

Near Detector Geometry

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January 7, 2016

Nomenclature

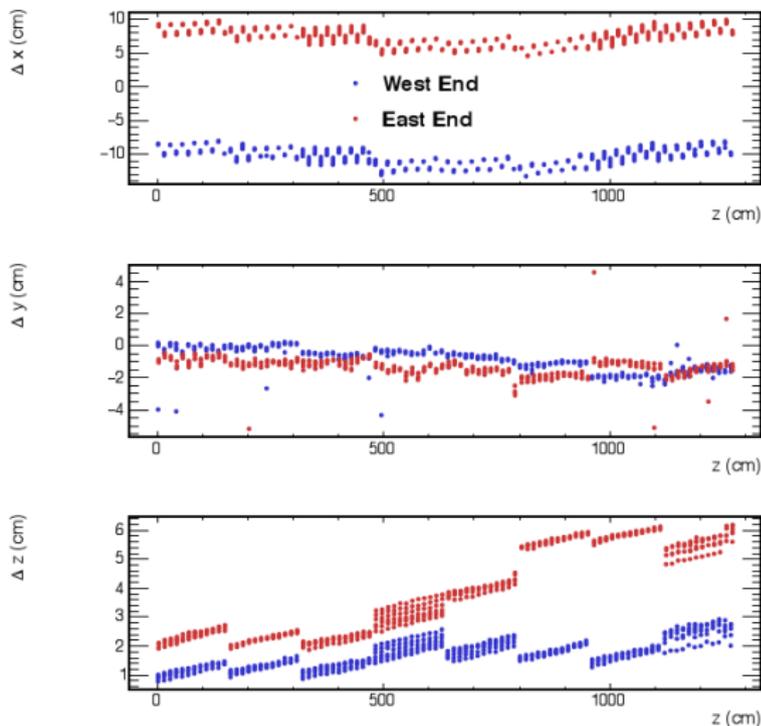
- * Ideal Geometry: Has the intentional plane to plane stagger, perfect alignment
- * Stagger Geometry: Has the intentional plane to plane stagger, based on survey data

Since my email during the holidays...

- * I've started looking at alignment of all blocks, not just active volume to MuCat
- * Xinchun has sent around an improved version of ND geometry that aligned the MuCat better
- * Louise and I have been underground to measure the elevation of ND blocks wrt floor

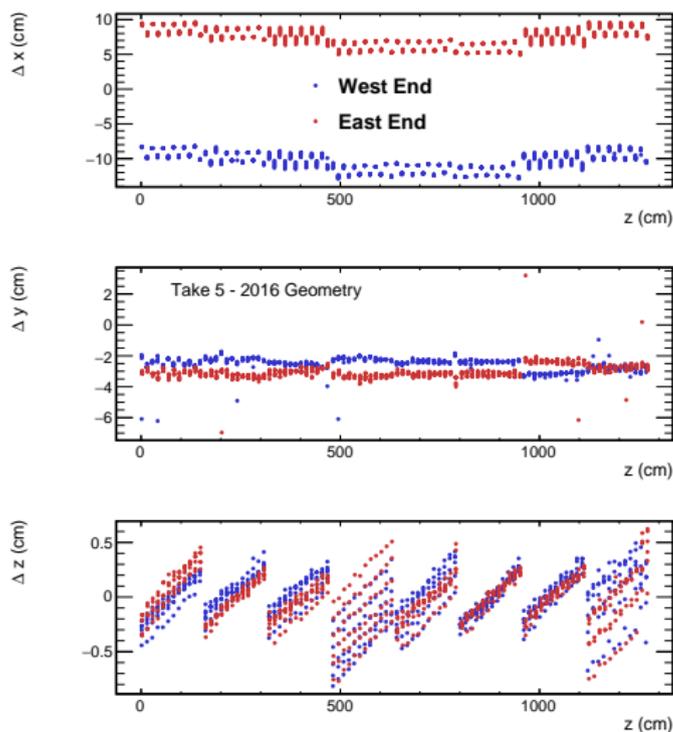
Stagger vs Survey

- * Ryan compares geometry with the survey data



NewGeo vs Survey

- * Ryan compares geometry with the survey data



- * Why is stagger \neq survey??
- * Paraphrasing Xinchun: Survey is done on planes not blocks. Measurements are more accurate than our tolerance of plane widths
- * We simulate planes with fixed widths
- * Implementing survey directly would make detector volumes overlap, so the survey data have to adjusted

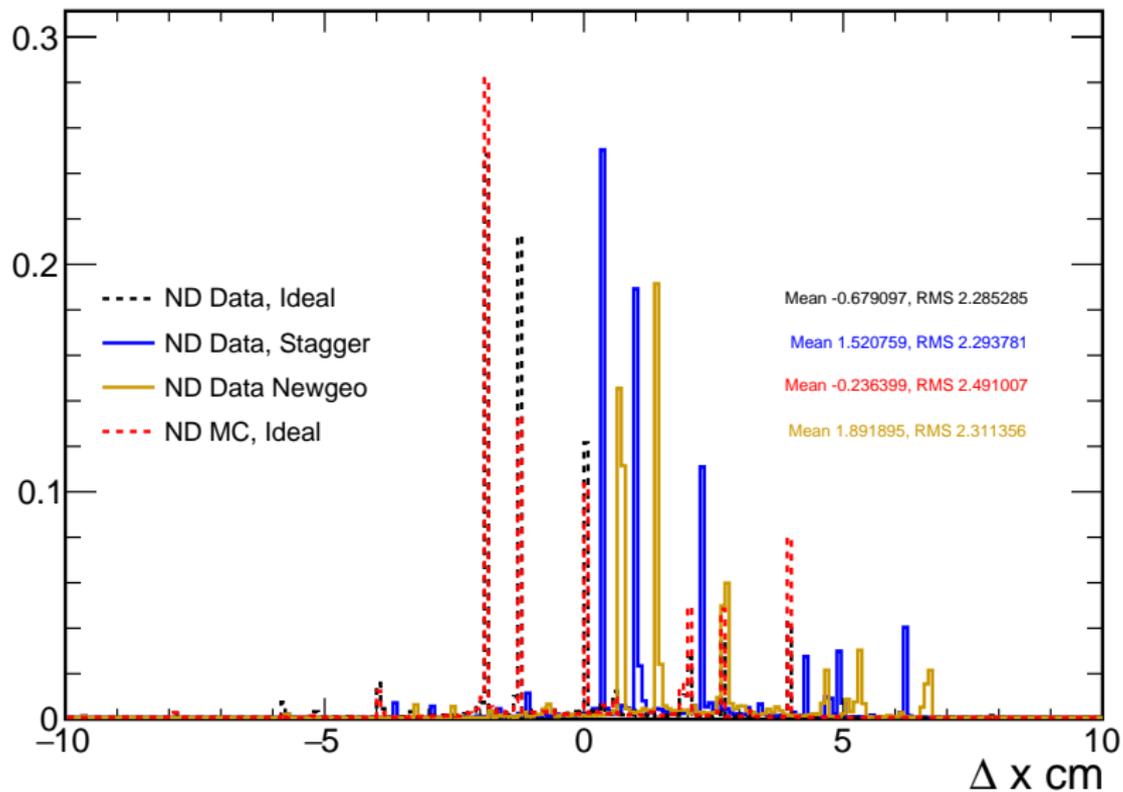
Track Reconstruction

- * To check how well blocks are aligned I did the following:
 - * Selected long rock-muon tracks from WindowTrackAlg (start $Z < 50$ cm and stop $Z > 1450$ cm).
 - * For these slices, I separated the hits in the different detector blocks and fit them separately with WindowTrackAlg
 - * Then plotted the difference in the x , y , polar angle and azimuth angle between the active and the muon catcher track fragments. For x and y it is the different between the stop point of track in upstream block and start point of track in the downstream block
- * This is done to both data and MC.
- * Since MC is generated and reconstructed with the same geometry, it represents how the data should look if it were interpreted with a geometry that is a good approximation of the detector that the particles are interacting

