

# Cathode Crossing Muons vs Cosmic Muon SCE Validation

Initial question: Is Lane's data under a different name/am I using samweb incorrectly?

From Lane's tech note:

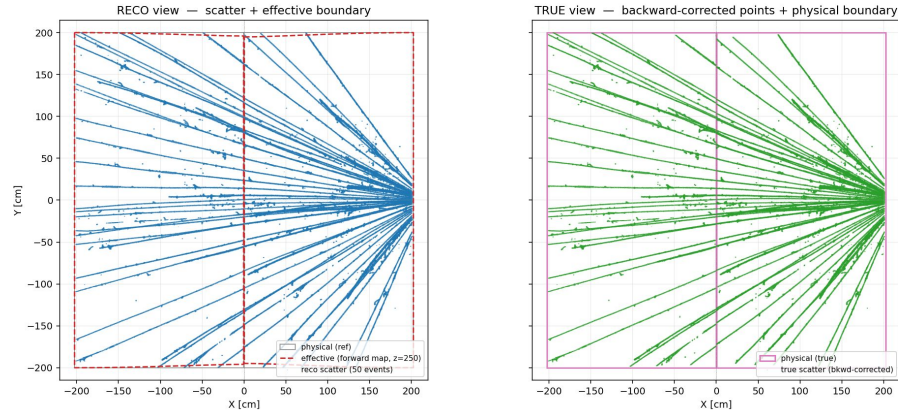
## 40 **2.2 Sample**

41 This study looks at data collected from February 2025 -July 2025 (Run 1 of  
42 SBND), specifically using a crossing muon stream where the light trigger is  
43 established. Data was processed with `sbndcode v10_06_03` through the calibra-  
44 tion ntuple stage. Files can be found using the following SAMweb definition:  
45 [data\\_MCP2025B\\_CrossingMuon\\_FullRun1\\_AfterLight\\_crossingmuon\\_v10\\_06\\_03](#).

```
SL7> [sbndgpvm01 11:15:55 AM] ~ > setup sam_web_client
SL7> [sbndgpvm01 11:16:05 AM] ~ > samweb list-definitions --defname crossingmuon_v10_06_03
SL7> [sbndgpvm01 11:16:23 AM] ~ > █
```

# Cathode Crossing Muons (n=50)

SBND SCE boundary closure — 50 crossing-muon events



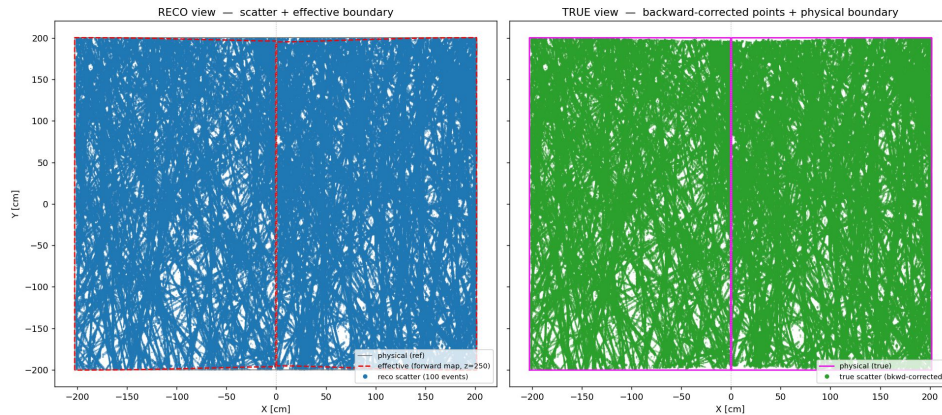
Blue: raw reco positions, where the SCE makes the charge appear to be

