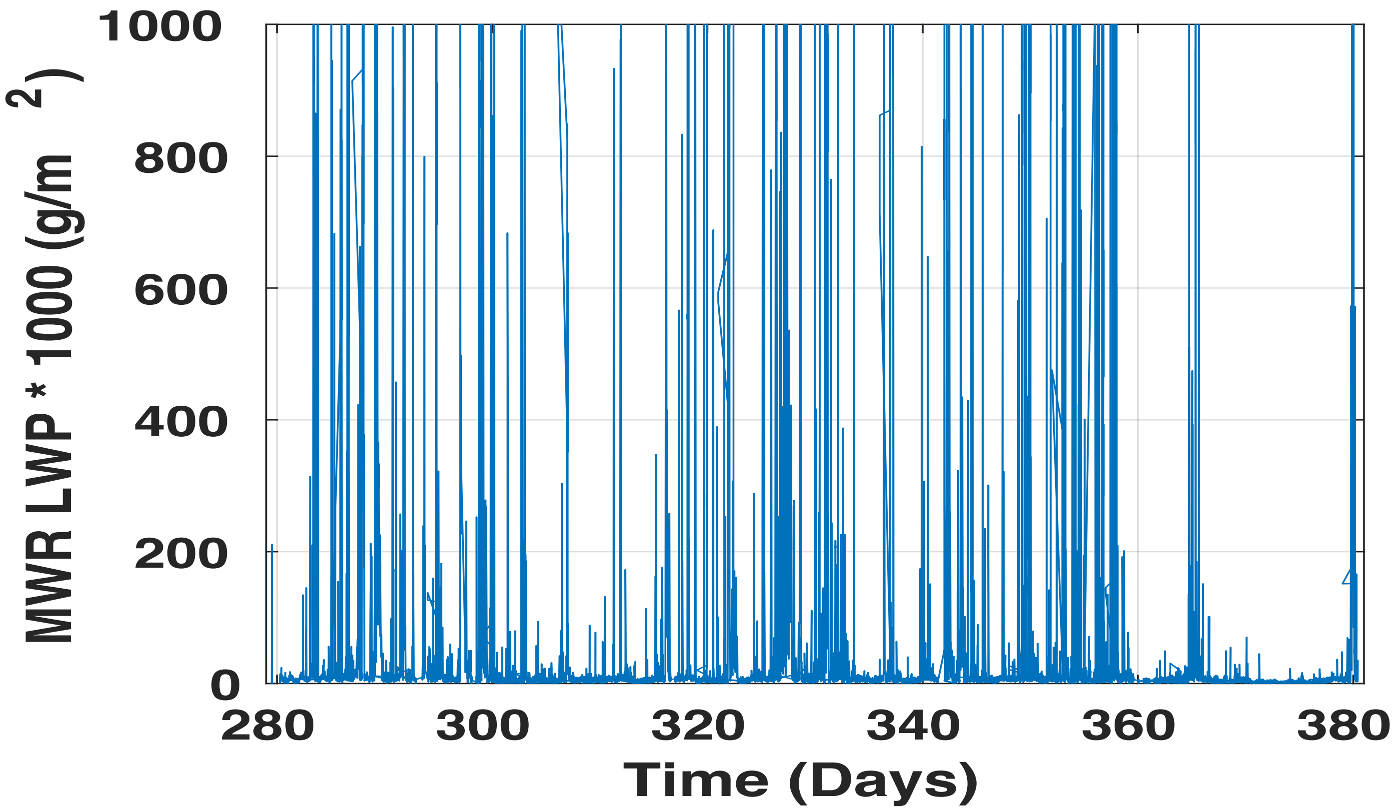


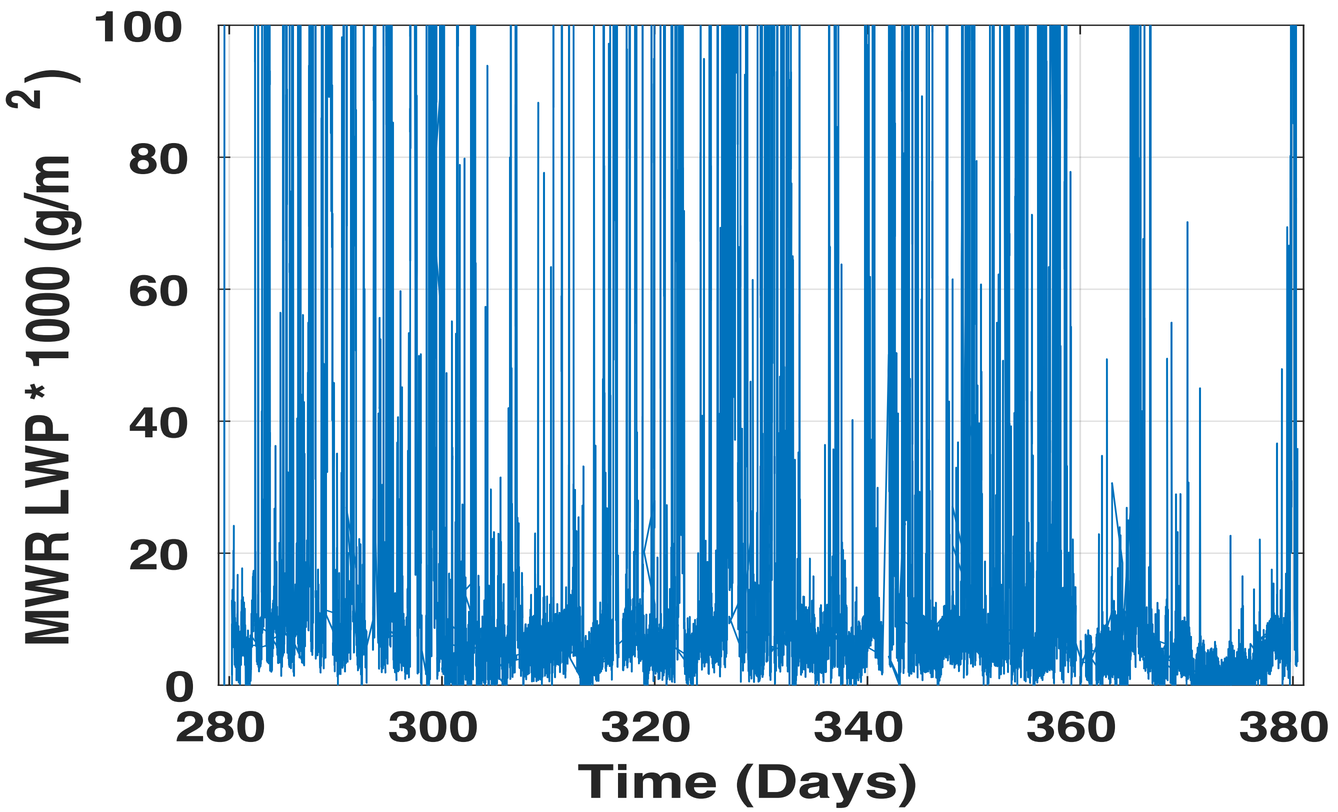
Comparison of Cloud Statistics Observed by Cloud and Precipitation Radars During the DYNAMO/AMIE Experiment at Addu Atoll

