

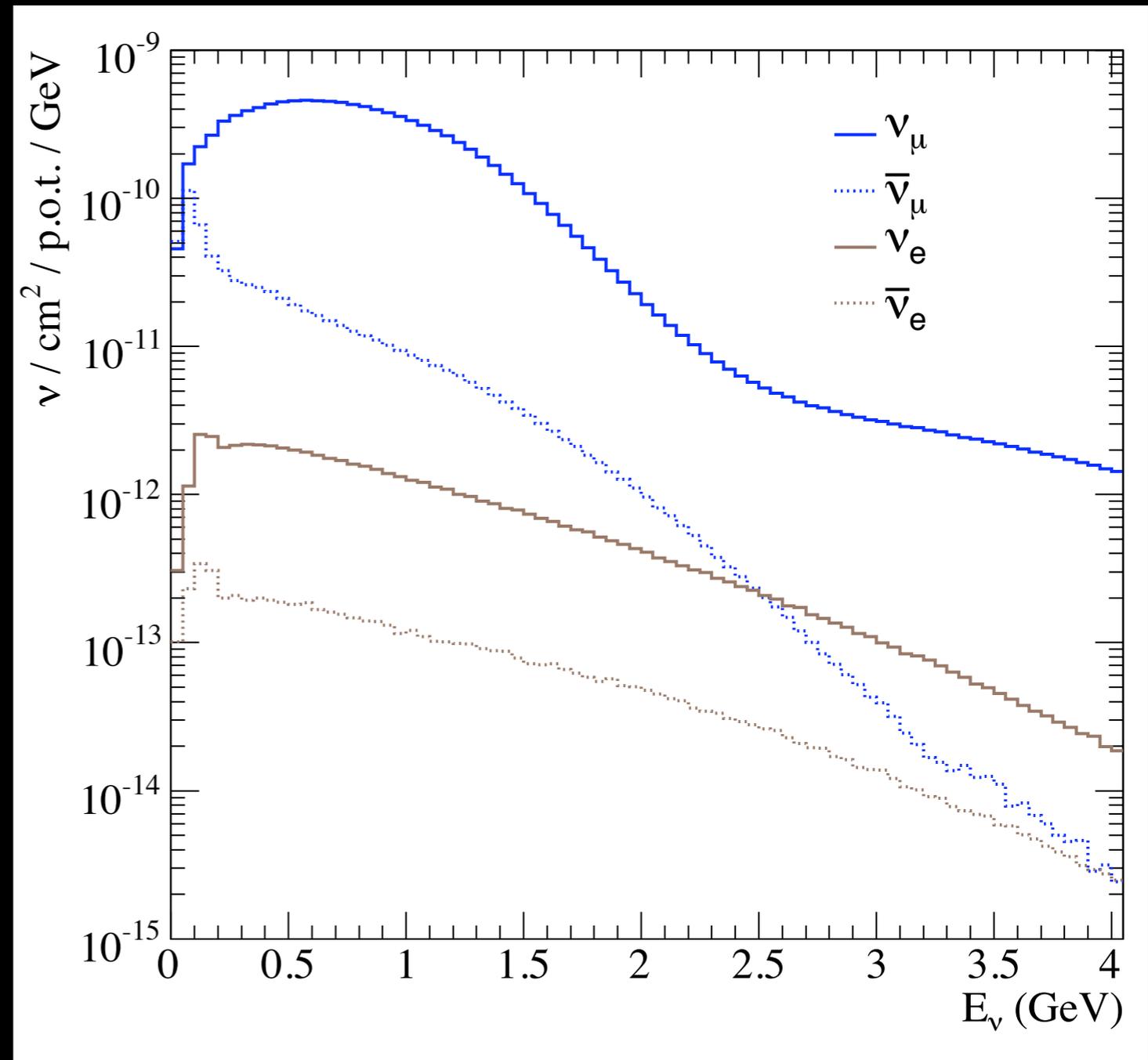
CCπ⁰ update

Robert Nelson
2009.9.01

- The “all about CCπ⁺” edition

Neutrino Flux

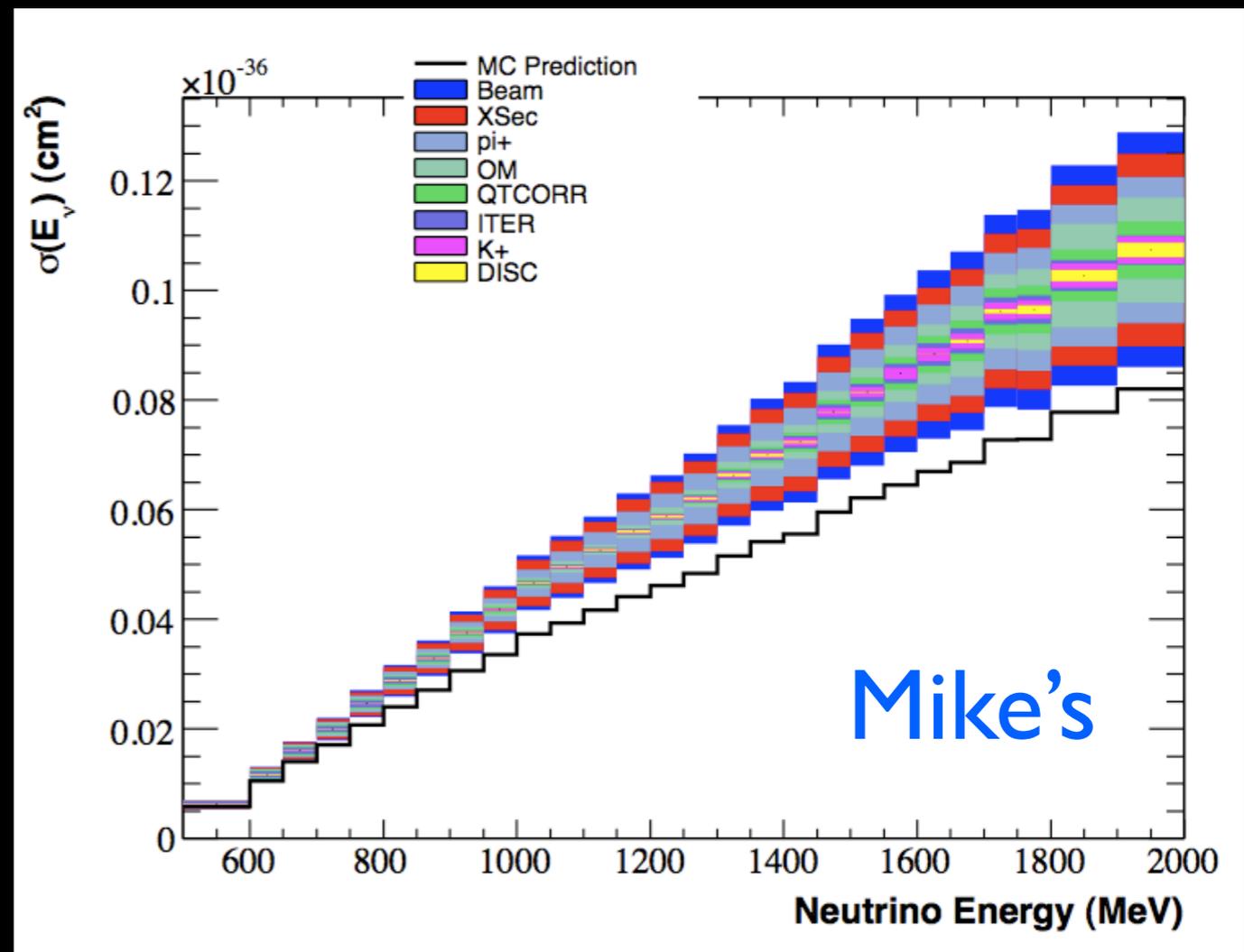
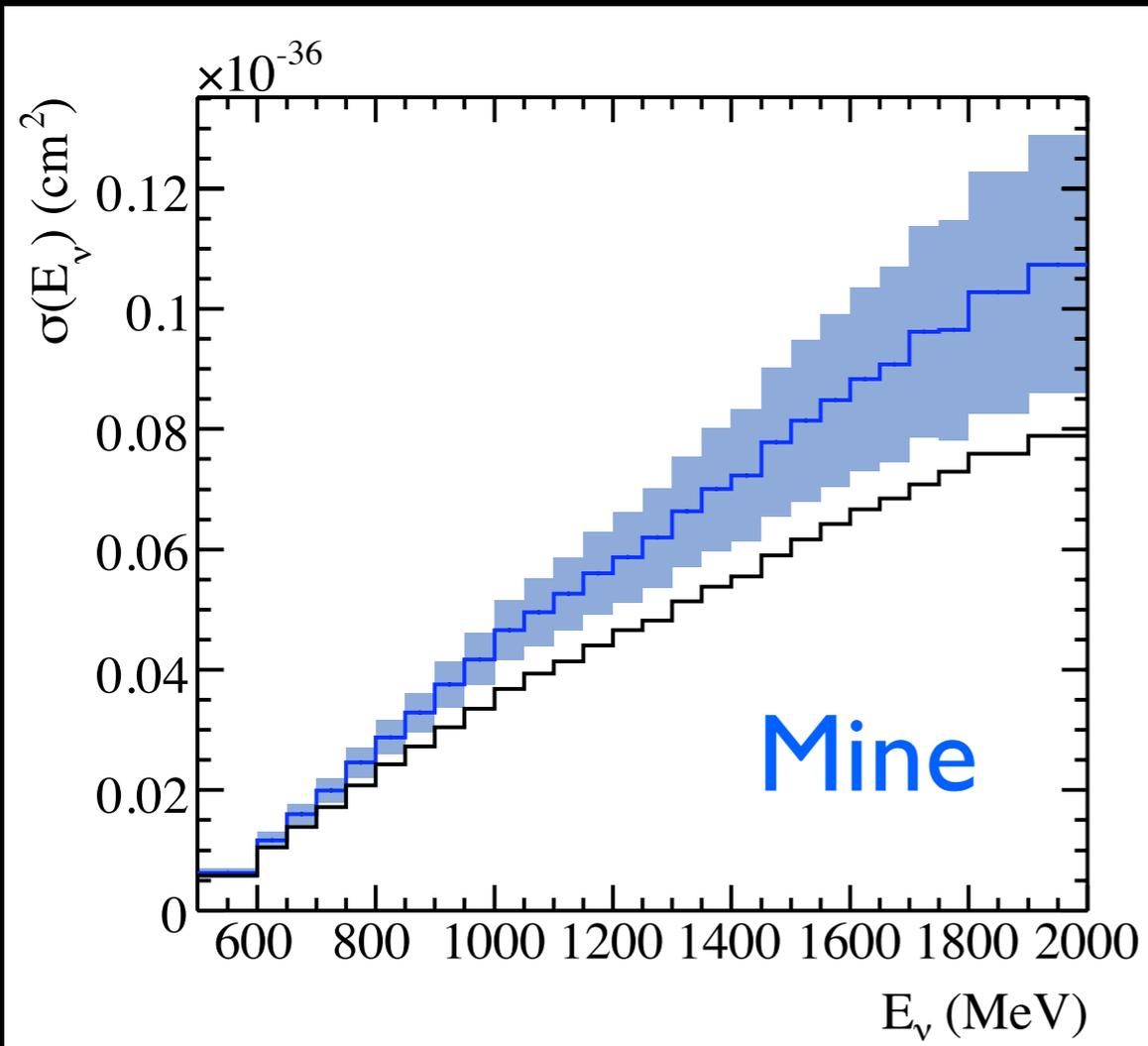
- I recently got my hands on the neutrino flux histograms.
- This means I can now convert rates to cross-sections.