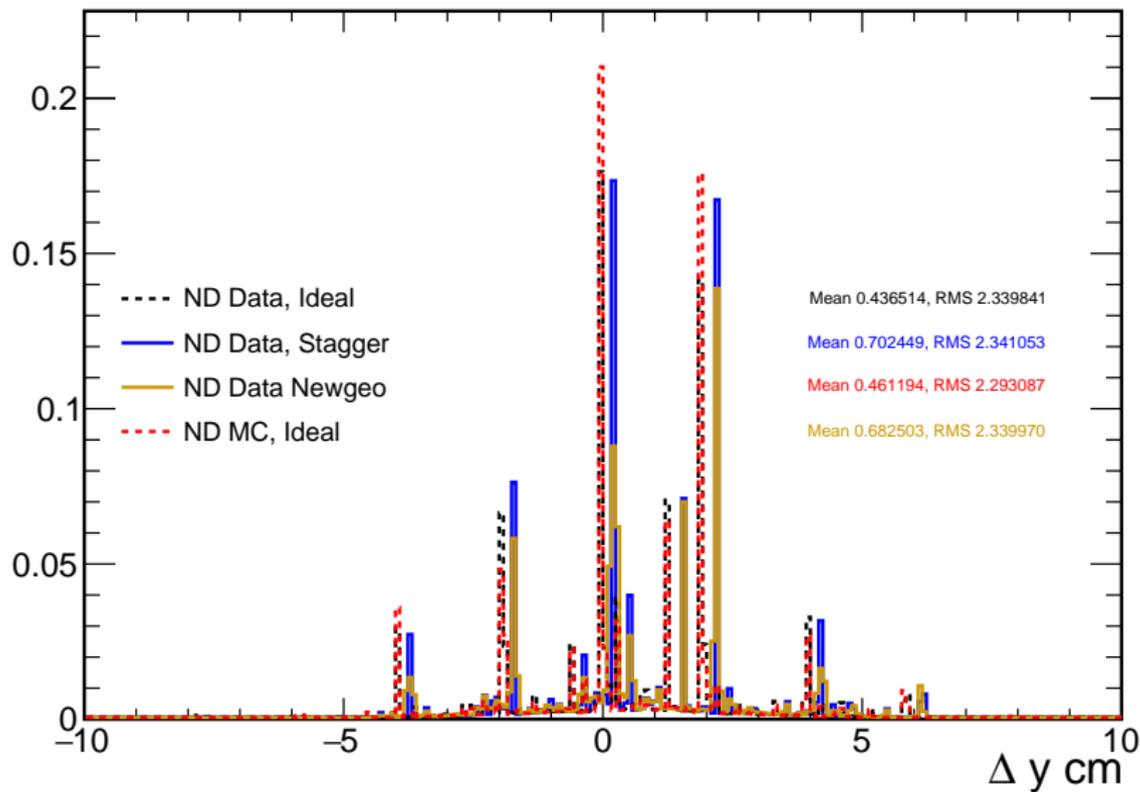
Datasets Used

- * MC : prod_reco_S15-05-04c_nd_genie_fhc_nonswap_ndnewpos_v2
- * Data ideal: prod_reco_S15-05-04_nd_num1
- * Data stagger: prod_reco_S15-05-04_nd_num1_stagger
- * I reran reco in development with Xinchun's newgeo to see how it performs