Zhe Feng - Pacific Northwest National Laboratory
Sally McFarlane - U.S. Department of Energy
Courtney Schumacher - Texas A&M University
Scott Ellis - NCAR
Nitin Bharadwaj - Pacific Northwest National Laboratory

https://asr.science.energy.gov/meetings/stm/posters/view?id=990

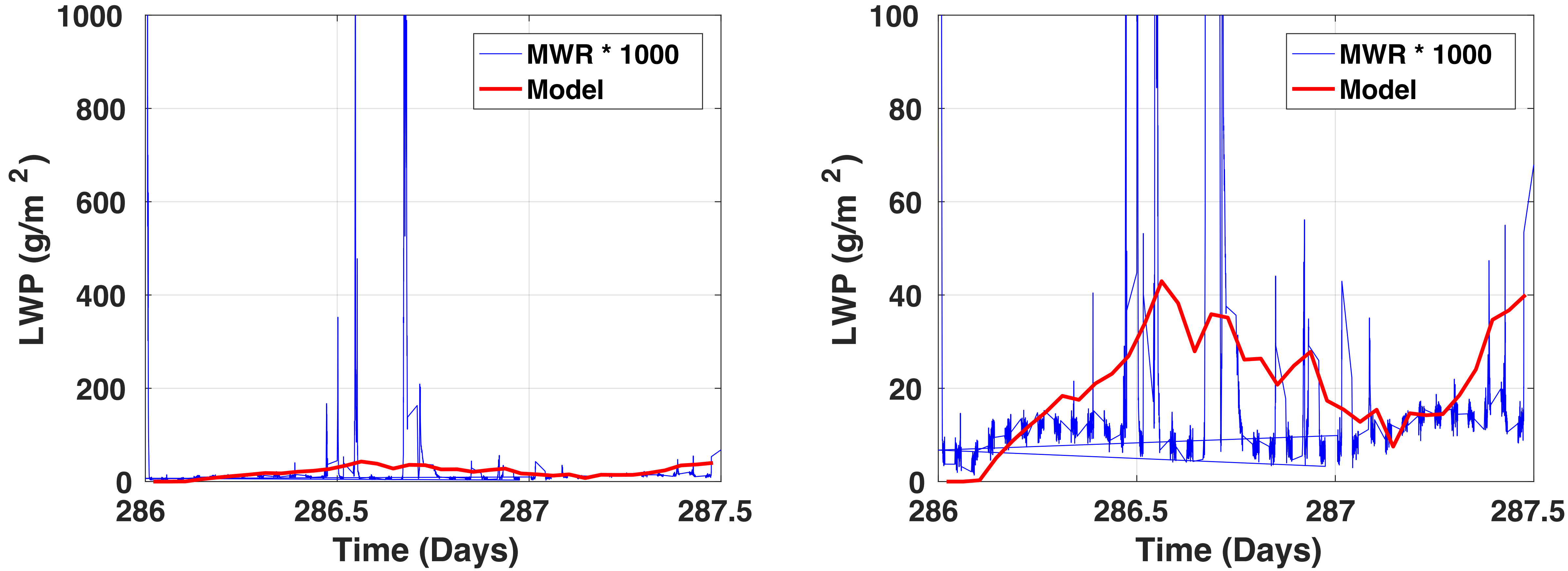
(same plot, different y axis)





Yeah that looks like the poster plot for LWP. (The unit labeling looks a bit weird, what I mean is that I multiplied it 1000 to get g/m2). So let's look at this with the model output.