Green: same points after backwards SCE correction

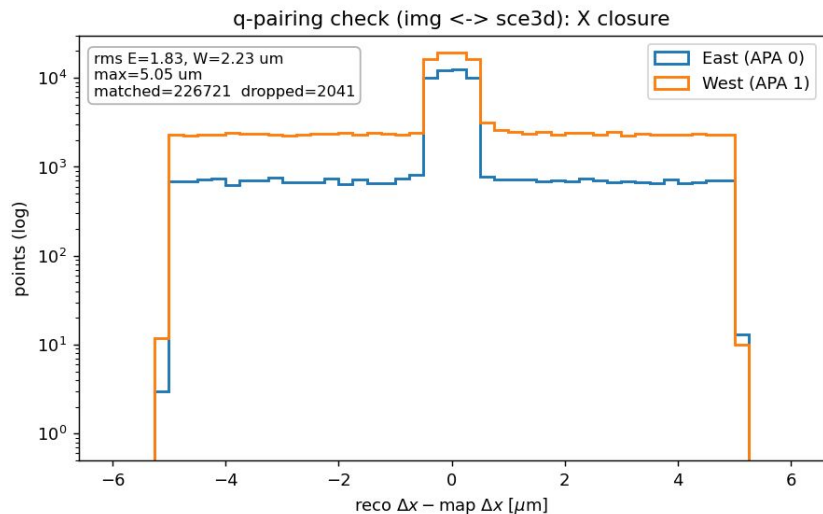
Effective boundary: where detectors walls appear to be, as distorted by SCE

# CORSIKA Cosmic Muons (n=50)

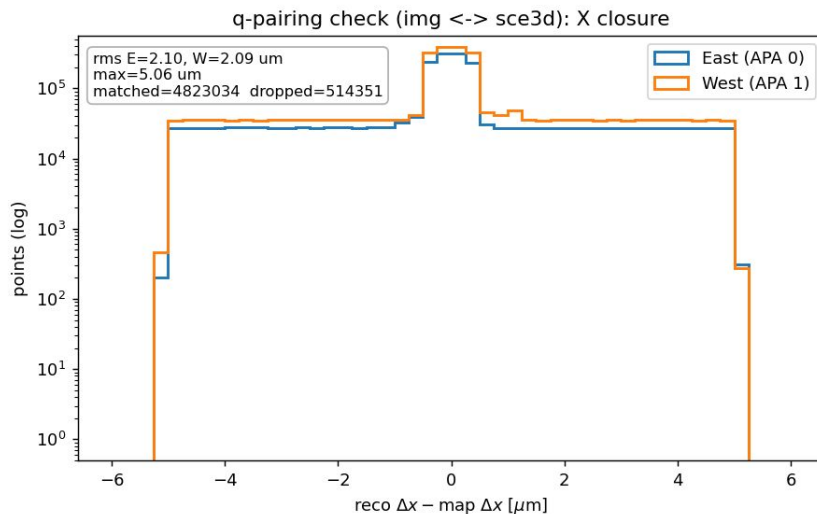
SBND SCE boundary closure — 100 events



## Cathode Crossing Muons (n=50)



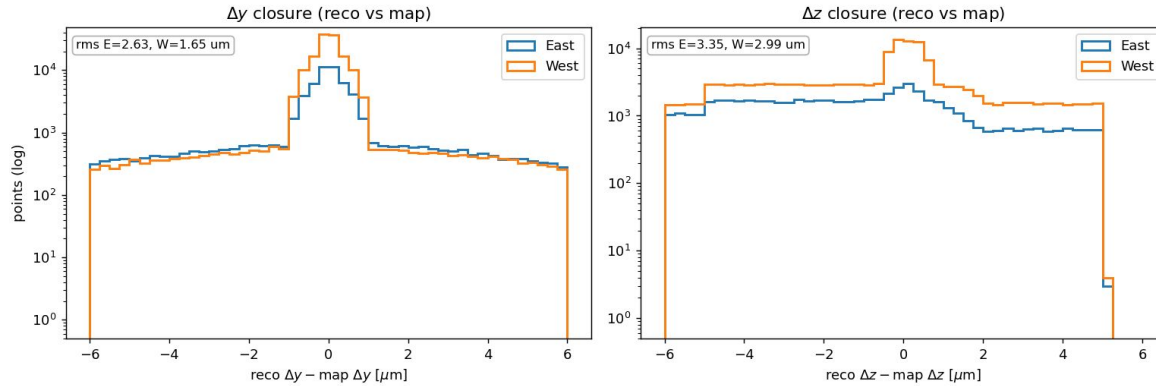
## CORSIKA Cosmic Muons (n=100)