Attempting to re-weight the observable $CC\pi^+$ background

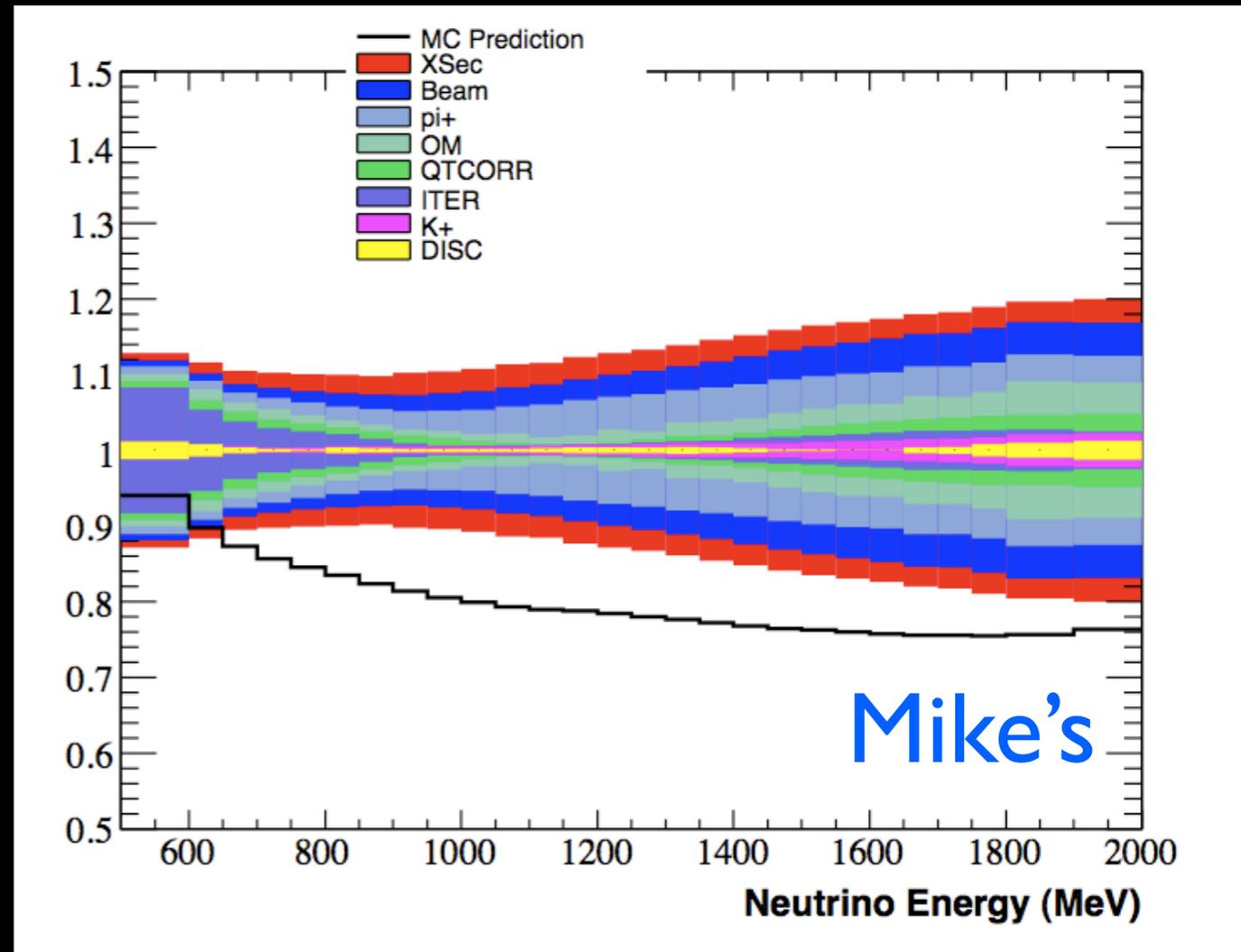
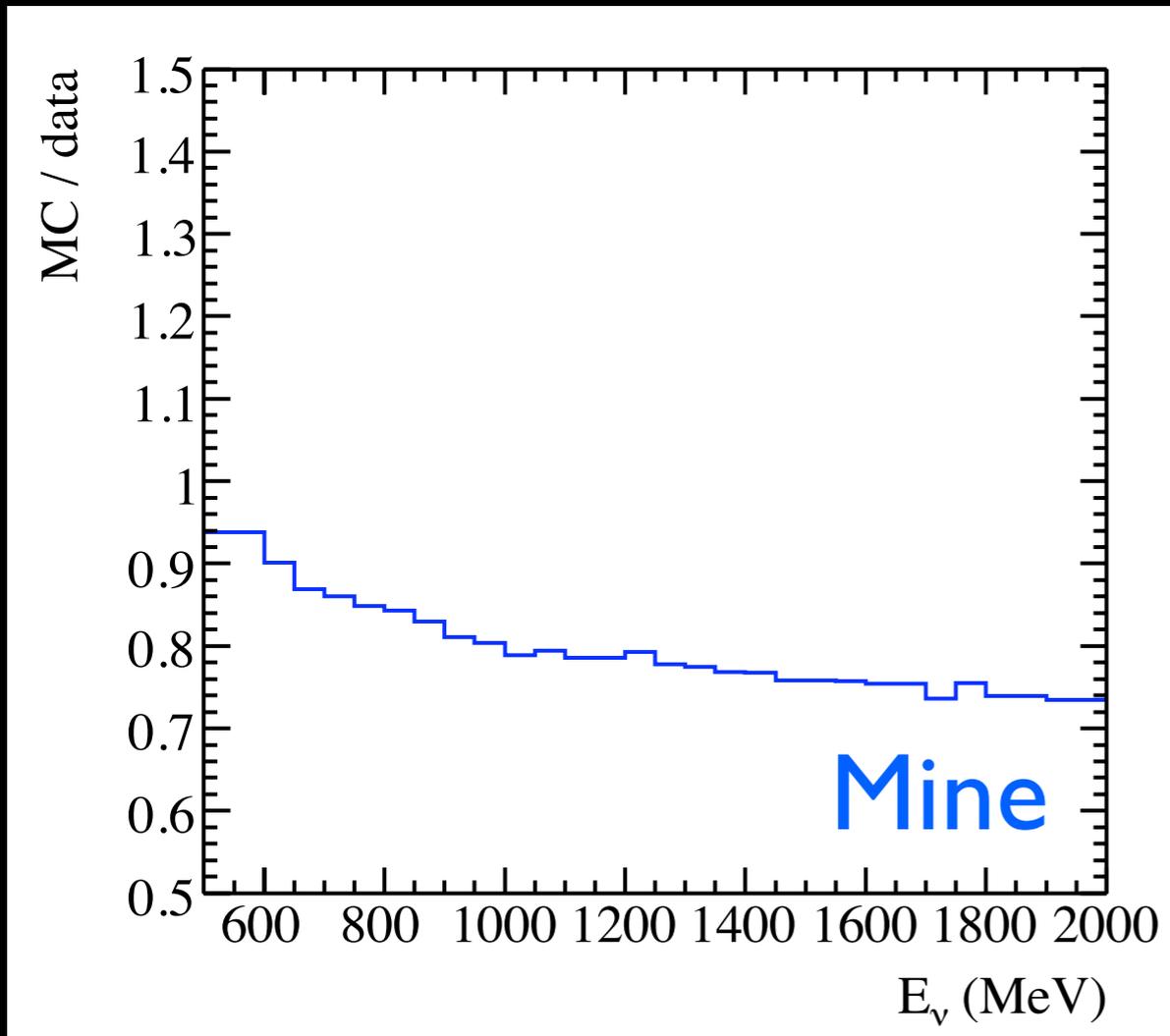
- The idea is re-weight the sample by using the measured cross-sections in Neutrino energy and pion kinetic energy.
- First, we will look at the one-dimensional cross-section re-weighting. Then the two-dimensional re-weighting.
- Finally we will look at a method of combining them to cover more of the phase space (Maybe??).

CC π^+ cross-section



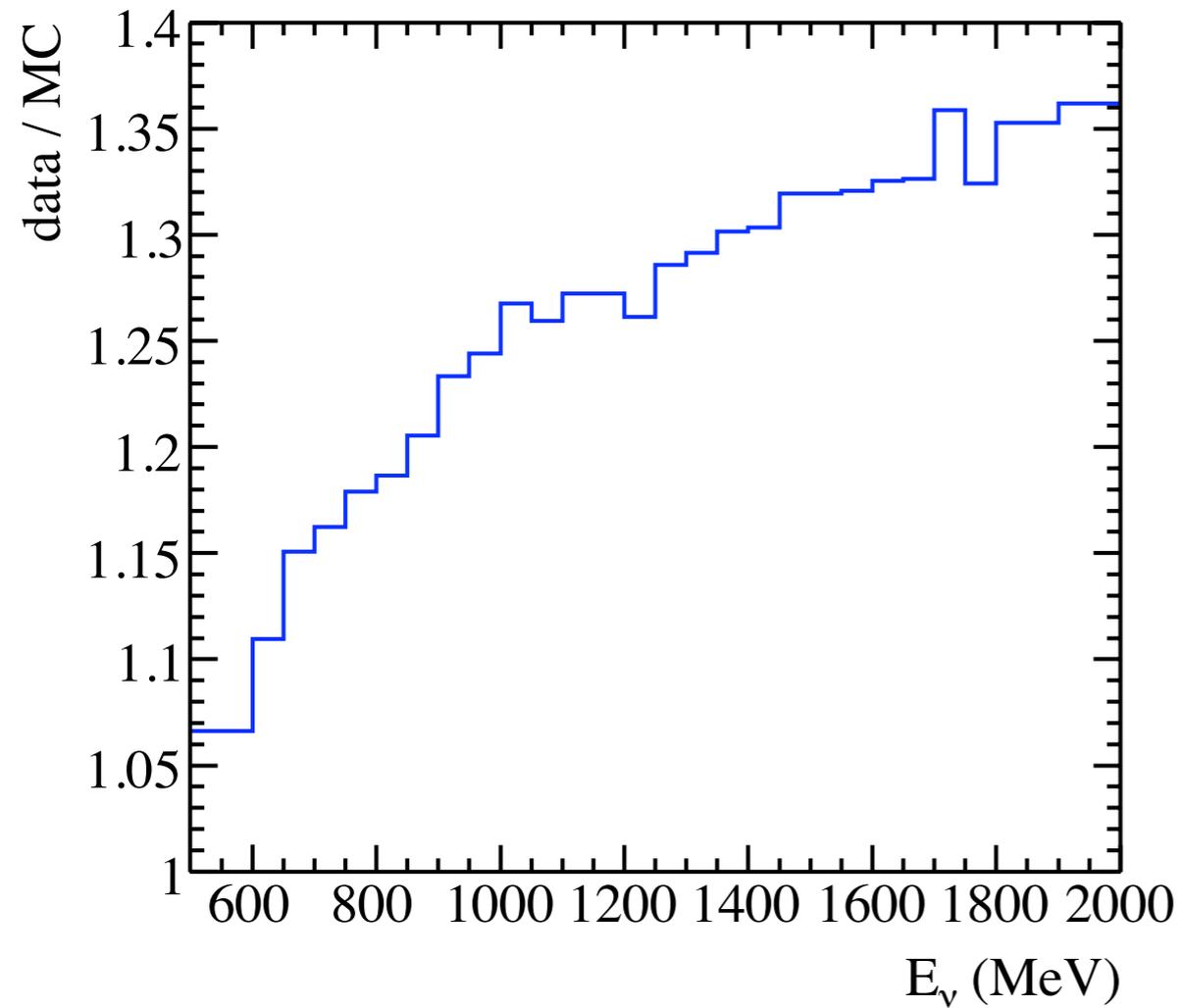
- The measurement was taken from a table in Mike's thesis.
- The MC comes from my definition of observable CC π^+ .
- There are slight differences at higher energies (lower statistic regions).