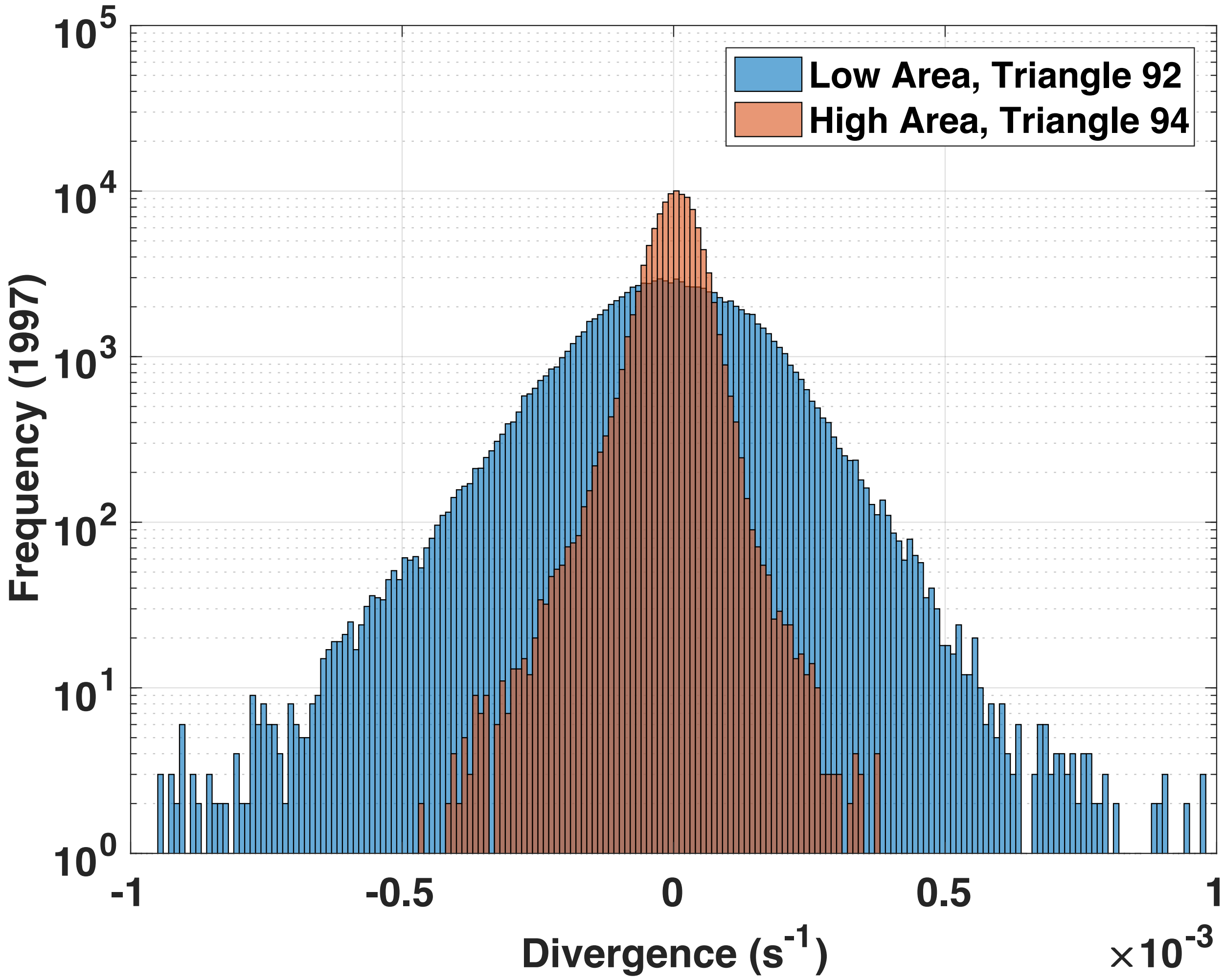
(same plot, different vertical axis).