Only 2x events but but 227k vs 4.8m matched since cosmic deposit more charge, so fewer fluctuations in cosmic sample

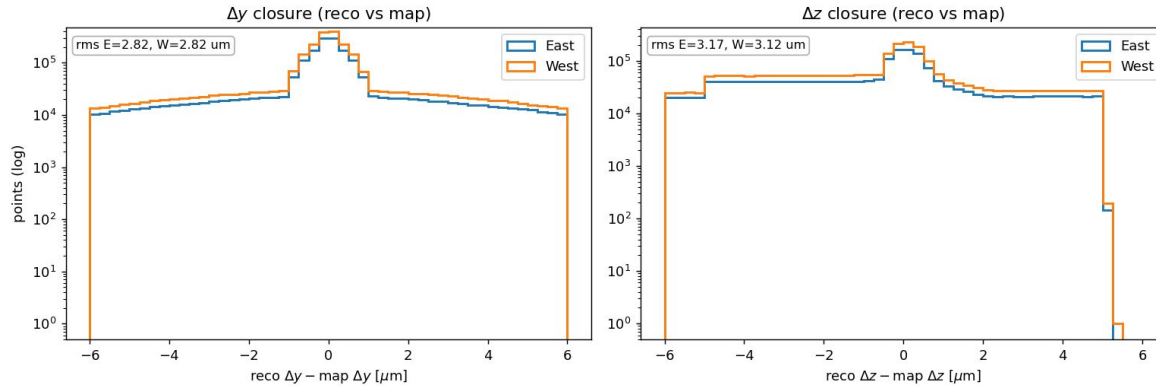
# Cathode Crossing Muons (n=50)

SCE transverse reco-vs-map per-point residual



# CORSIKA Cosmic Muons (n=100)

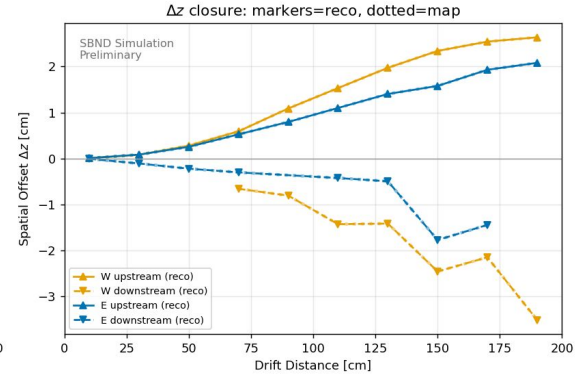
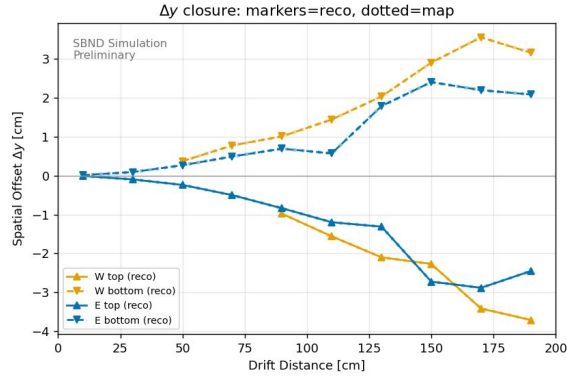
SCE transverse reco-vs-map per-point residual



Less east-west  
asymmetry in  
counts with  
cosmics as  
cosmics fill  
east-west  
evenly