MC / data



- Here the difference are more noticeable.
- This is probably ok since the differences are slight compared with the errors.

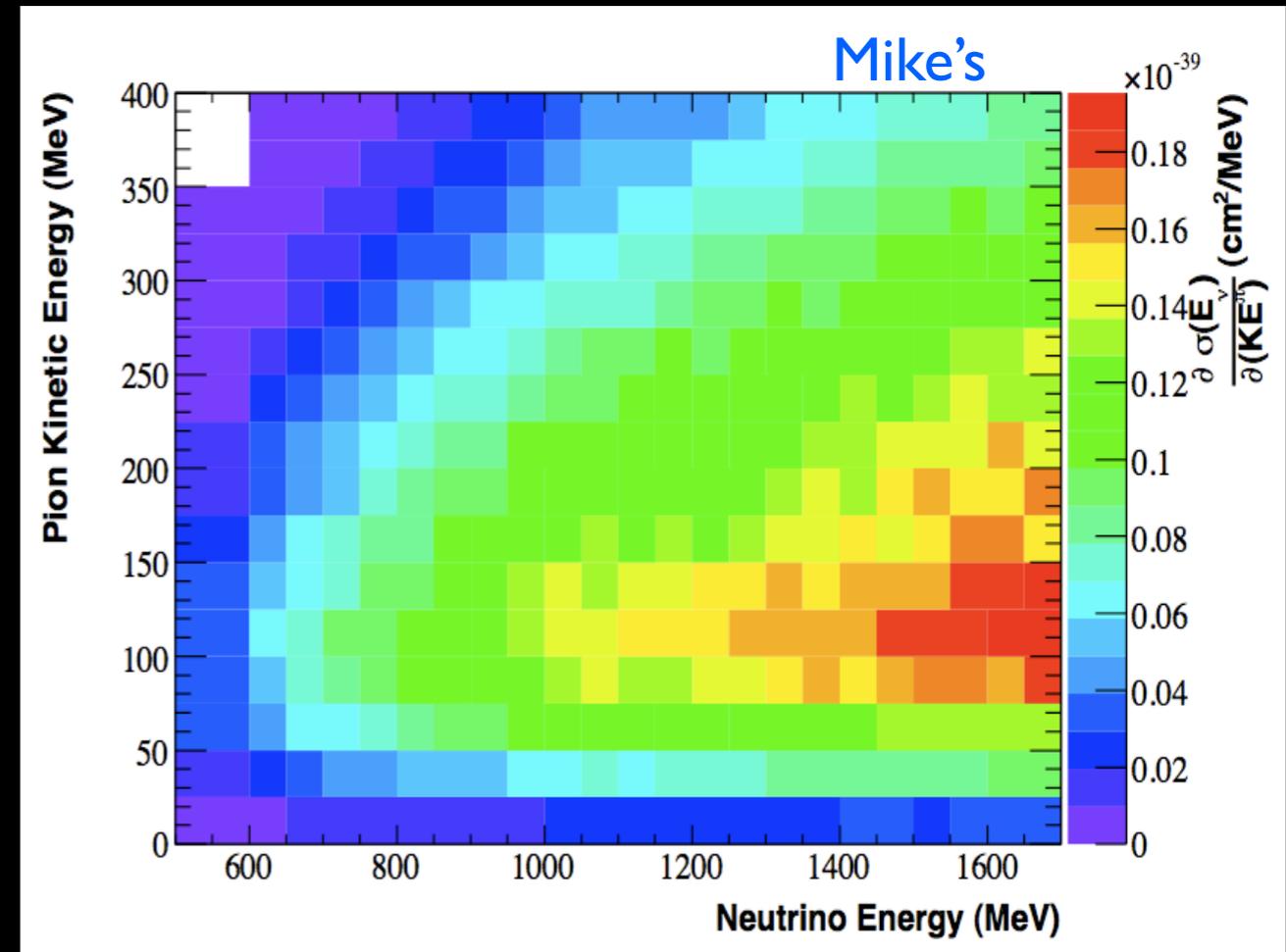
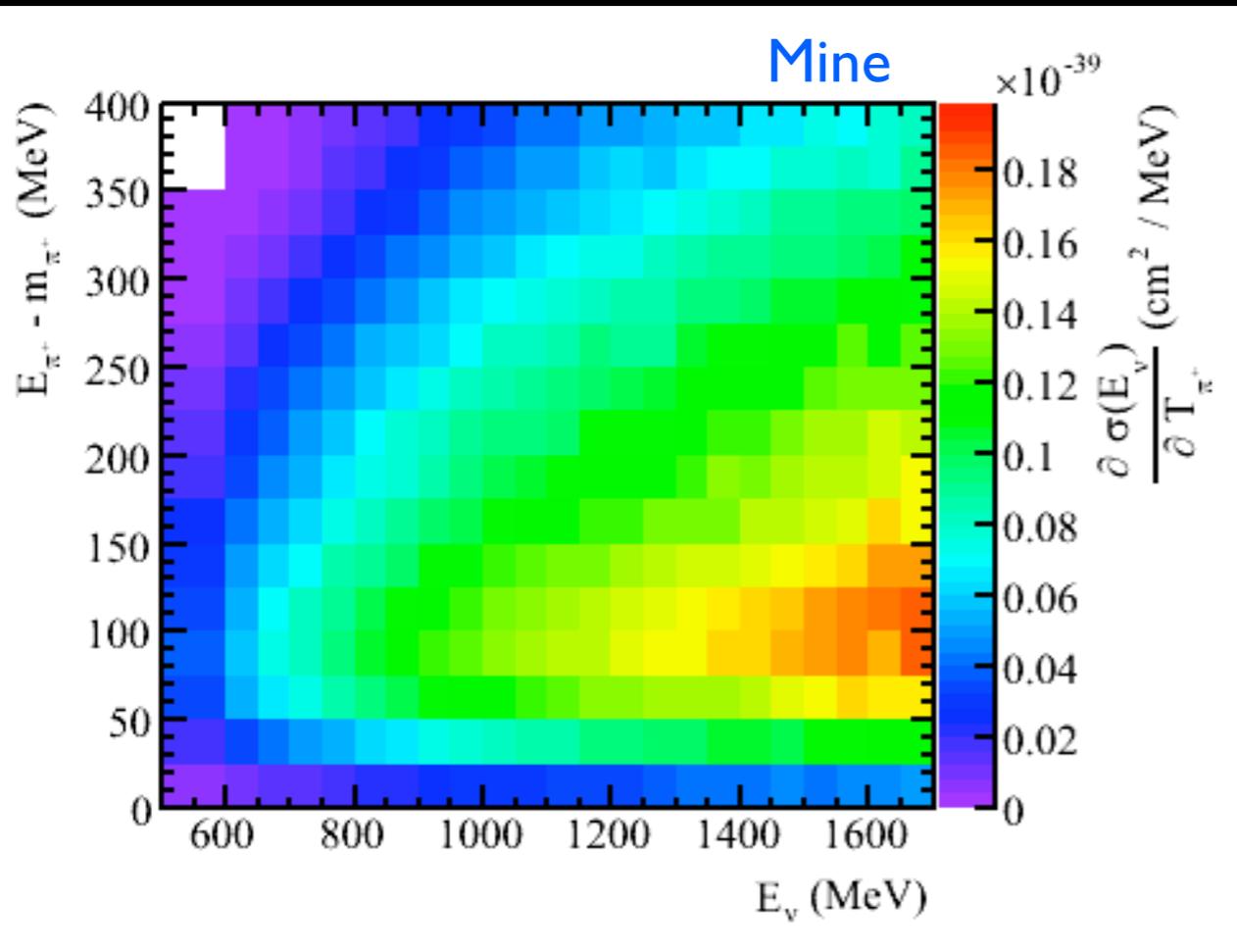
Re-weighting



- The re-weighting function is the inverse of the previous plot.
- When plotted this way it does look rattier.