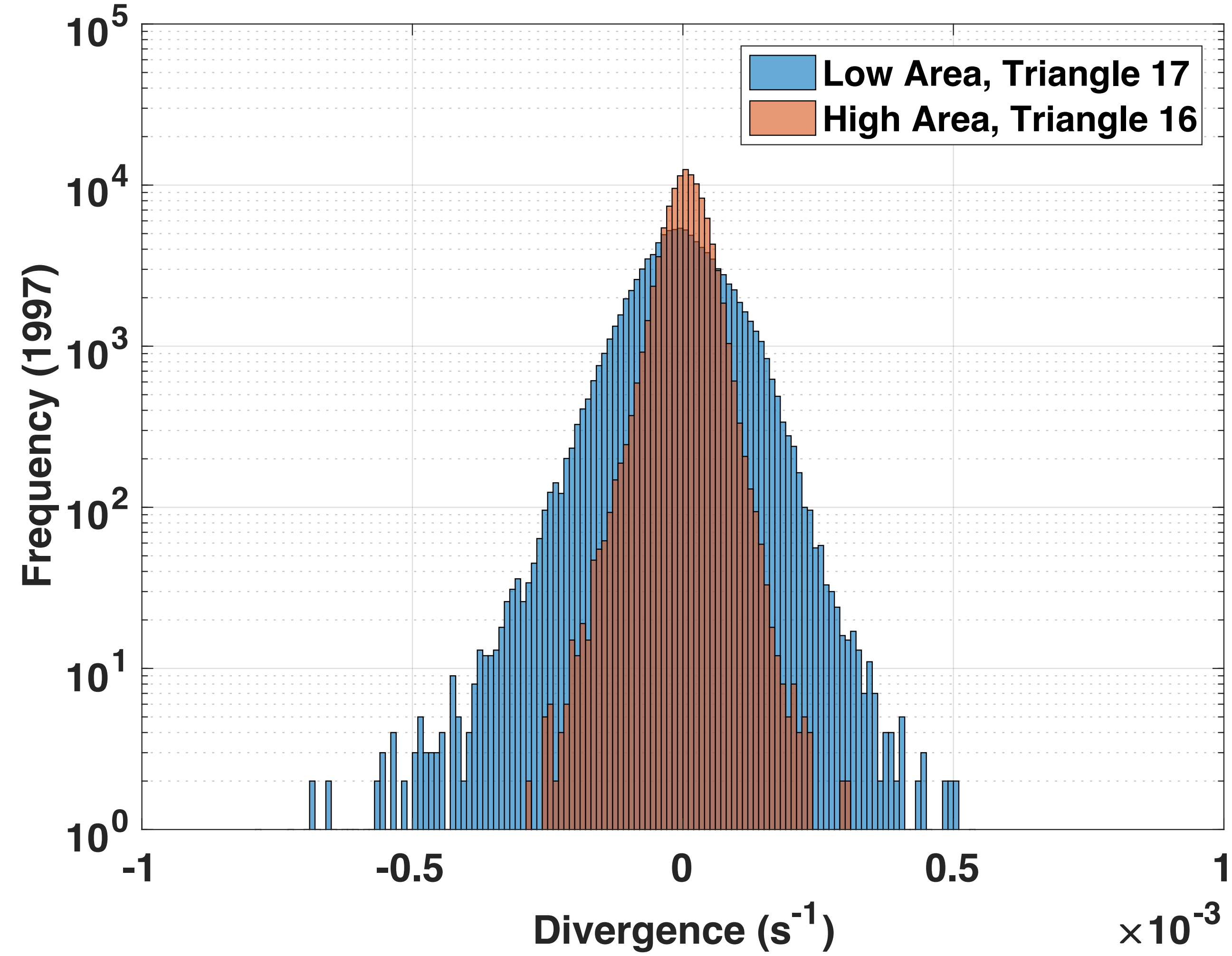


It sorta looks like the model is in a similar ballpark to the MWR considering that the stats file is an average so it's not going to act exactly like the MWR with regards to the spikes.