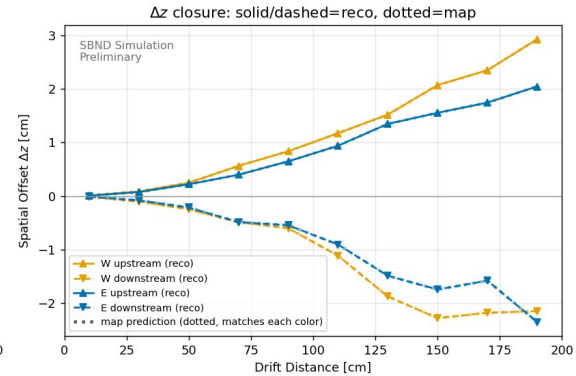
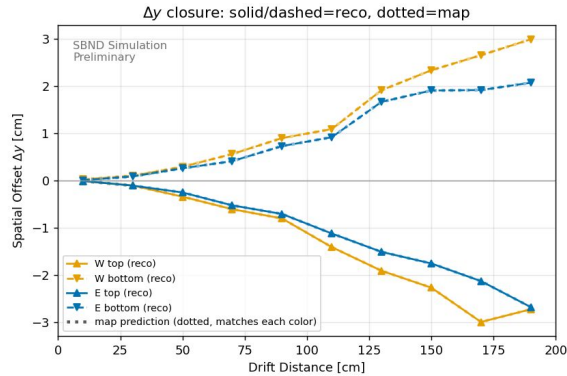
# Cathode Crossing Muons (n=50)

SBND SCE transverse closure -- reco (markers) vs map (dotted) vs drift



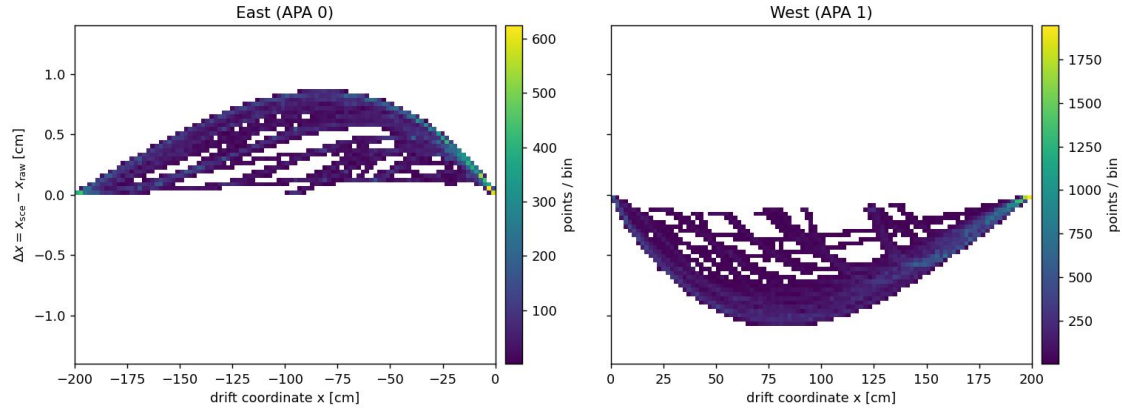
# CORSIKA Cosmic Muons (n=100)

SBND SCE transverse closure -- reco (markers) vs map (dotted) vs drift



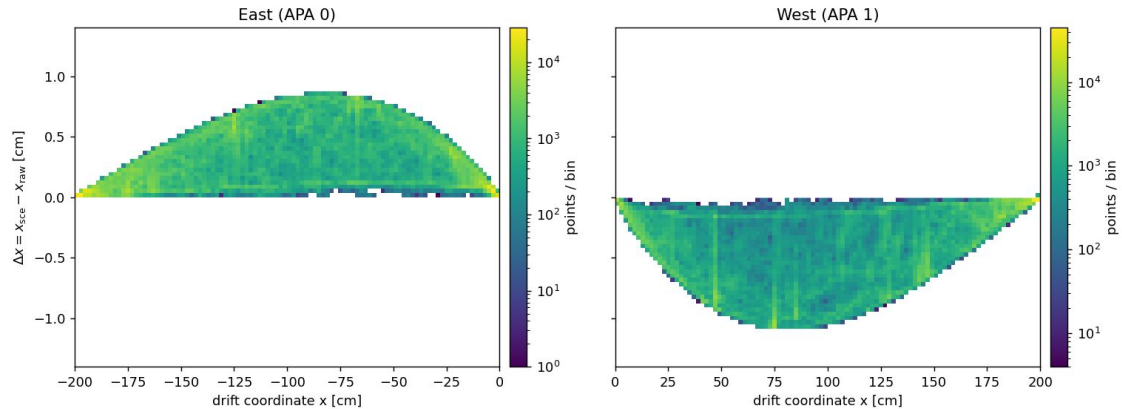
# Cathode Crossing Muons (n=50)

