Mapping the Asymmetry in the SAA Fluxes Using the Medipix Particle-by-Particle Directional Information

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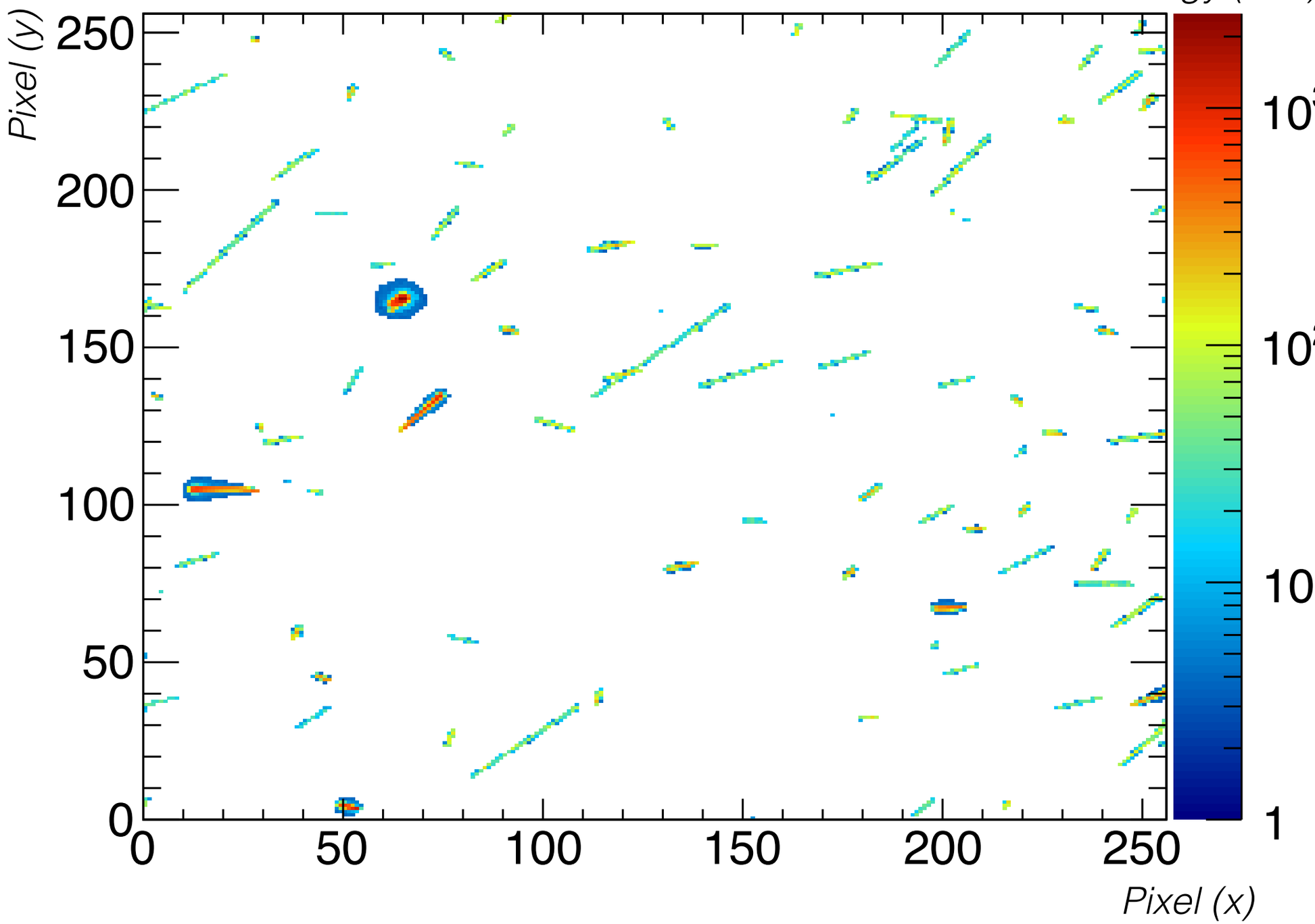
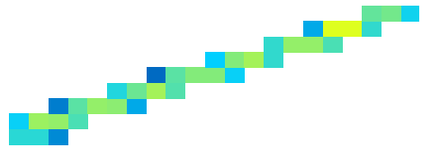
0.5s in South Atlantic Anomaly, Wed Apr 02 2014
12:24:03 Dose Rate = 30 uSv/hr