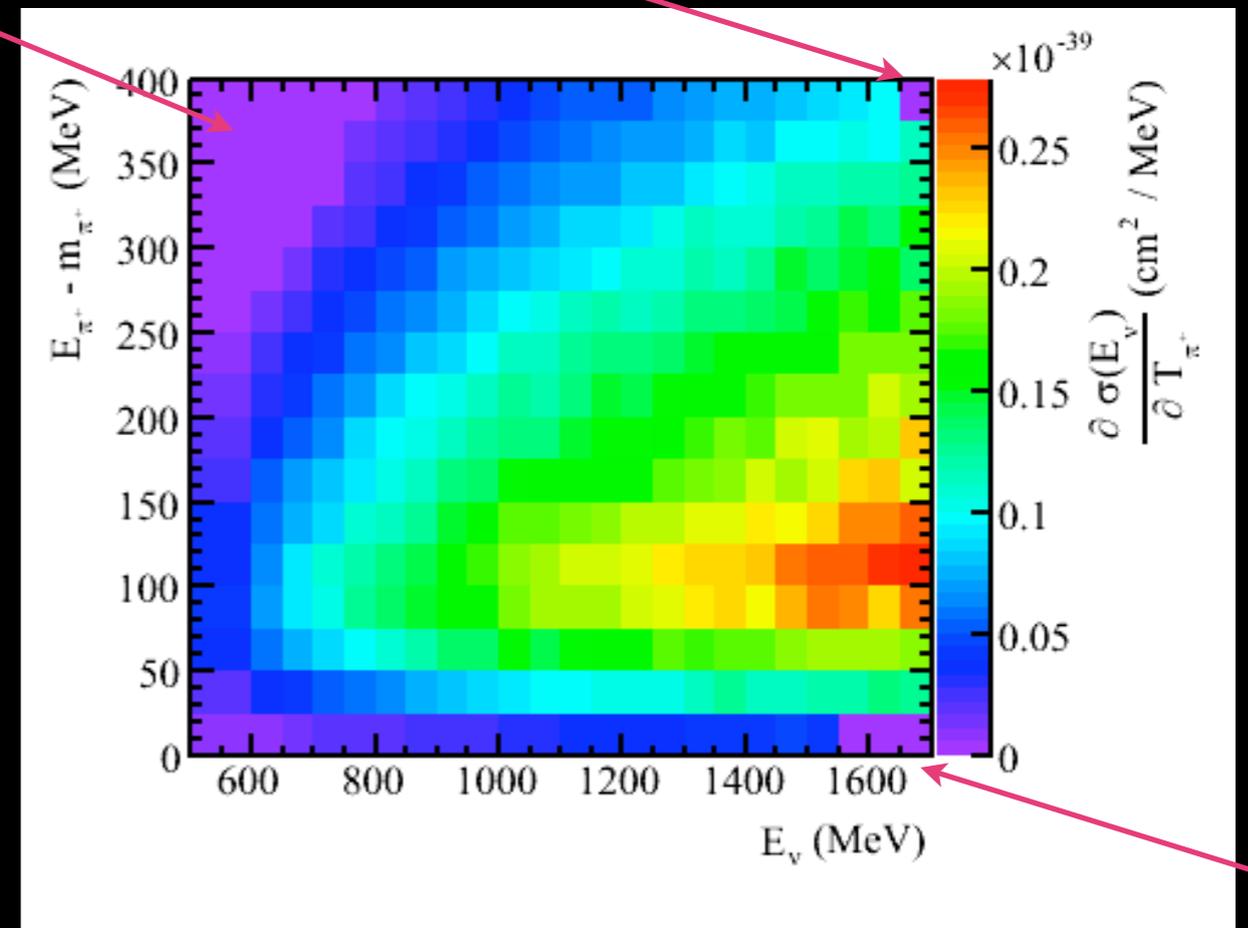
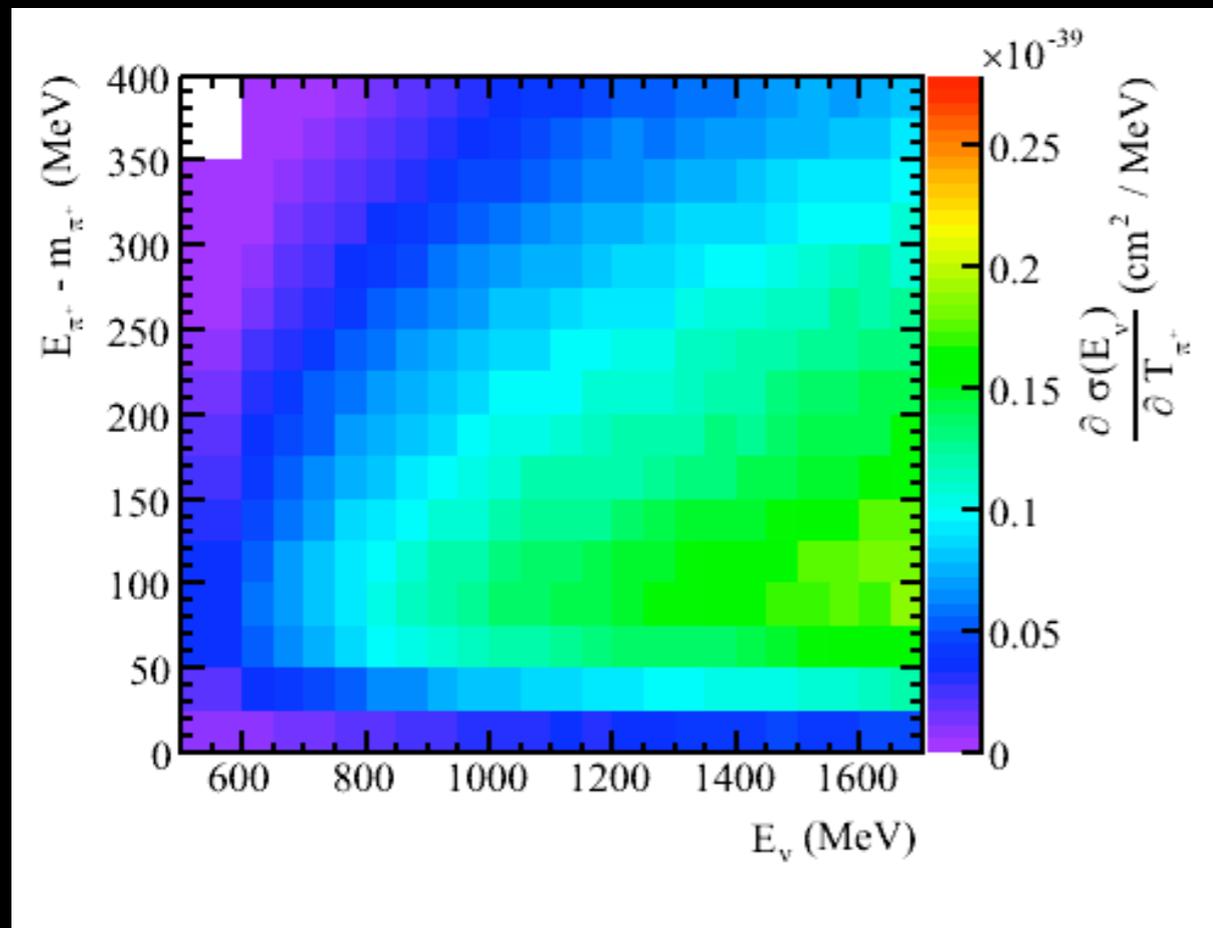
MC Differential cross-section

- Here the differences are a little bit more noticeable because the low statistics bins have the largest cross-section.
- I attempted to plot mine to the same maximum z (color) scale as Mike.
- I used a different number of files than Mike, and our definitions are slightly different.
- Again, nothing huge, just some slight noticeable differences.



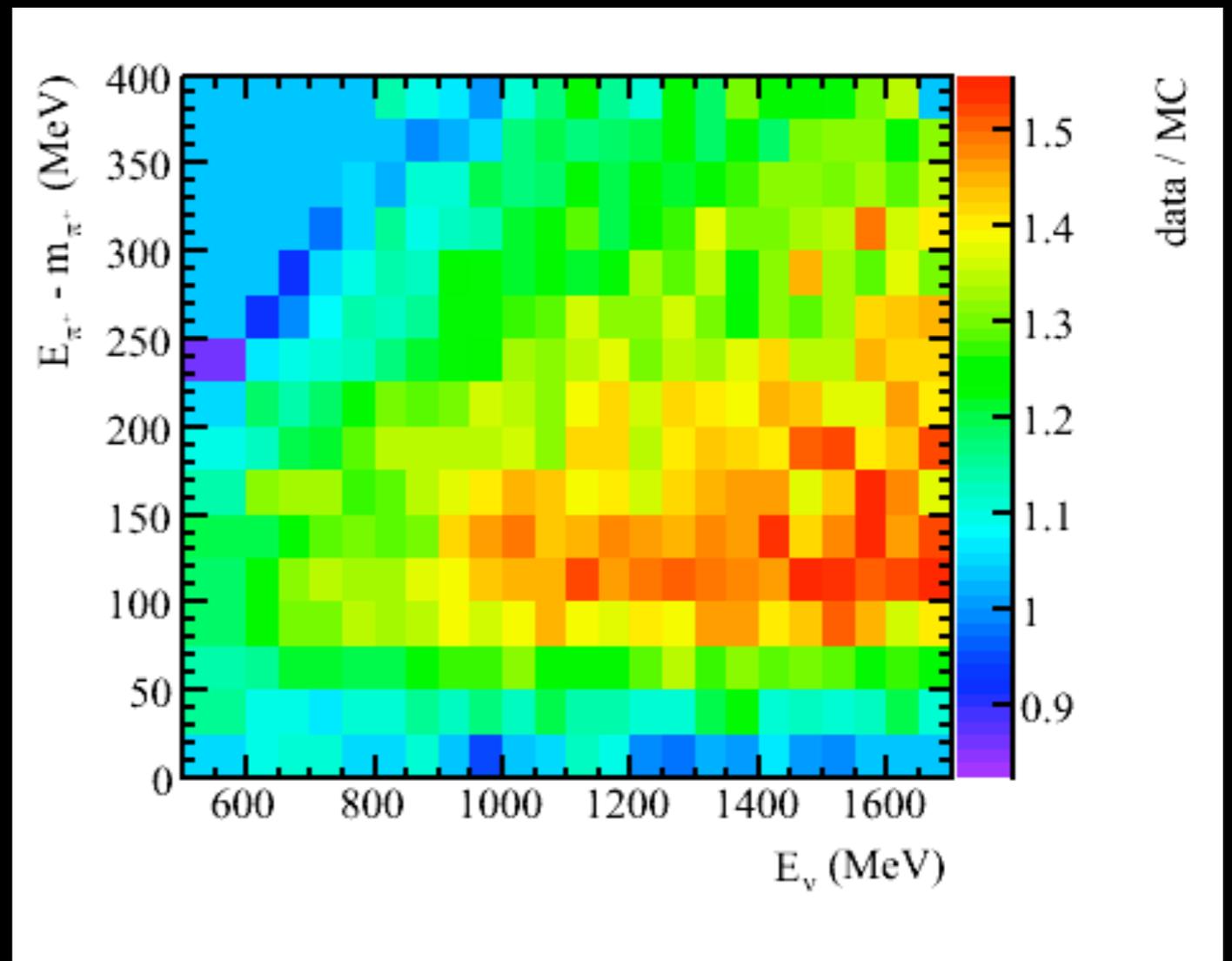
Comparison with data

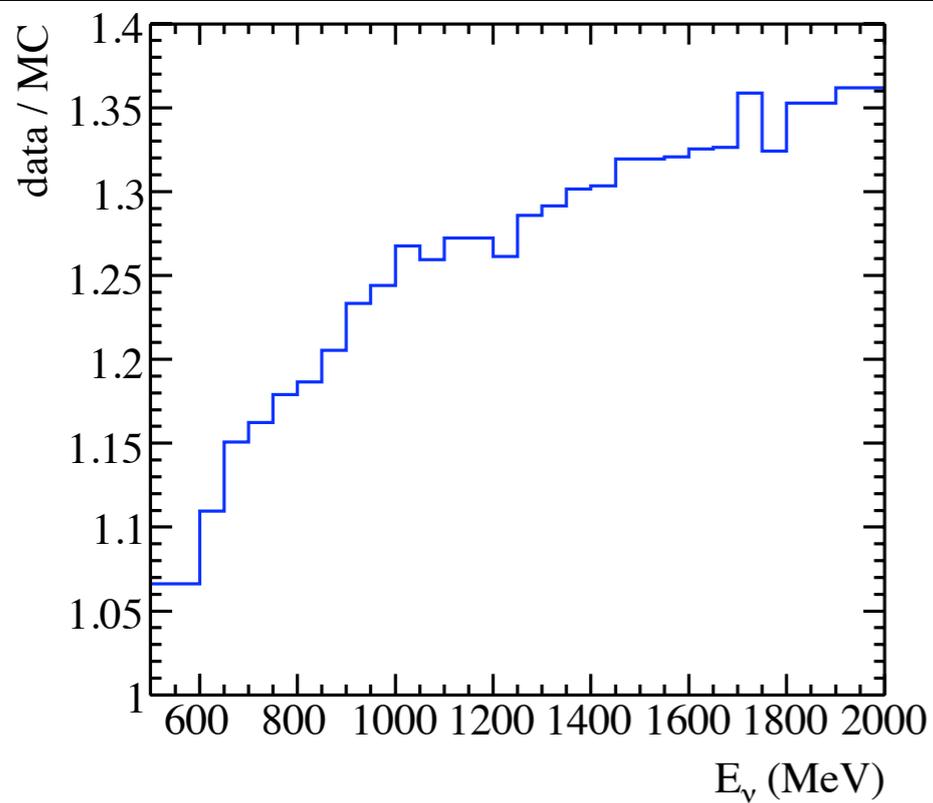
- I re-plotted the MC (left) to match the color axis of the data (right).
- The data is around 50% larger in certain regions.
- Also, several of the data bins are unreported (I set them to a really small value, also in the MC).
- A region at high T_π and low E_ν . And 4 bins at high E_ν .