SCE spatial offset vs drift (50 crossing-muon events) — East  $\Delta x > 0$ , West  $\Delta x < 0$ : inward backward correction



# CORSIKA Cosmic Muons (n=100)

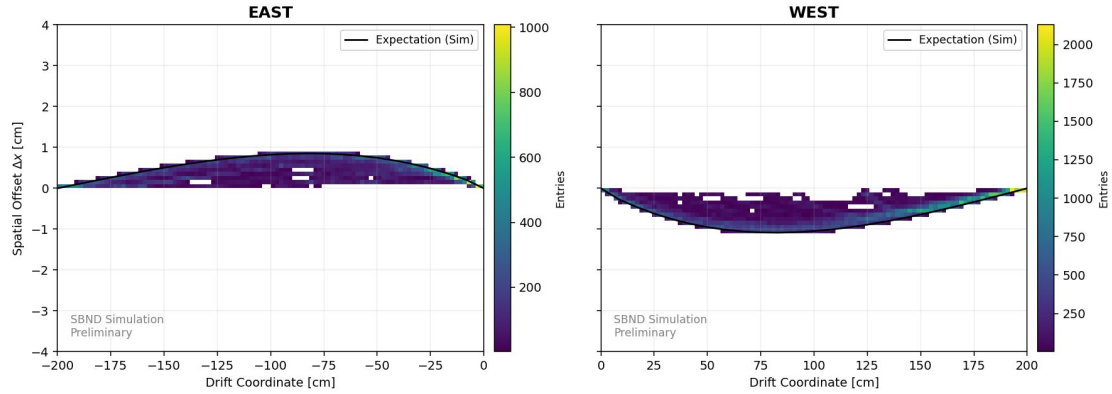
SCE spatial offset vs drift (100 events) — East  $\Delta x > 0$ , West  $\Delta x < 0$ : inward backward correction



Note log scale  
I don't think  
vertical/horizontal  
streaks mean  
much, n=100 is still  
a pretty small  
sample

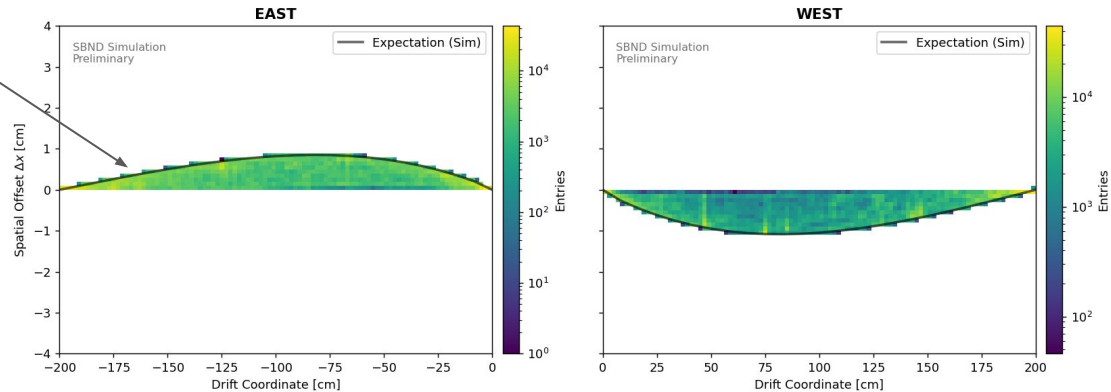
# Cathode Crossing Muons (n=50)