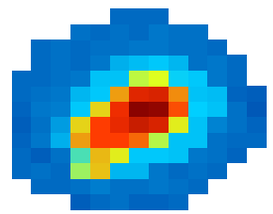


Probably…

Slow Proton

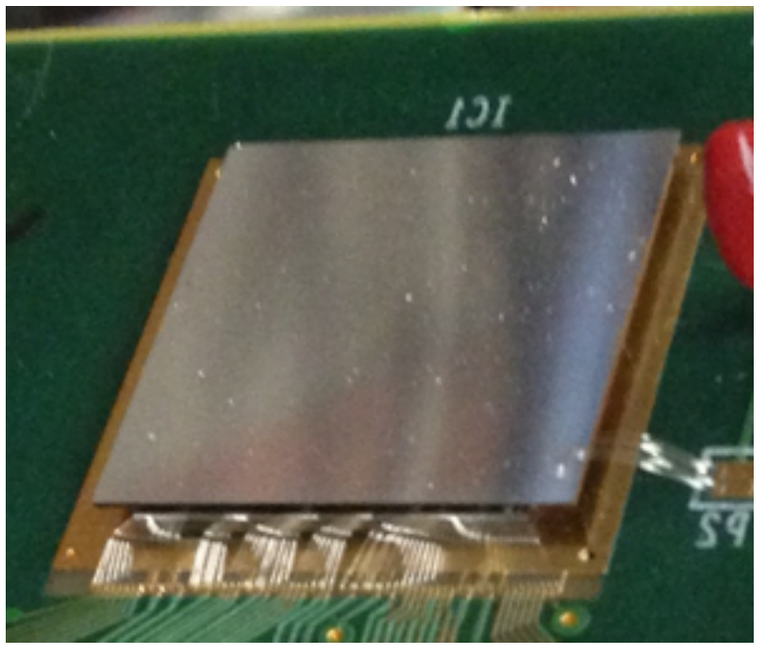


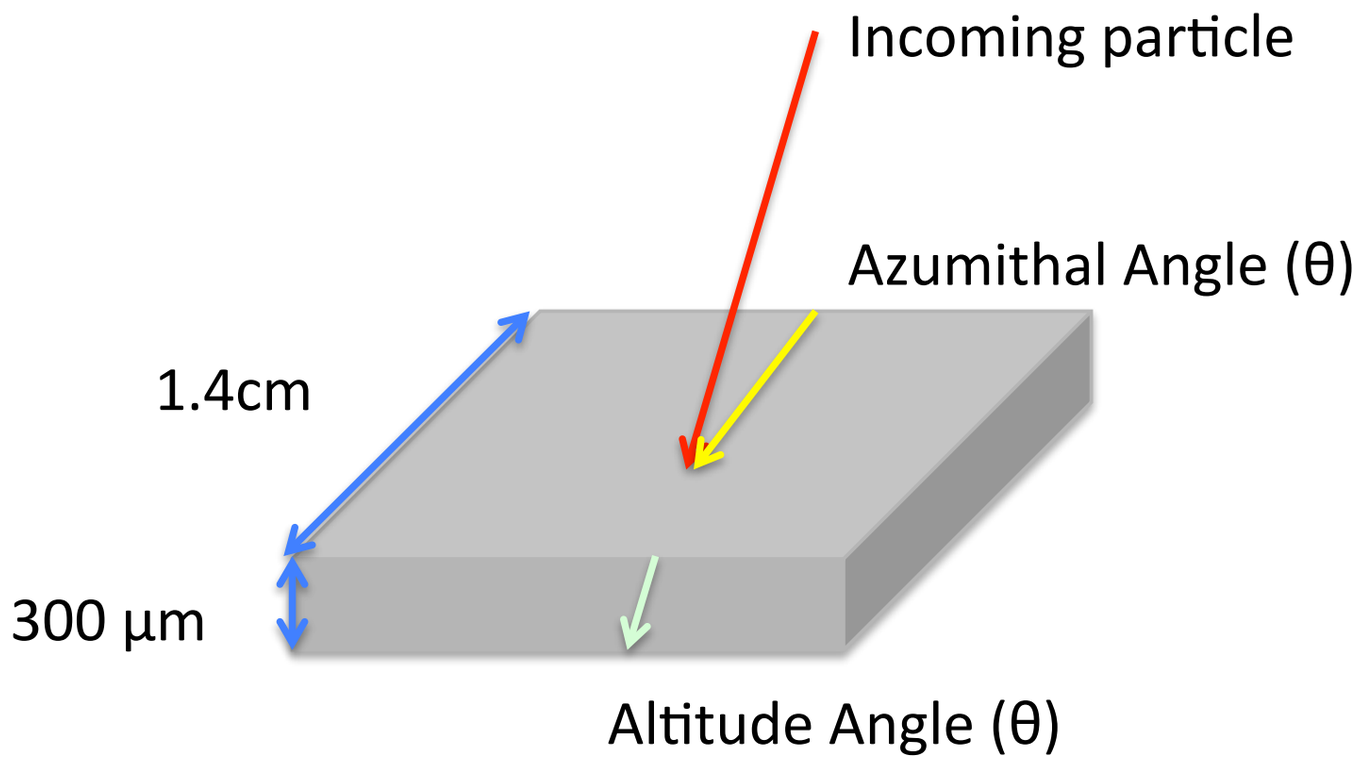
Fast Proton



Fast Alpha

Calculation of Track Angles in Timepix

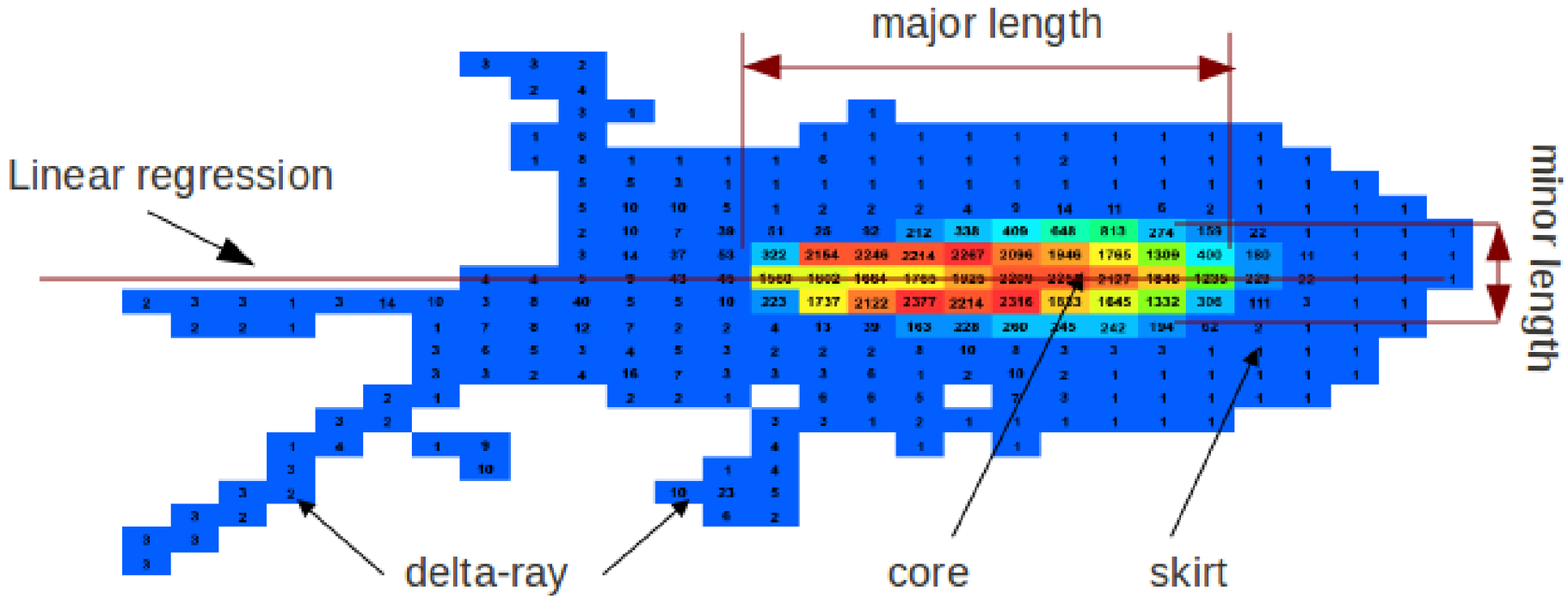




- 4π view of sky, 1π discrimination (slope cannot tell up from down, projection of a line symmetric around 180 degrees)

- Assumption of sensor penetration for slope, work on corrections for stopping protons in progress.