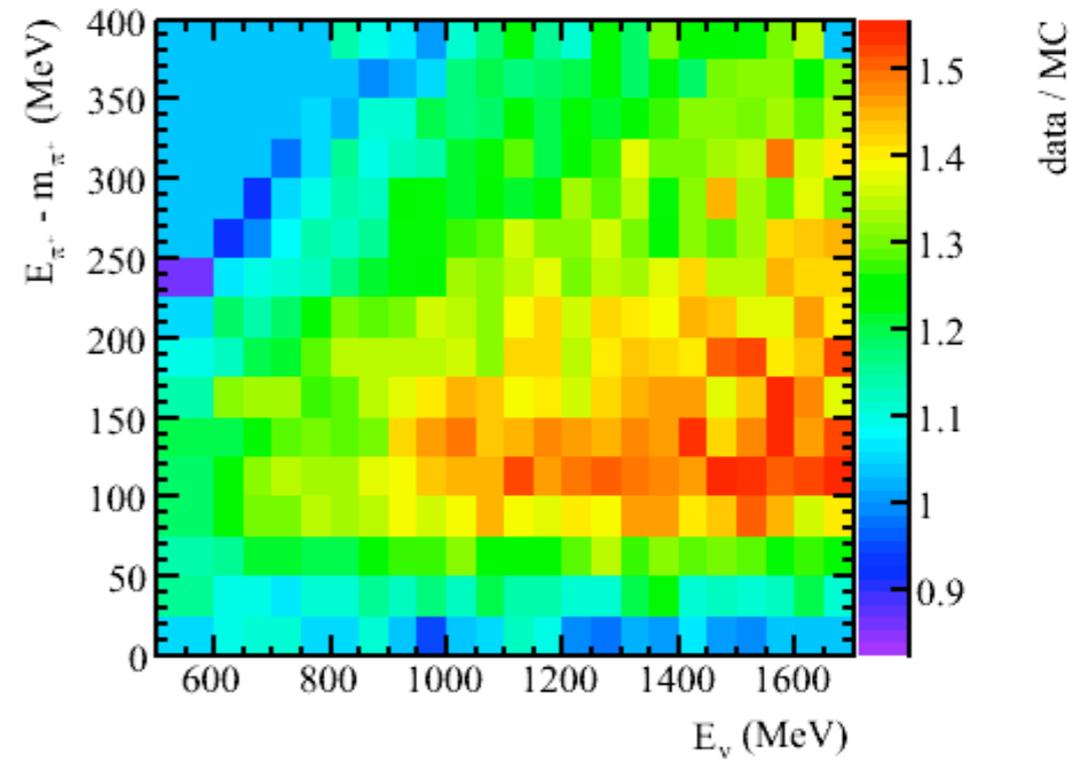
2D re-weighting

- Unreported regions and overflows are set to 1.
- Those regions should have few events.



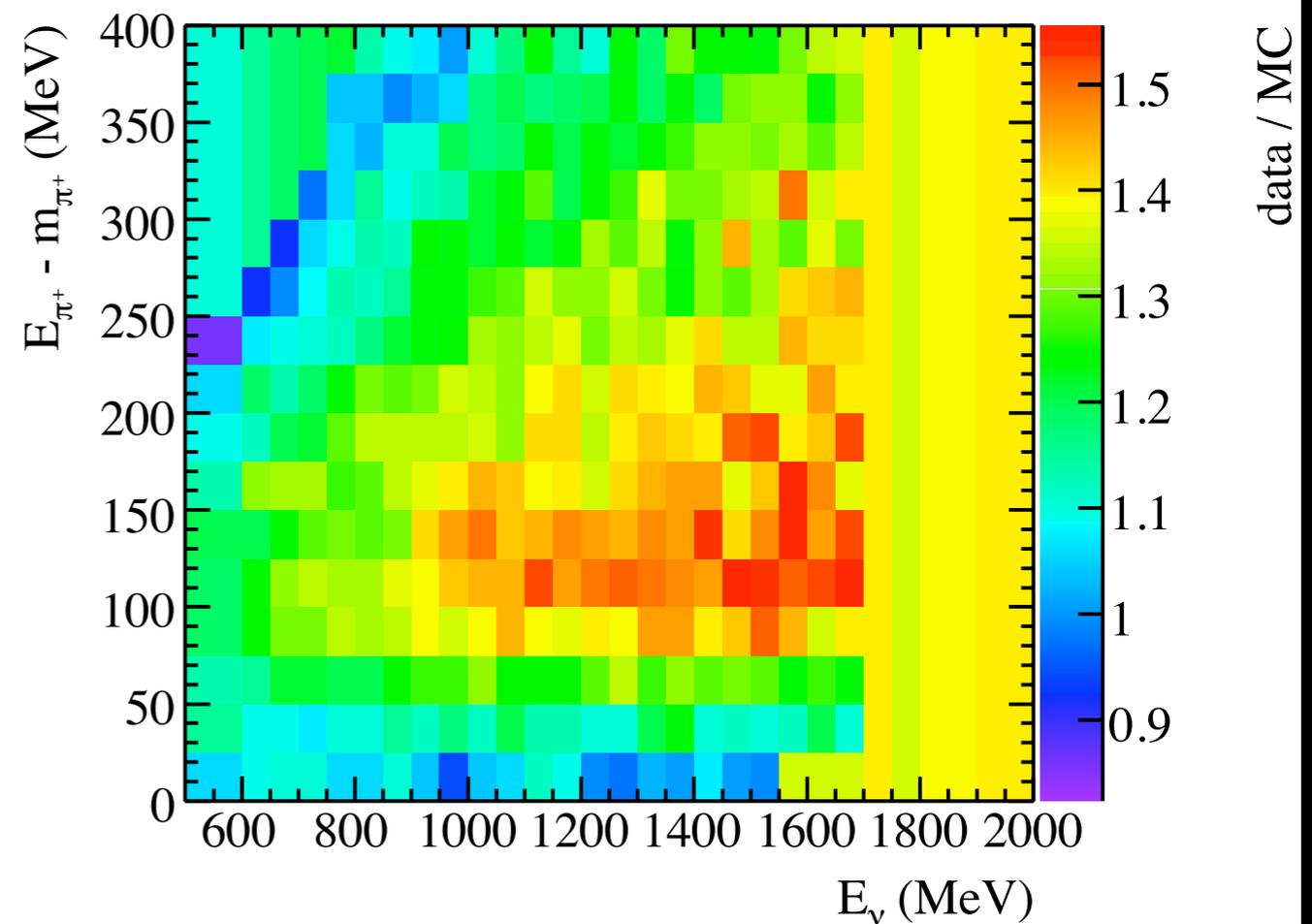


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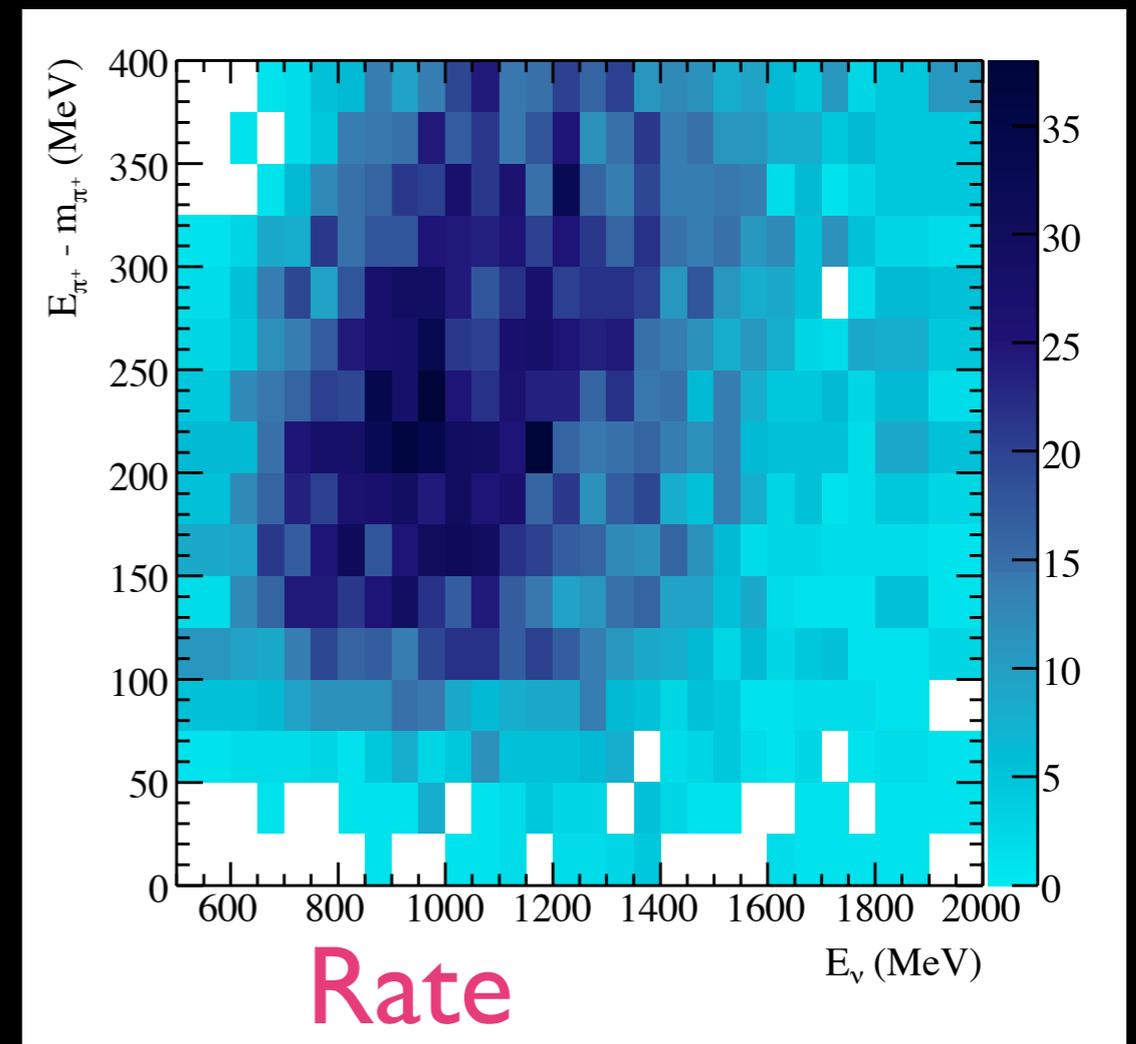
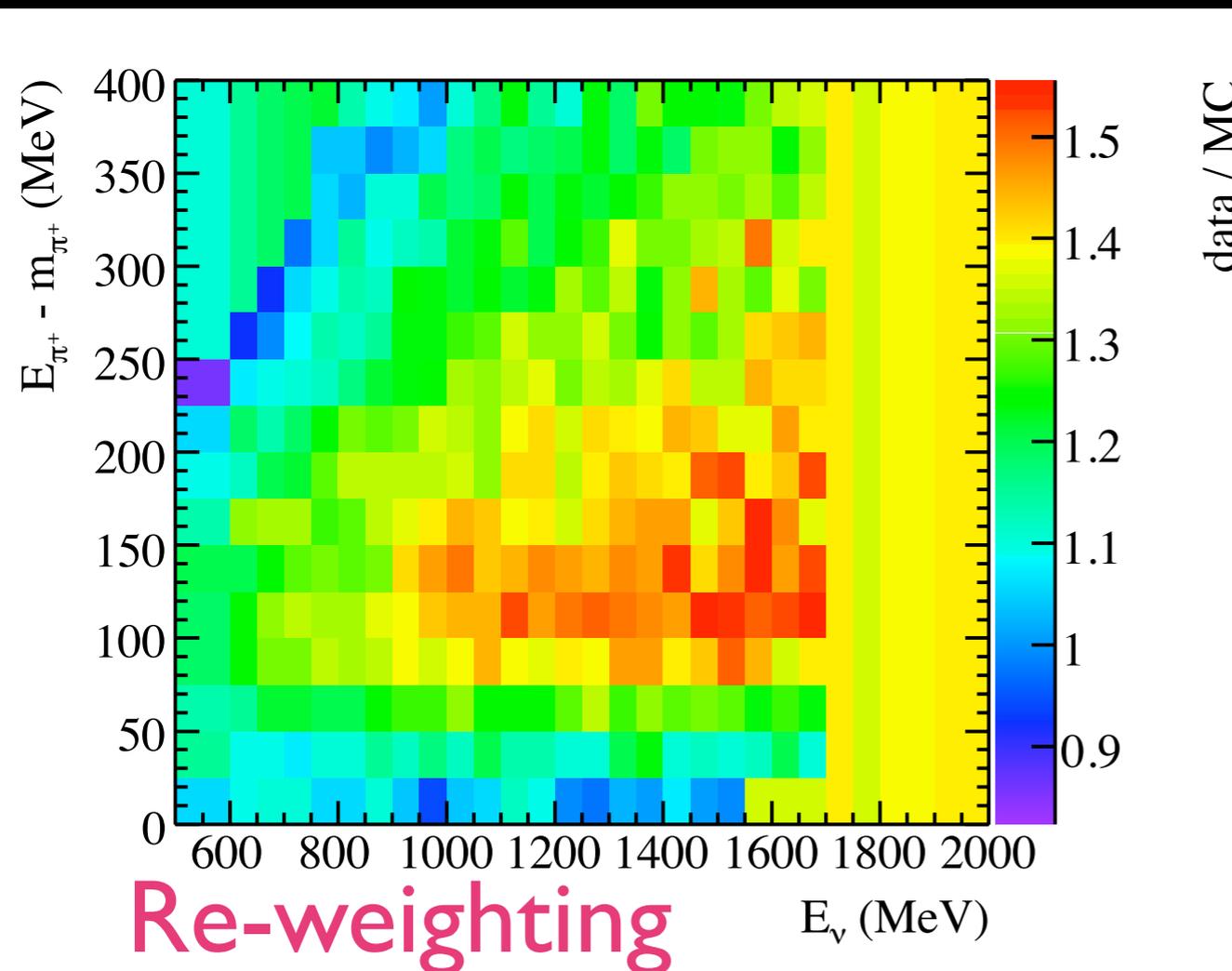
Full re-weighting