Oklahoma Mesonet

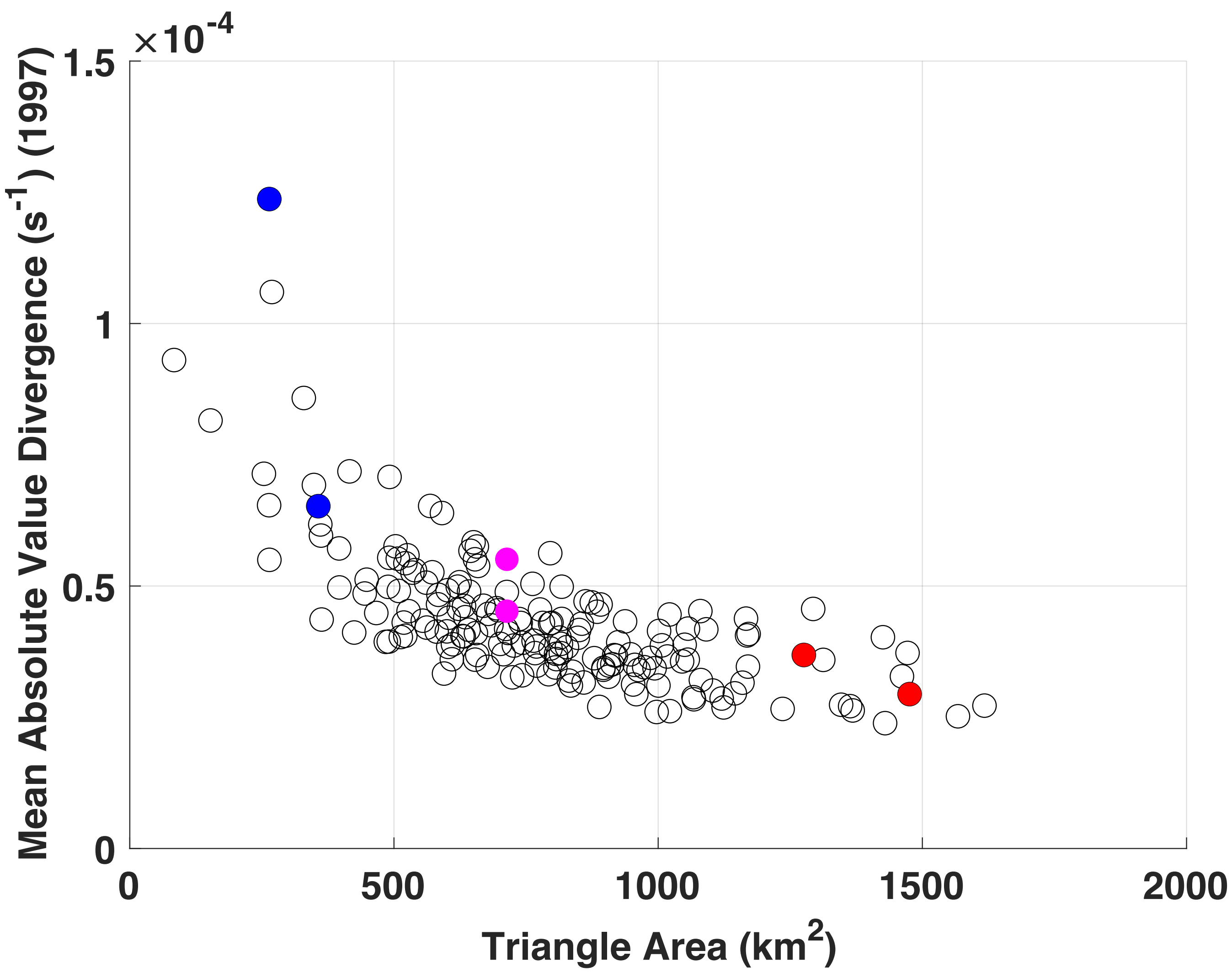
One of the reviewers wondered if my divergence threshold should be varying with grid size. So to check that I can just take a year of divergence values for a couple triangles and compare their distributions. The results are… not good.