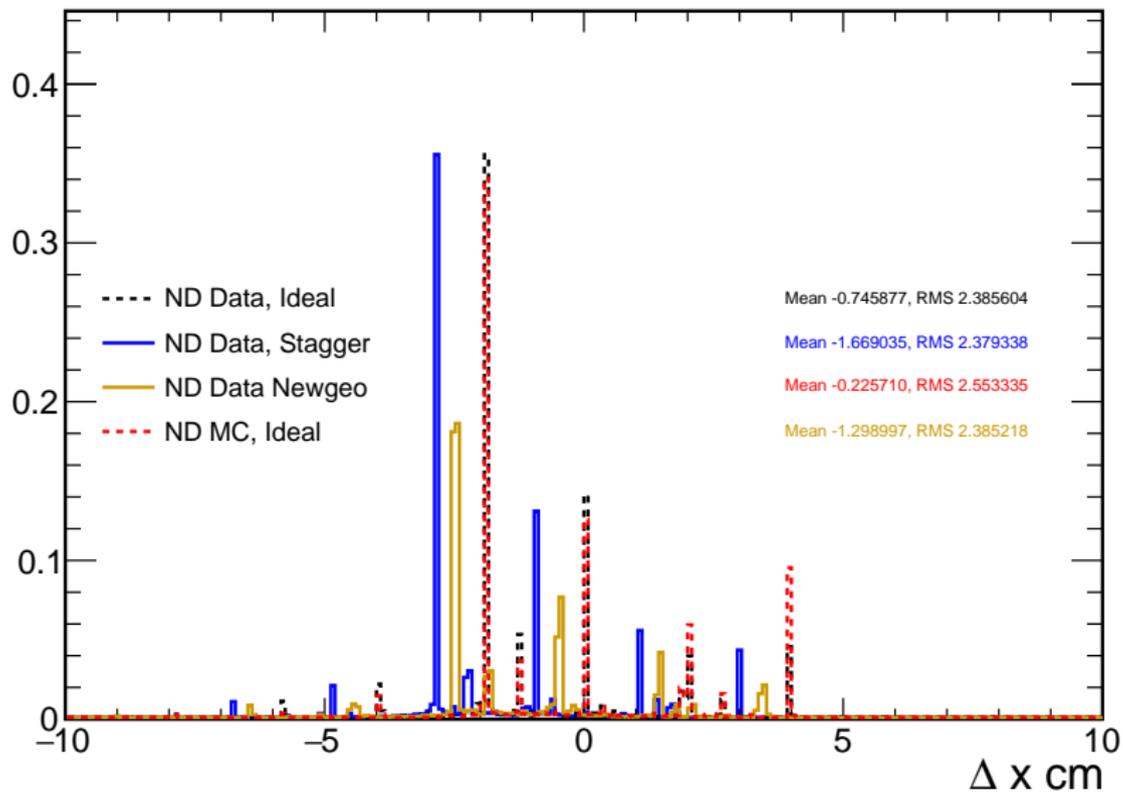
X Difference, Block 0 and 1



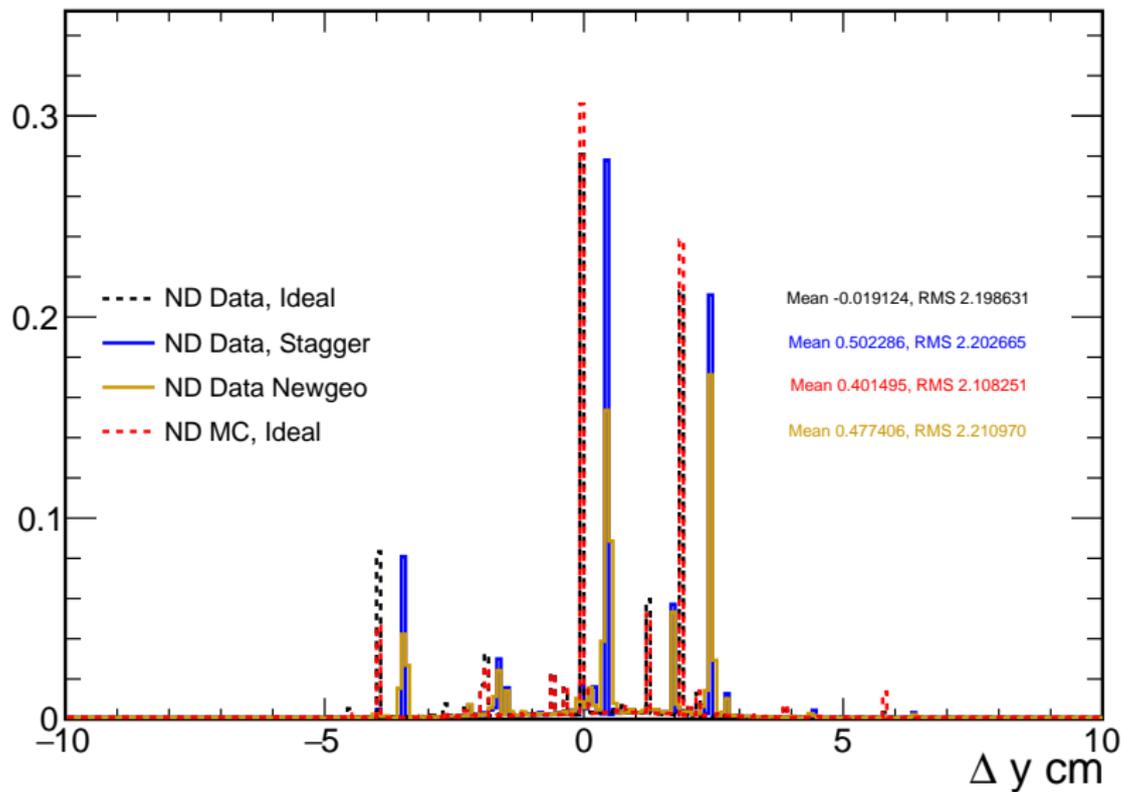
Y Difference, Block 0 and 1



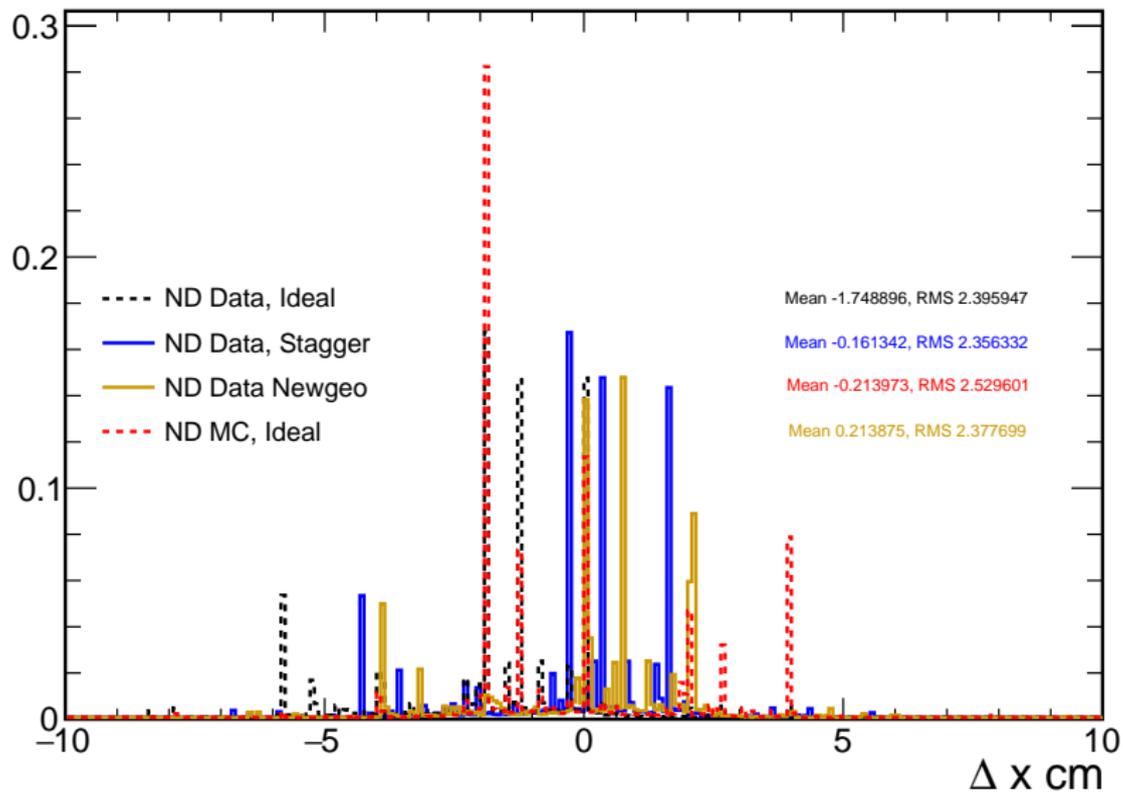
X Difference, Block 1 and 2



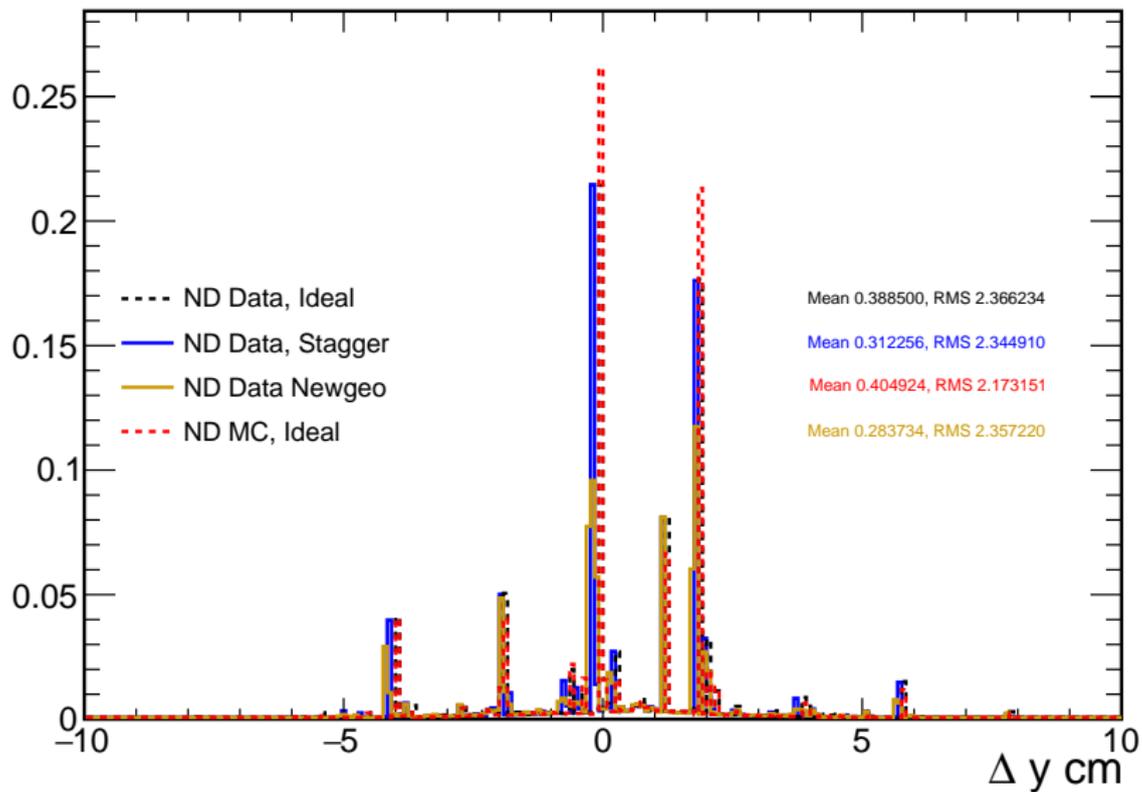
Y Difference, Block 1 and 2



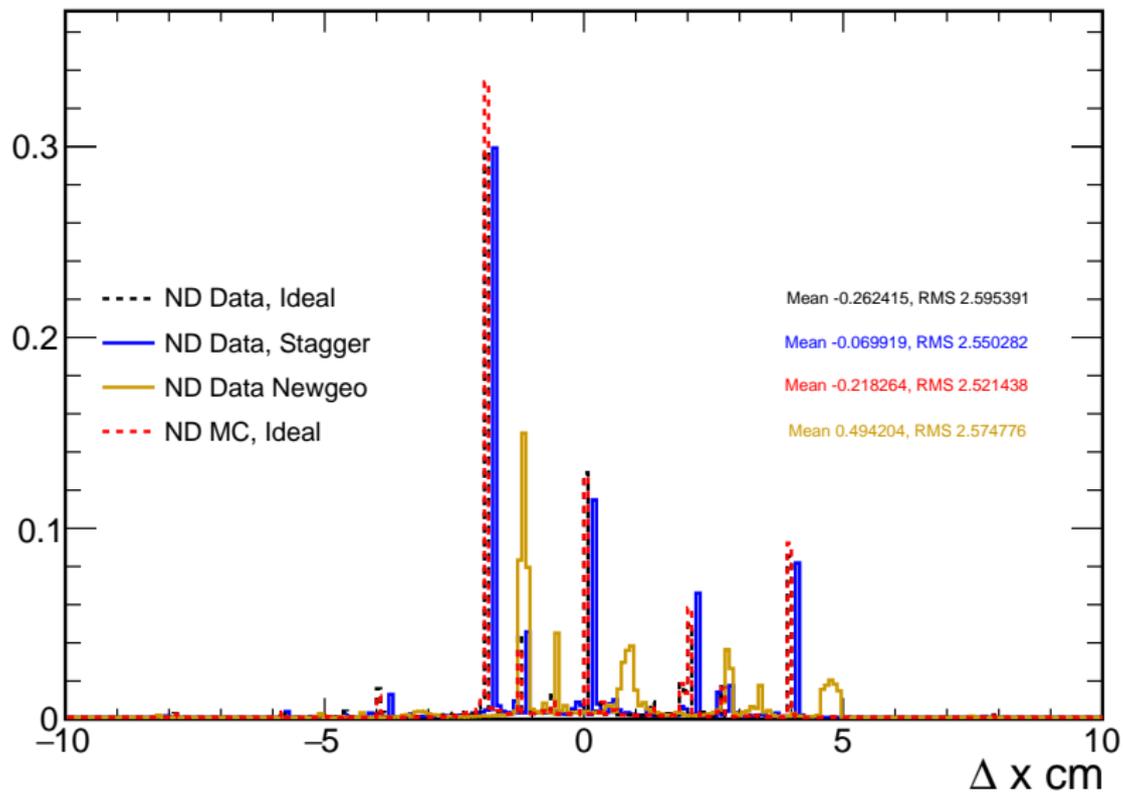
X Difference, Block 2 and 3



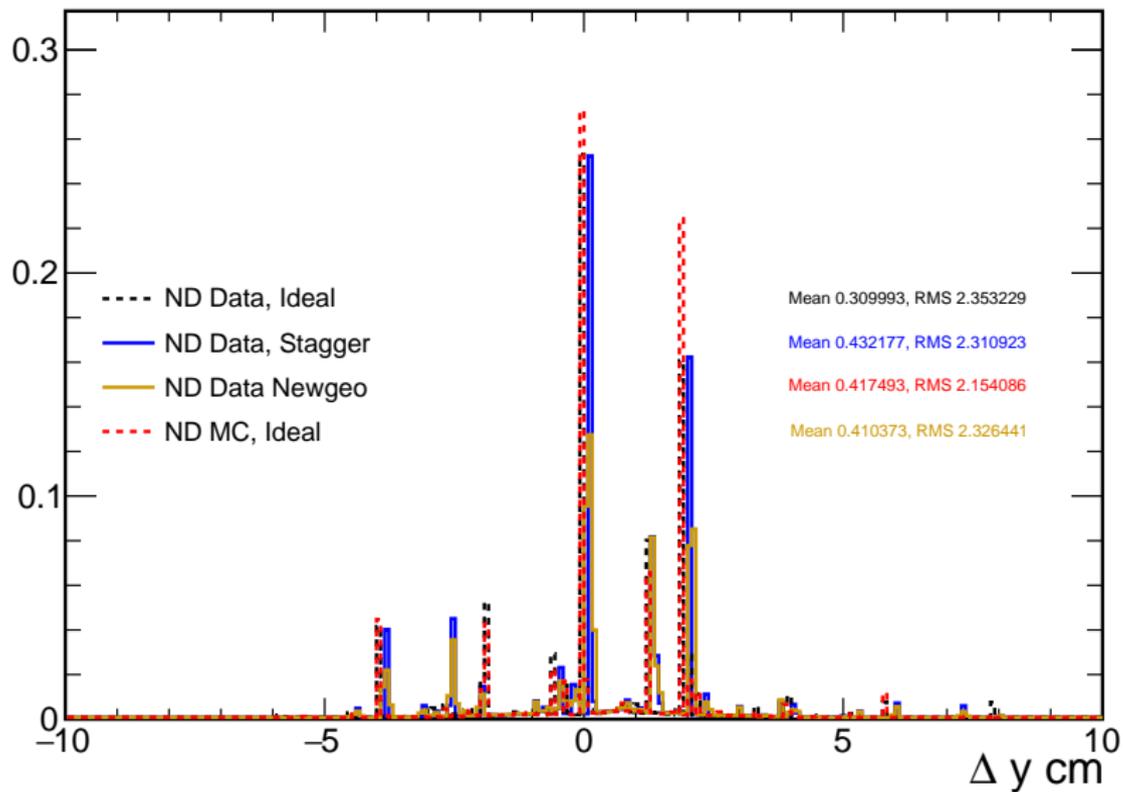