- The ID re-weighting extends to higher E_ν .
- The value of the ID is uniformly applied to the unreported bins of T_π and their overflows.
- E_ν overflows are set to 1.



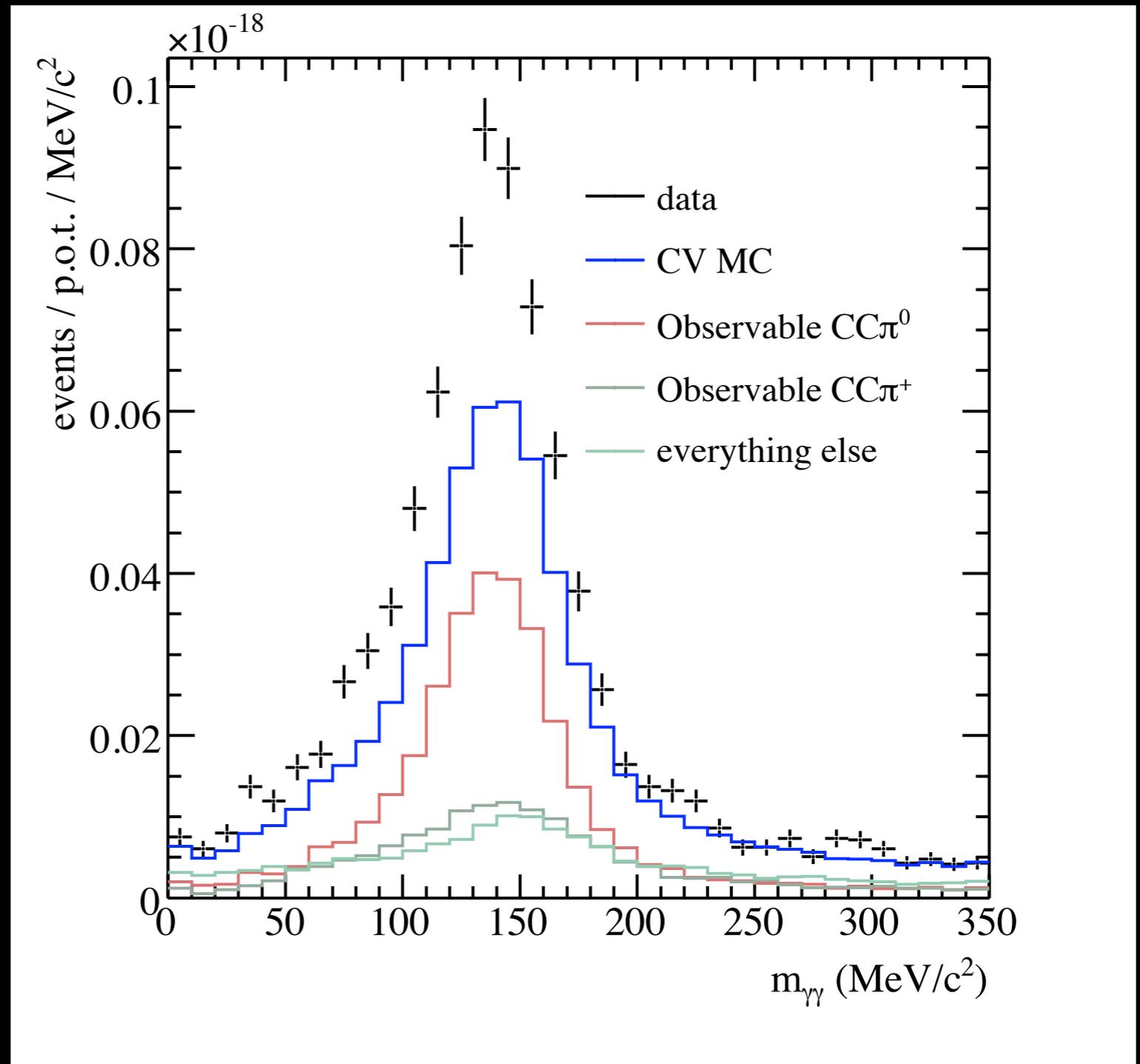
Rate after cuts

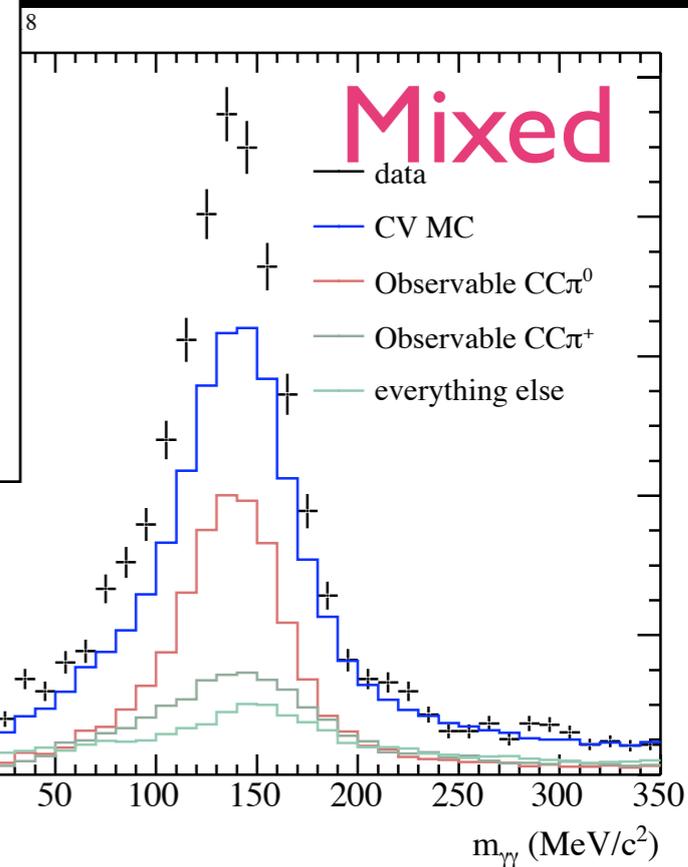
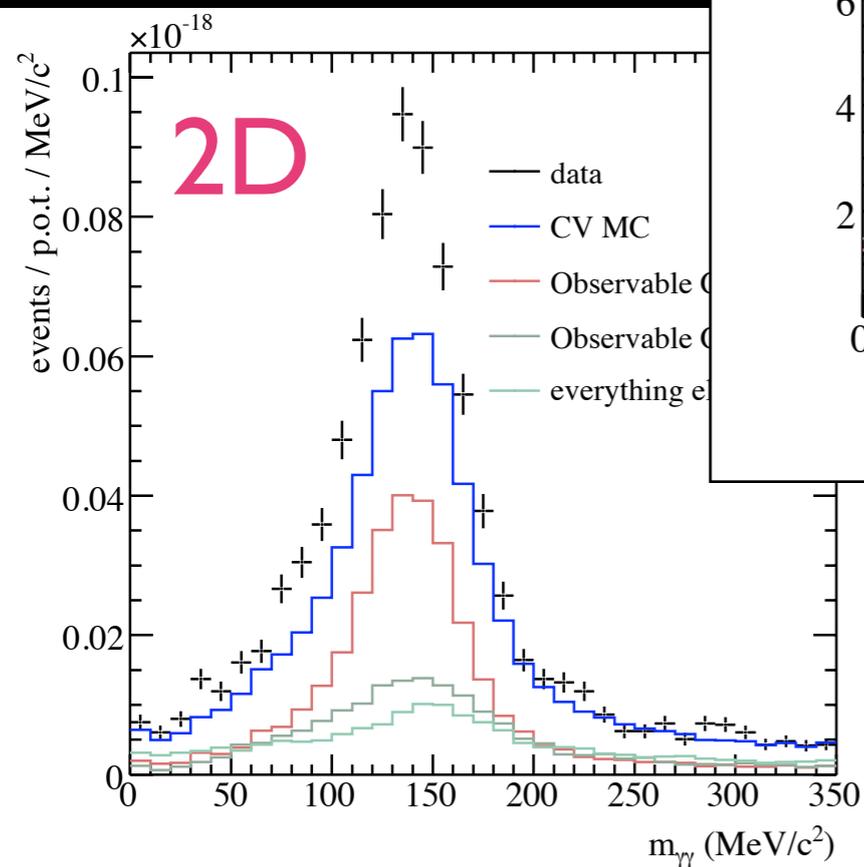
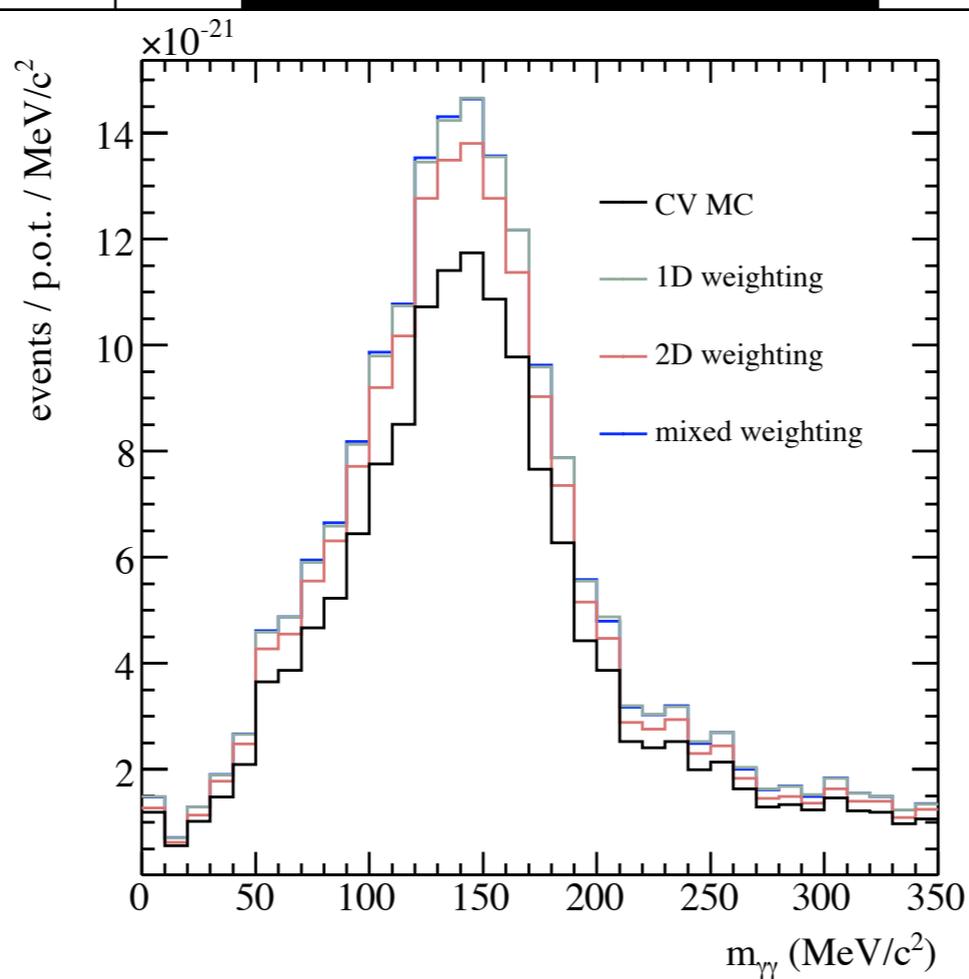
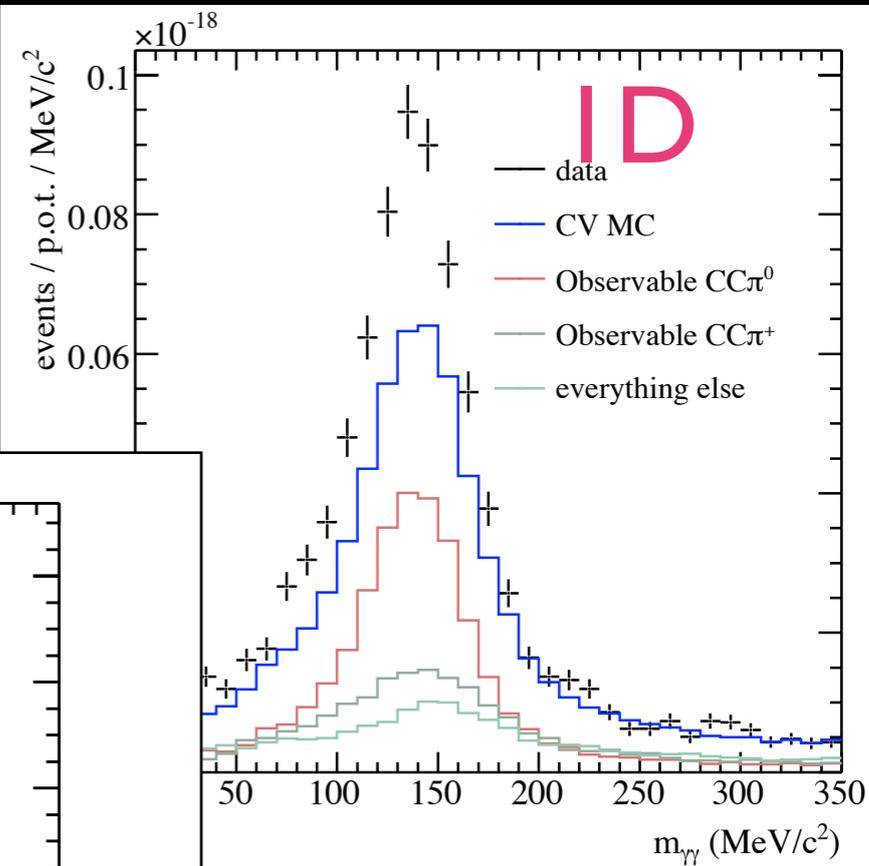
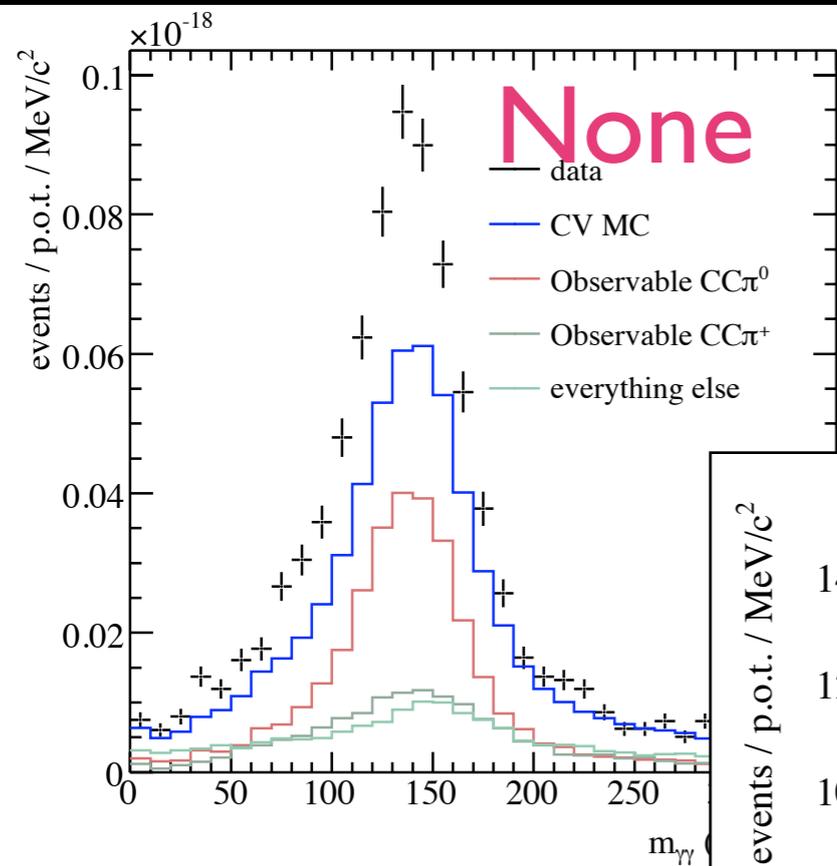