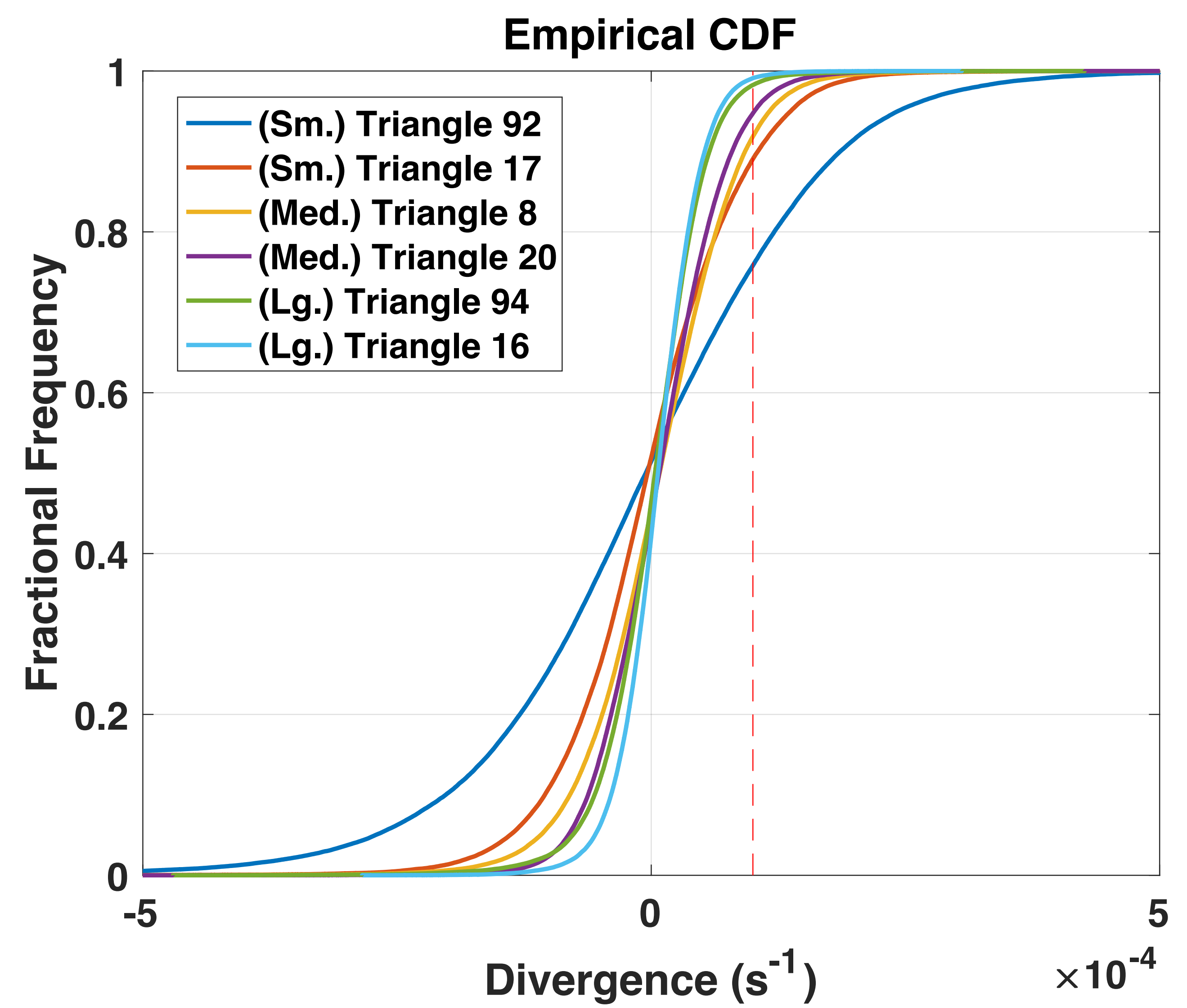




Large area triangles just have much lower ranges of divergence than smaller area triangles. It's actually not hard to exceed the divergence threshold (1×10^{-4}).

How general is this?





What does this mean?

- It doesn’t affect frontal passage stats at all, divergence doesn’t matter for that.

- It means smaller triangles are more likely to detect a cold pool after a front than larger triangles so there may be over/under counting and a bit of an adjustment to percentages of cold pools following fronts. (This would explain some of the need for area/length adjustments for the geographic distribution which we removed.)

- It means duration of cold pools in case studies may be affected; however, since the standard for getting in and out of a cold pool was set to “when it falls to half the max value” that actually kinda does try and account for this problem.