Y Difference, Block 2 and 3



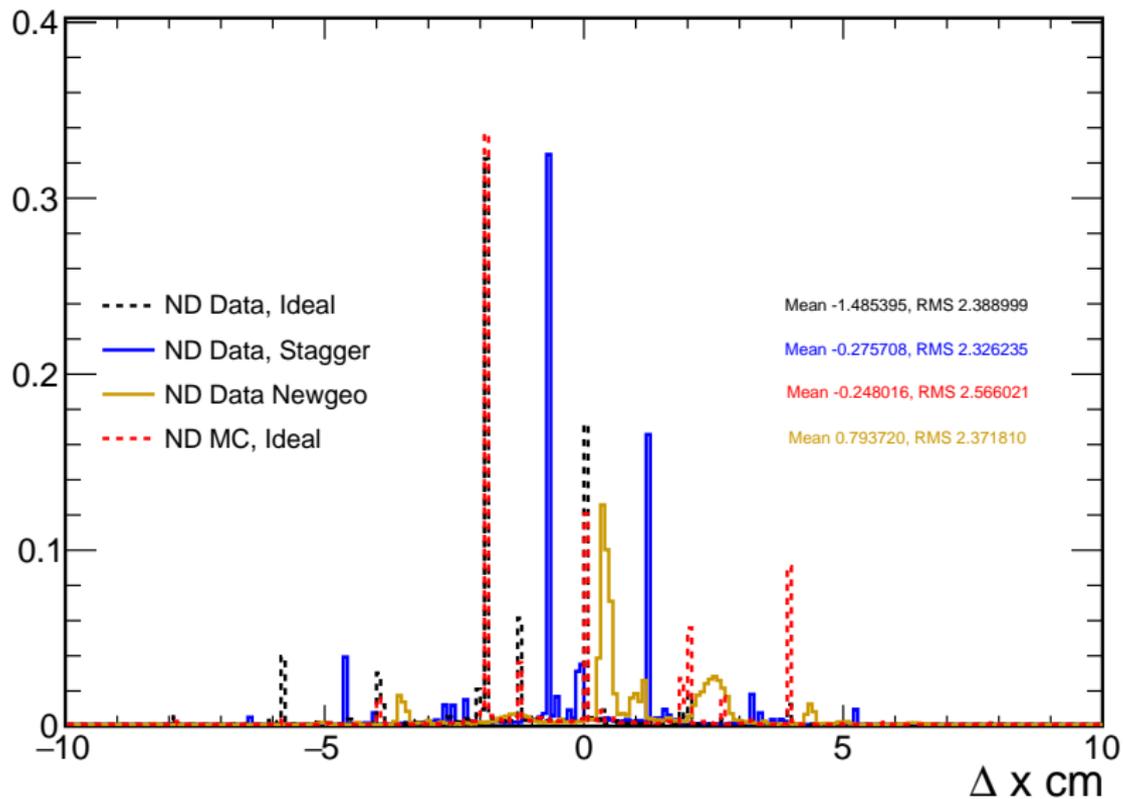
X Difference, Block 3 and 4



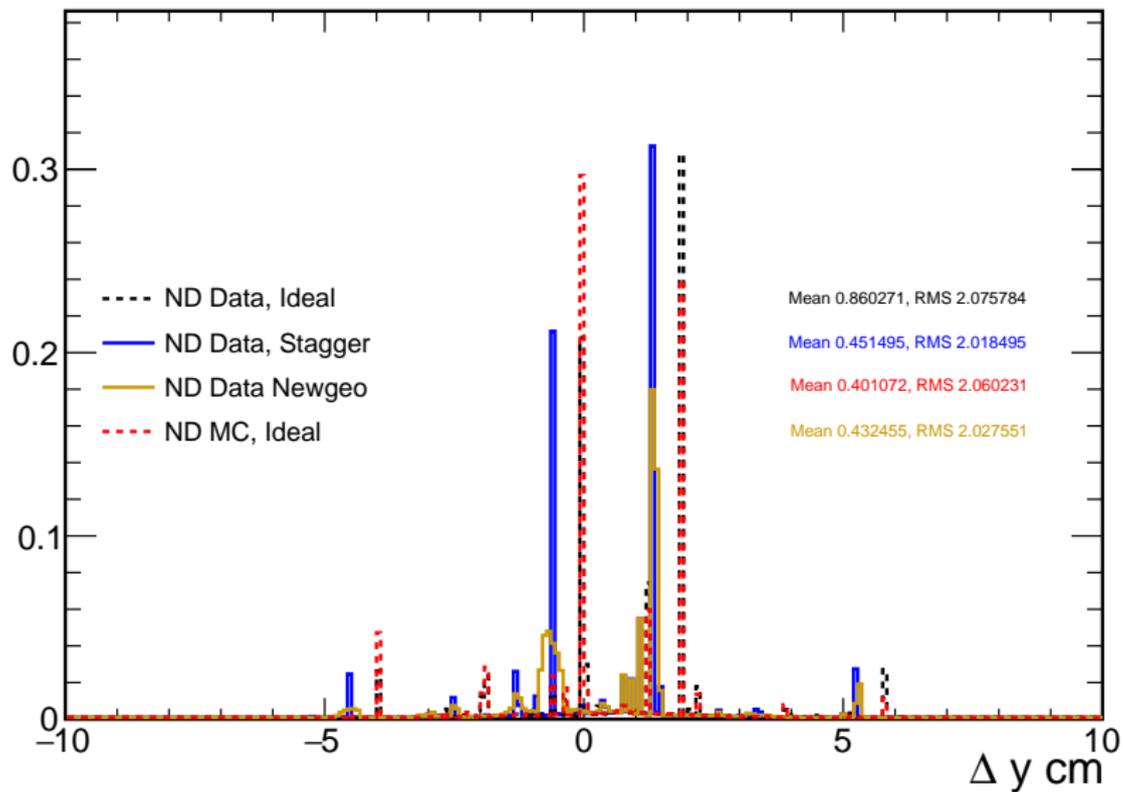
Y Difference, Block 3 and 4



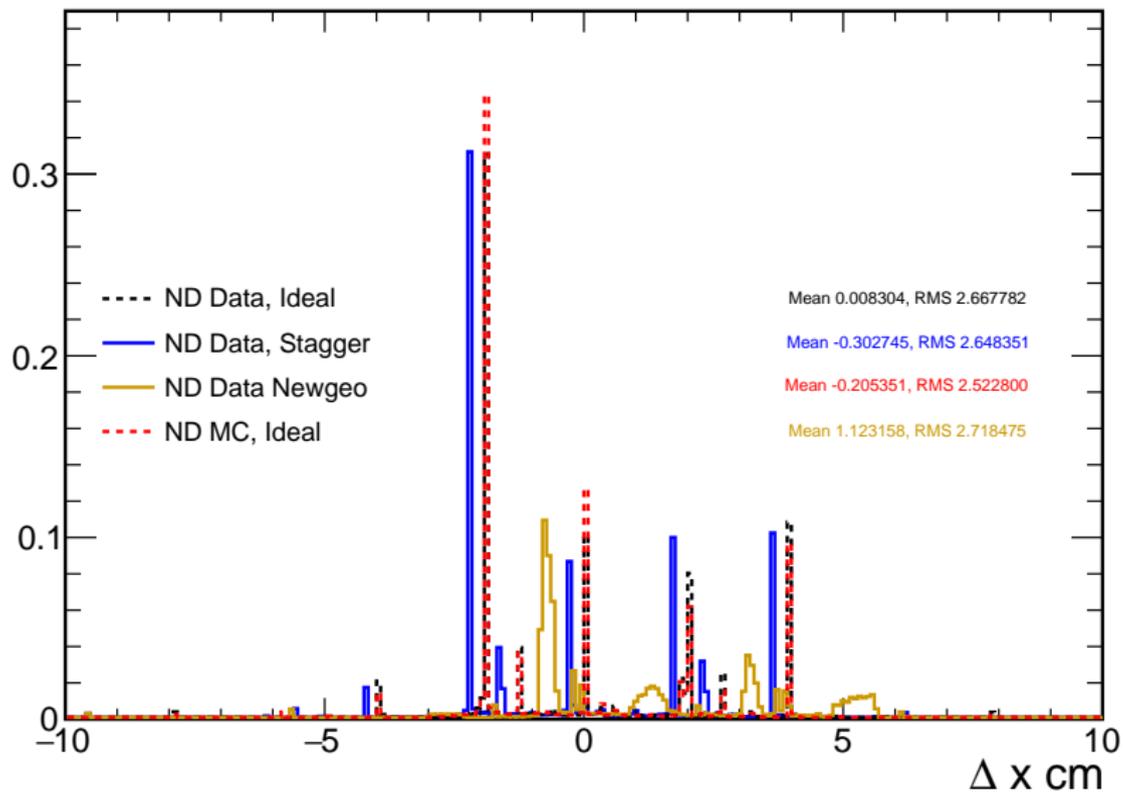
X Difference, Block 4 and 5



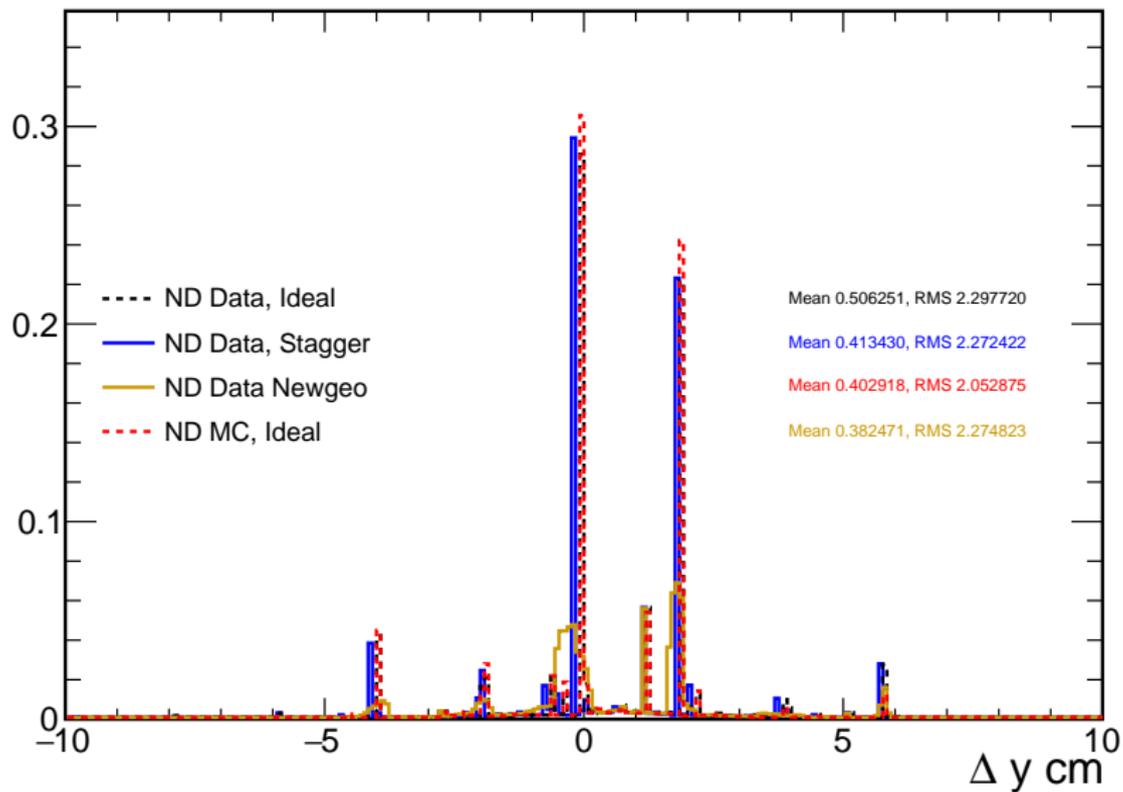
Y Difference, Block 4 and 5



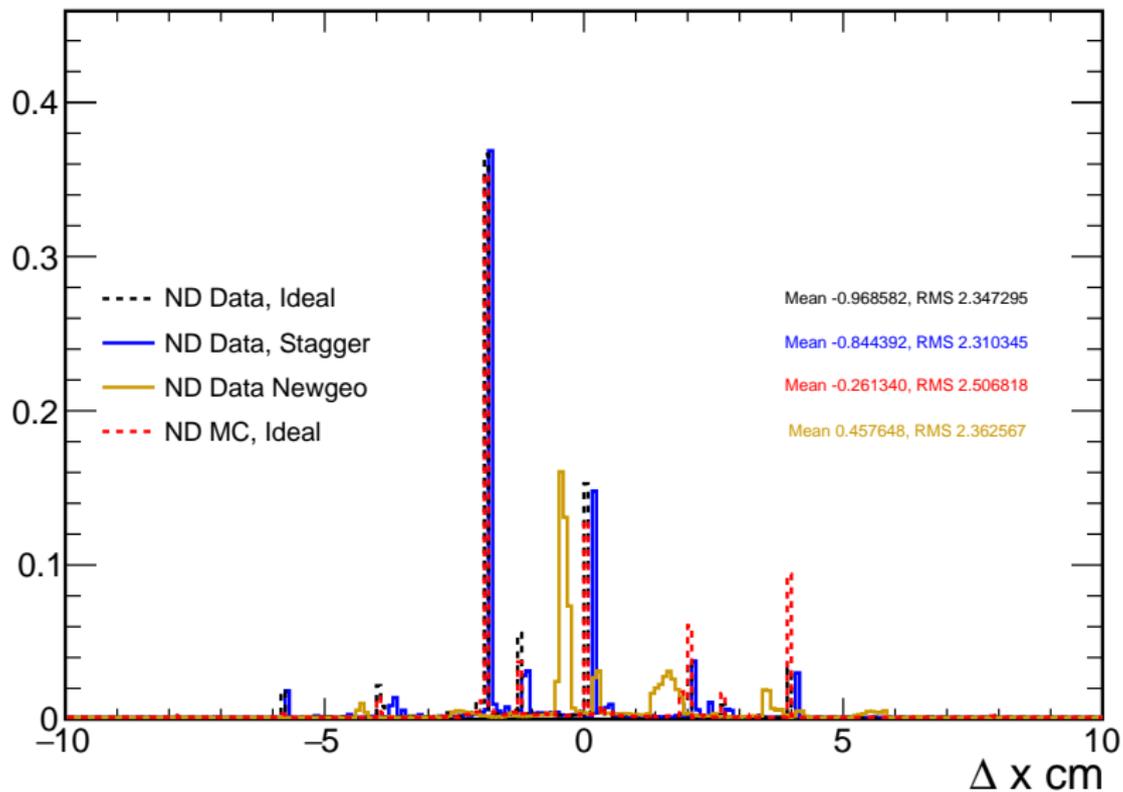
X Difference, Block 5 and 6



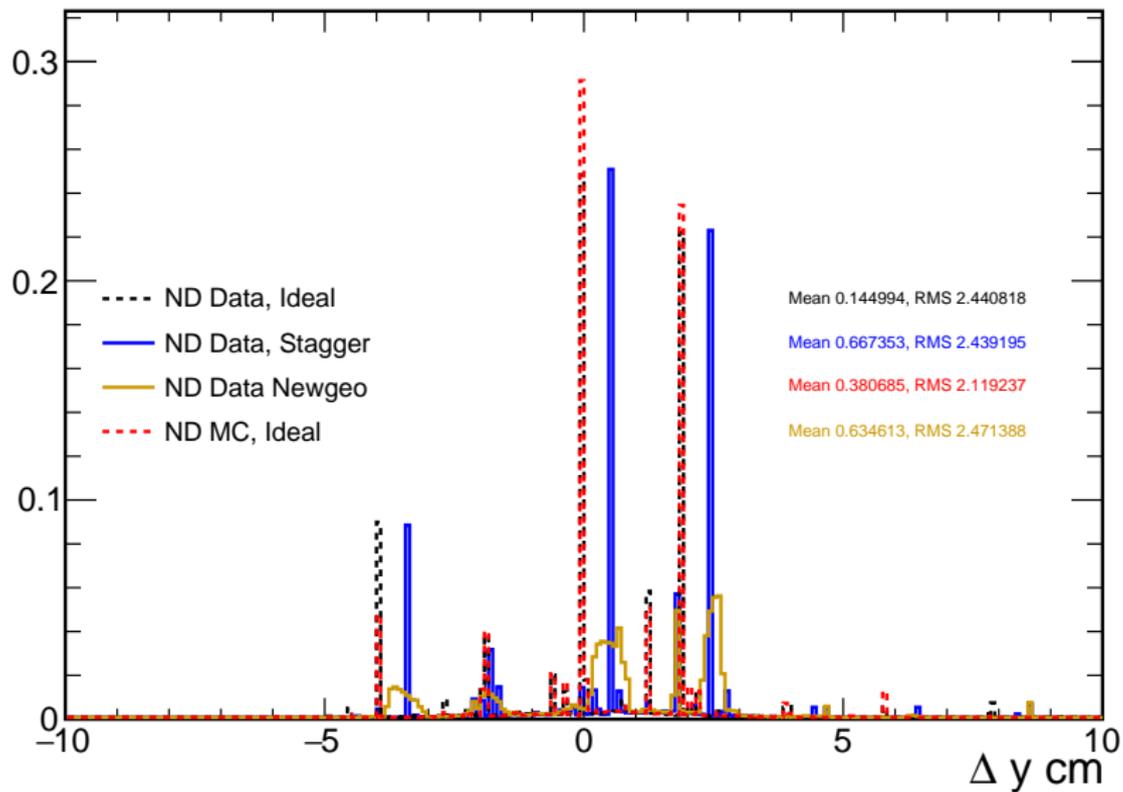