Spatial Offsets (Raw) with simulation expectation overlay

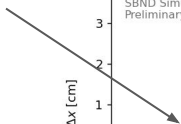


# CORSIKA Cosmic Muons (n=100)

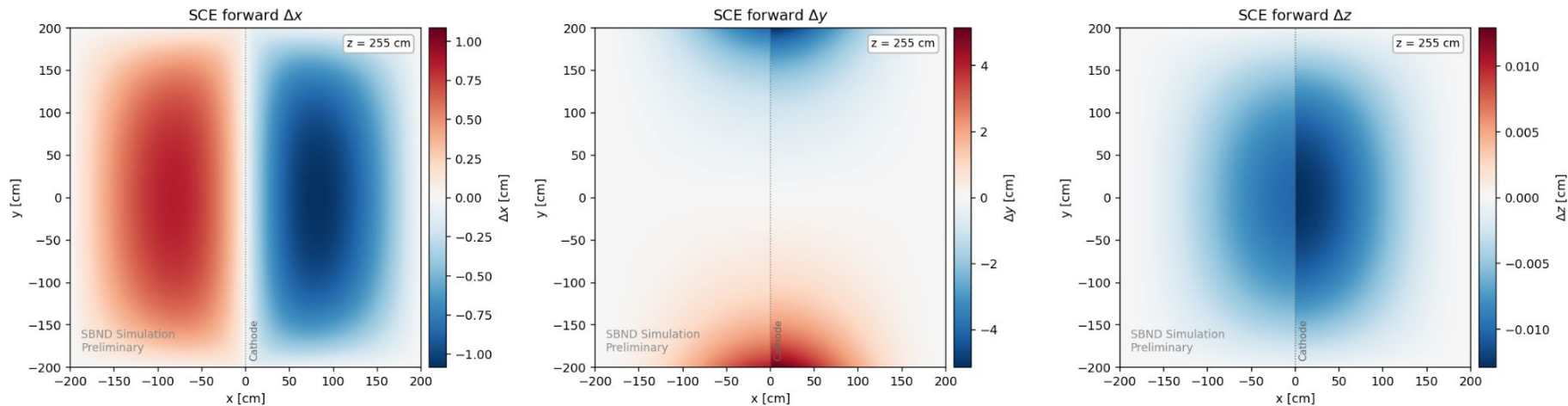
Spatial Offsets (Raw) with simulation expectation overlay



Expectation at  
central y, z



SBND SCE dualmap — end-view forward displacements at  $z = 255$  cm

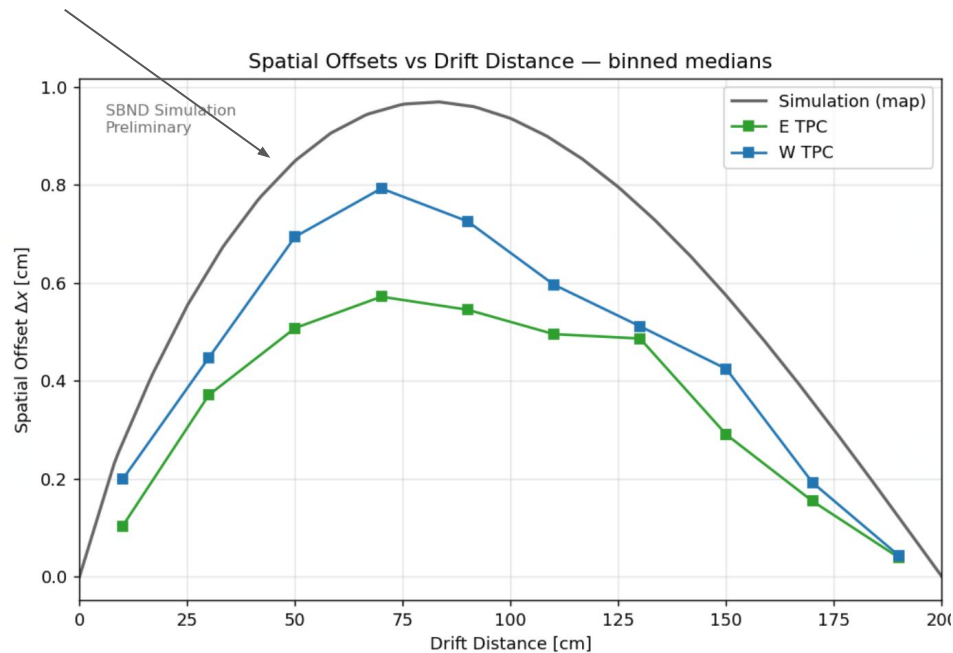
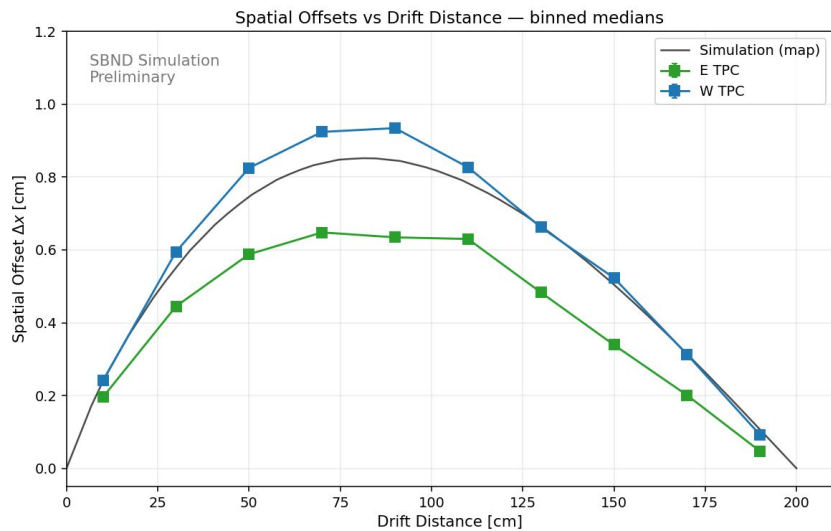