- The main population that gets re-weighted in the 2D plot is not near the largest re-weighting area.
- However, there are many events in the overflows.



m_{π} no re-weighting

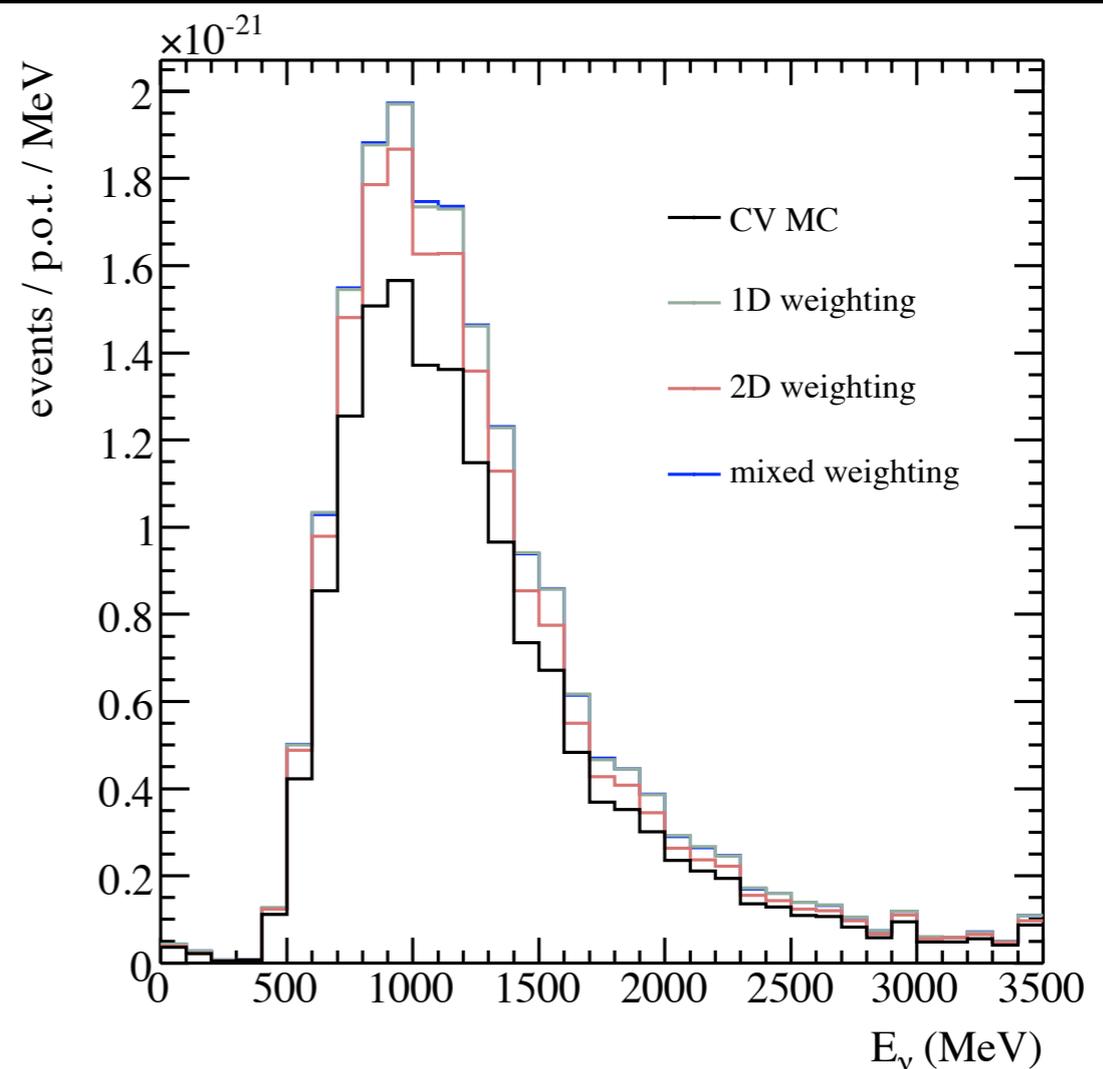
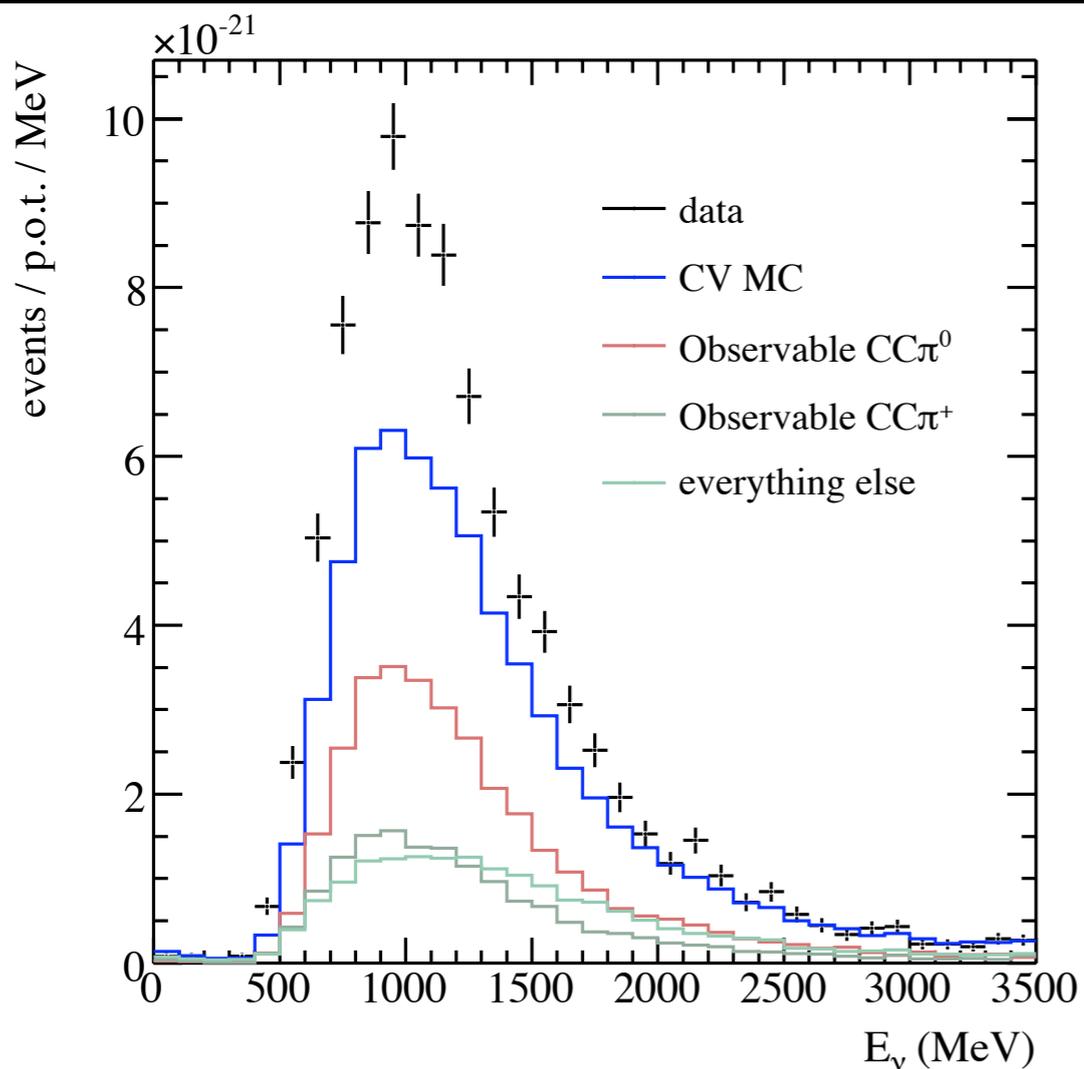
- At first I thought I screwed something up, since the signal looks so prominent.
- But no, I'm just awesome.
- The $CC\pi^+$ sample is only about half of the tank π^0 .