Y Difference, Block 5 and 6



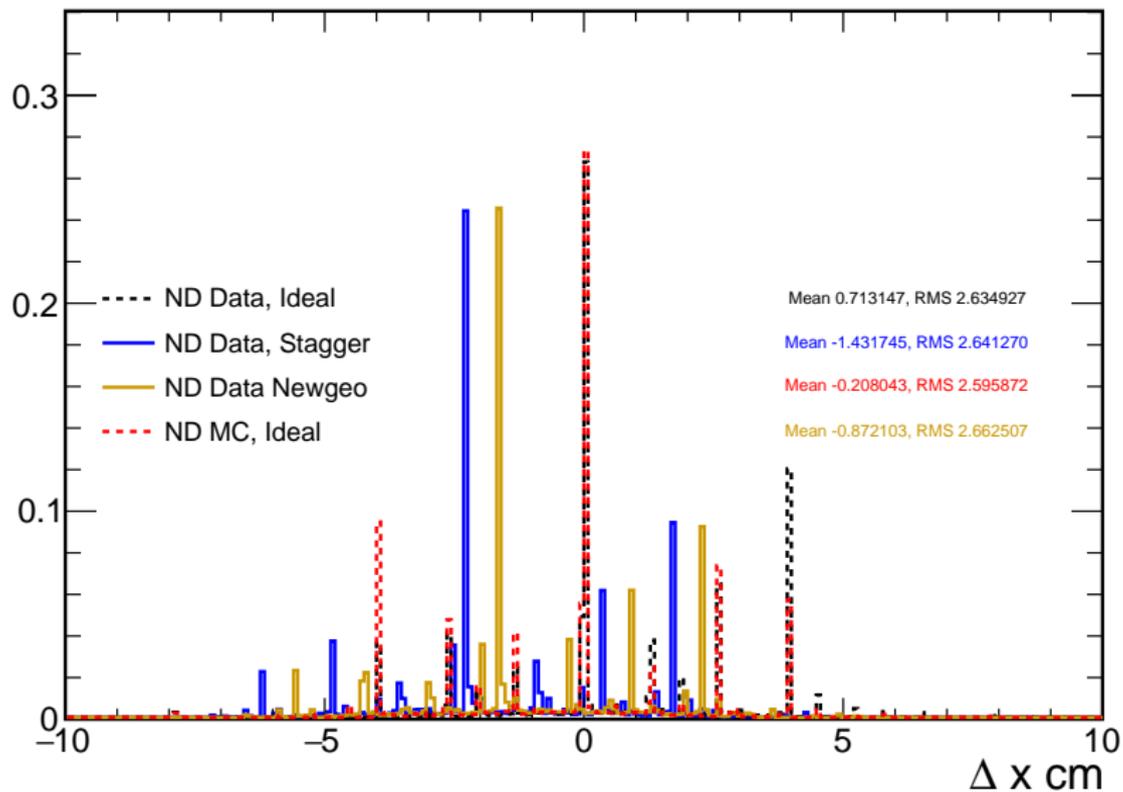
X Difference, Block 6 and 7



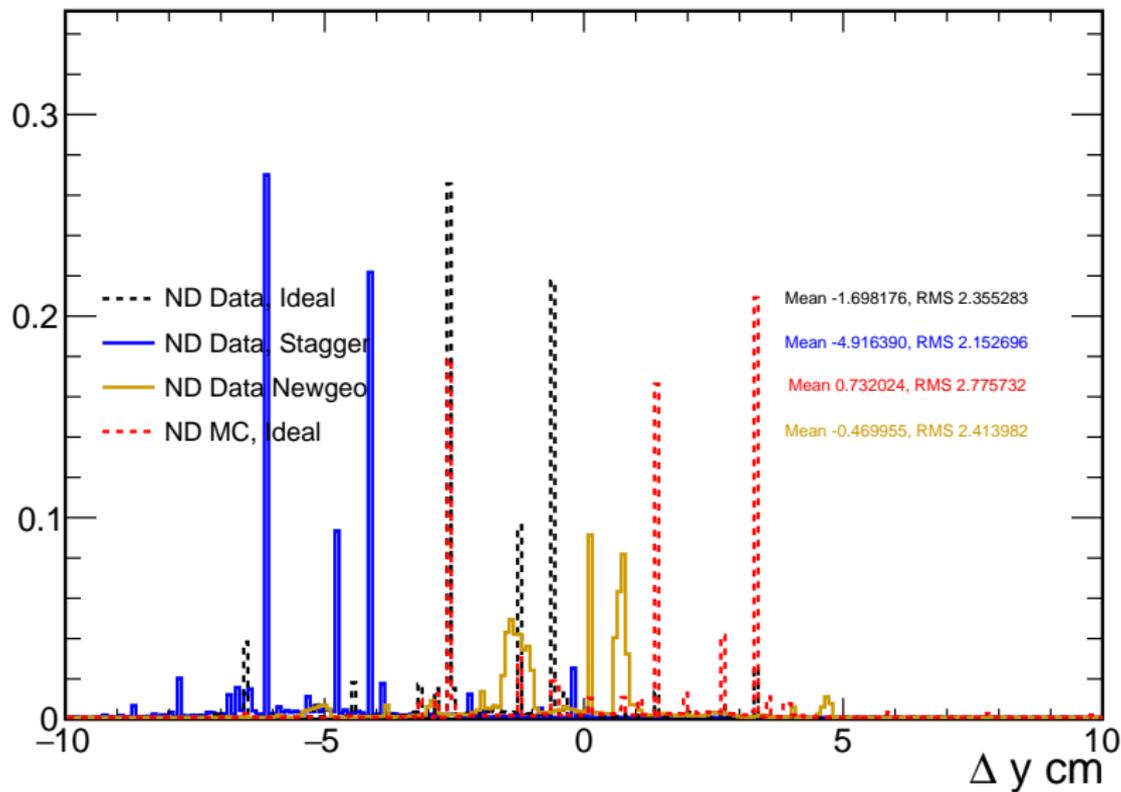
Y Difference, Block 6 and 7



X Difference, Block 7 and 8

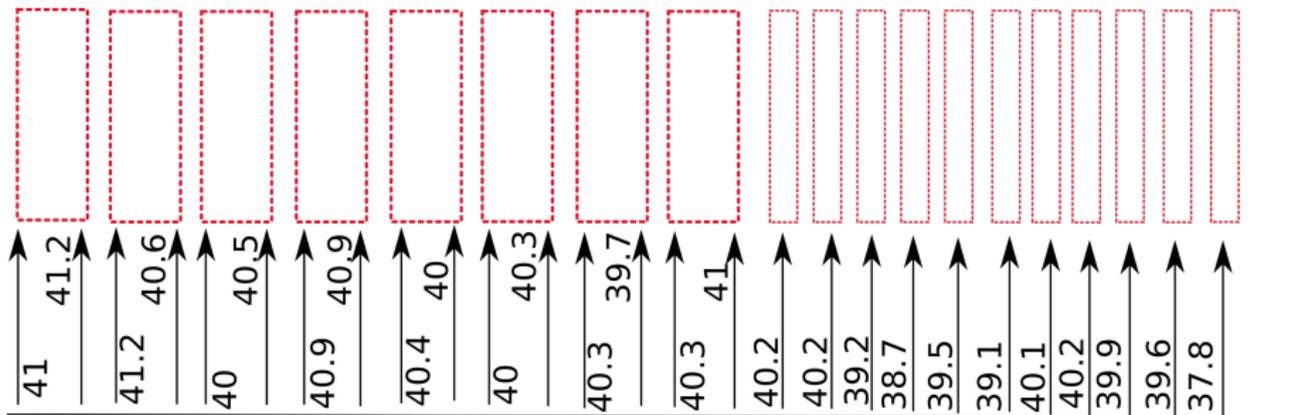


Y Difference, Block 7 and 8

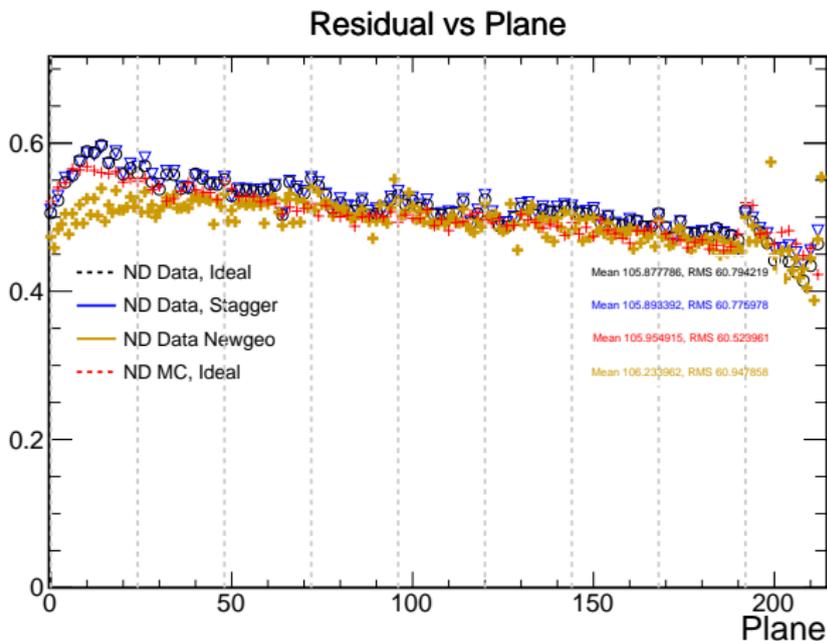


Underground Tape Measurements

- * Louise and I measured the elevation of ND blocks