Corrected scale on right plot, just very small delta z correction

# Cathode Crossing Muons (n=50)

# CORSIKA Cosmic Muons (n=100)

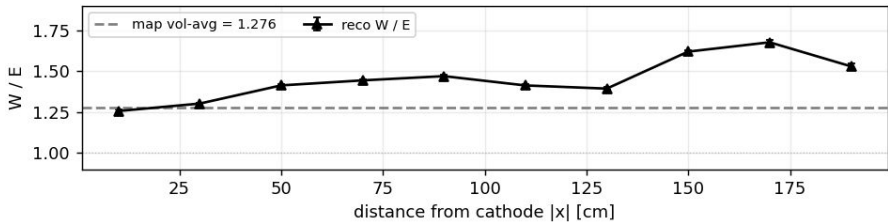
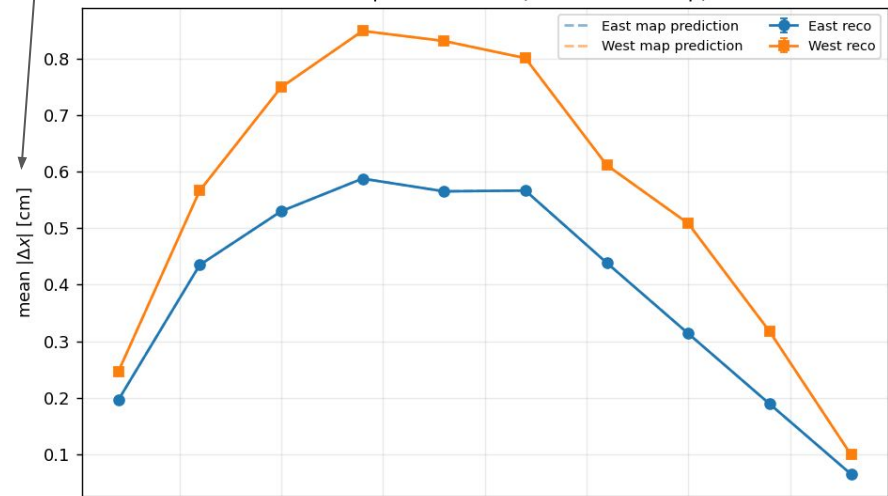
y=0, z = 250 correction



# Cathode Crossing Muons (n=50)

Difference b/w this and last plot is mean vs median

SCE offset profile vs drift (reco vs TH3 map)



# CORSIKA Cosmic Muons (n=100)

SCE offset profile vs drift (reco vs TH3 map)