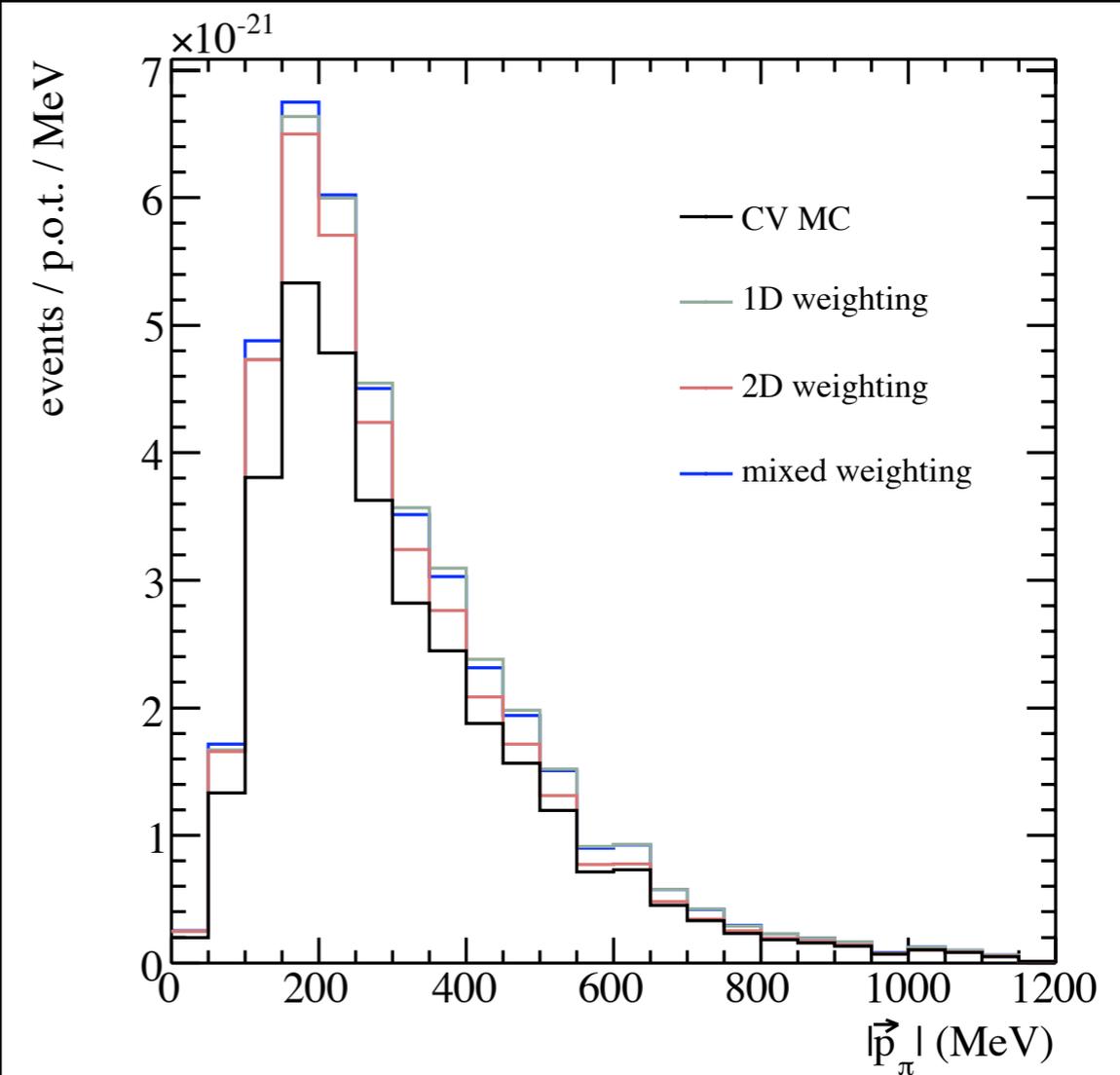
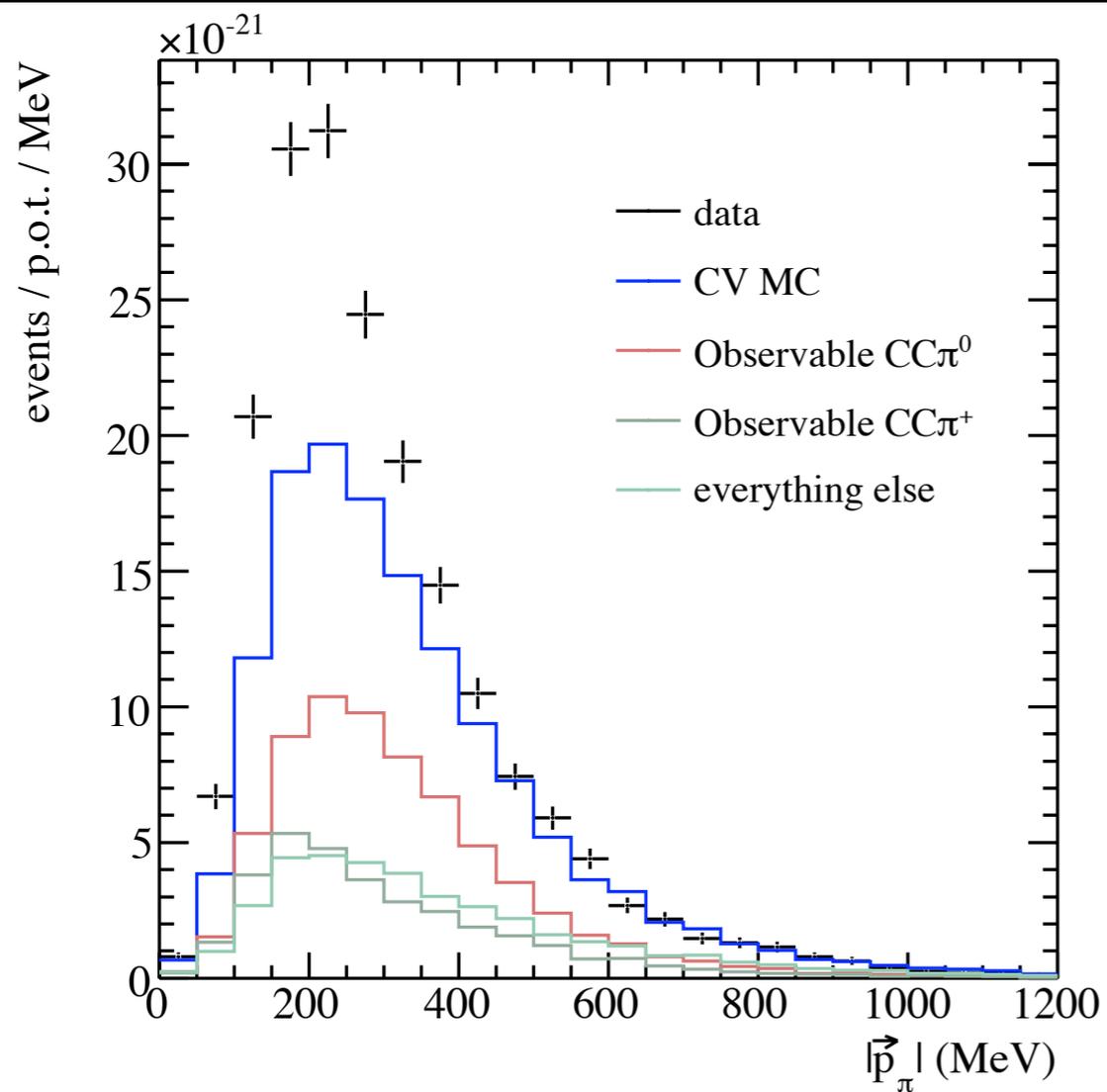
Reconstructed neutrino energy

- The mixed re-weighting again seems to match the ID. Perhaps I have a bug somewhere.
- I would have thought with the trend in the re-weighting functions to increase with neutrino energy that the higher energies would have been re-weighted more, but then again, I fixed all true neutrino energies > 2 GeV to 1.
- So this makes sense.



Effects on the reconstruction pion momentum

- Like before the re-weighting is most noticeable where there are events.



Thoughts?

- The 2D re-weighting is the smallest with the ID and the mixed being roughly the same.
- The ID and the mixed are probably similar for exactly the same reasons.
- This makes the choice odd. I have no clear idea which one is correct....
- I think this re-weighting is necessary but it will not account for the data-MC discrepancy.
- If this was our only background we'd be done, but there is no reason to assume that other backgrounds are like this....