- * Not too precisely because it was dark, oily and cramped near the detector
- * Effectively a measurement of the steel structure that each block rests on
- * For active blocks, two measurements- at the front and the back end
- * Fourth and last MuCat segments show anomalously smaller elevations

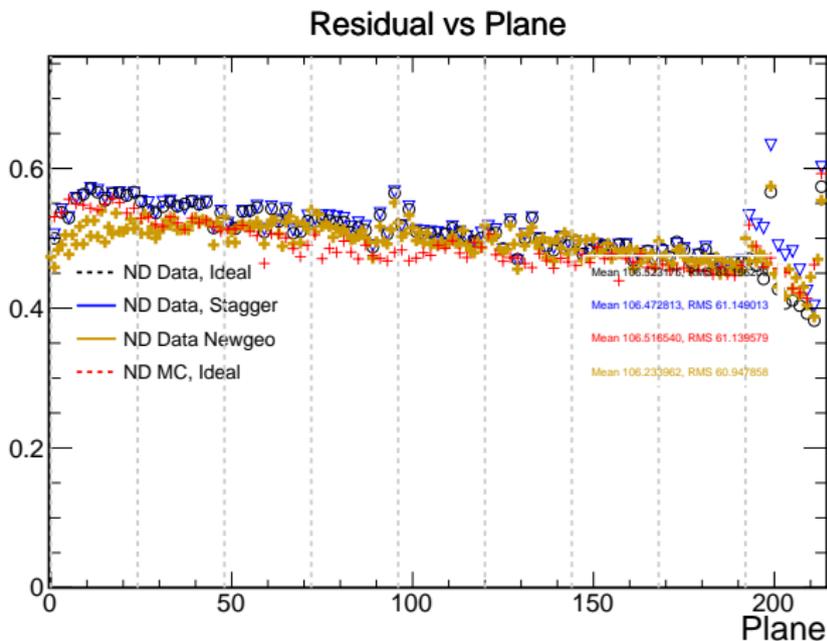


Residual: Even Planes



- * Jumps within muon catcher consistent with our tape measurements?
- * The newgeo residuals go up and down with plane- did we mess up the

Residual: Odd Planes



- * Jumps within muon catcher consistent with our tape measurements?
- * The newgeo residuals go up and down with plane- did we mess up the

Remarks

- * The new geo plots are less spikey- recall that the reconstruction was done in development, so things may have changed - windowalg has not changed, but `rb::Track::ZipWith` has
- * Residual get better deeper in the detector- something you'd expect if the fit was done from front to back
- * Residual vs plane has a sharper slope in the muon catcher- what can cause that?
- * Using a different tracker for residual plots is easy and might shed some light on these features- trying that out now.

Residuals for Even Planes