Slope Calculation for Heavier Tracks



$$\tan(\phi) = \frac{55}{T}\left(\text{major} - \frac{\text{minor} - 1.5}{\text{major} + 1}.\text{minor}\right)$$

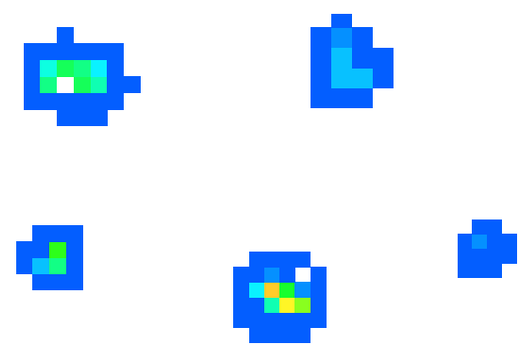
“LET Estimation of Heavy Ion Particles based on a Timepix- Based Si Detector”, Hoang et al (2012)

Caveats - Limitations of Angular Discrimination

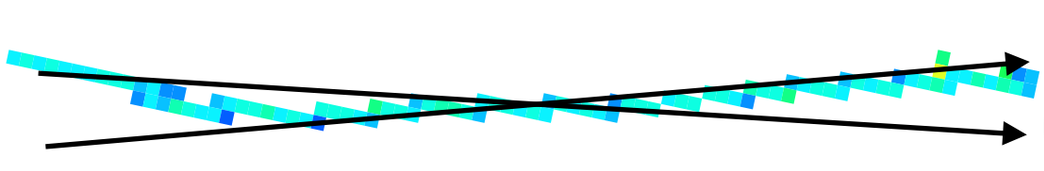
- Limits of around 15 degrees on θ for low ϕ

- Detectors move around

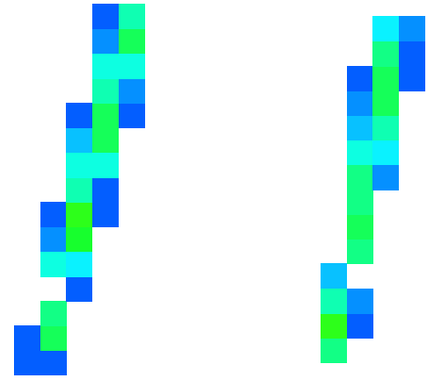
- Detectors change their view of the sky



Low ϕ (perpendicular) tracks (poor θ discrimination)



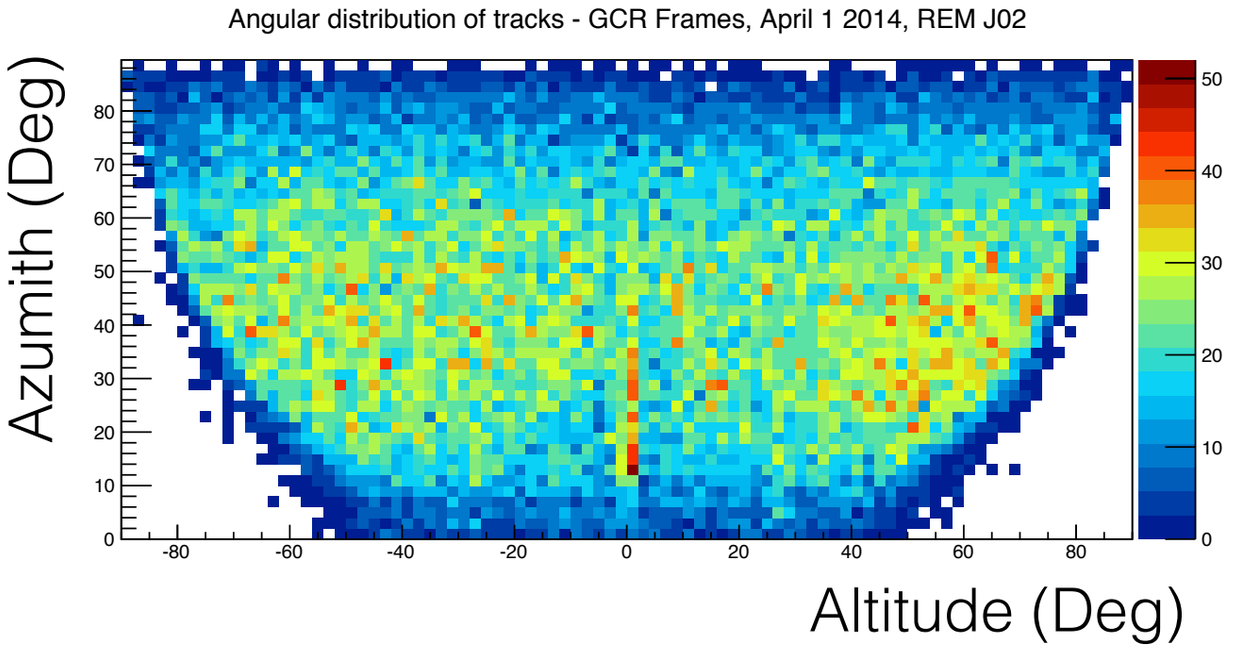
Angular space wraps in the timepix

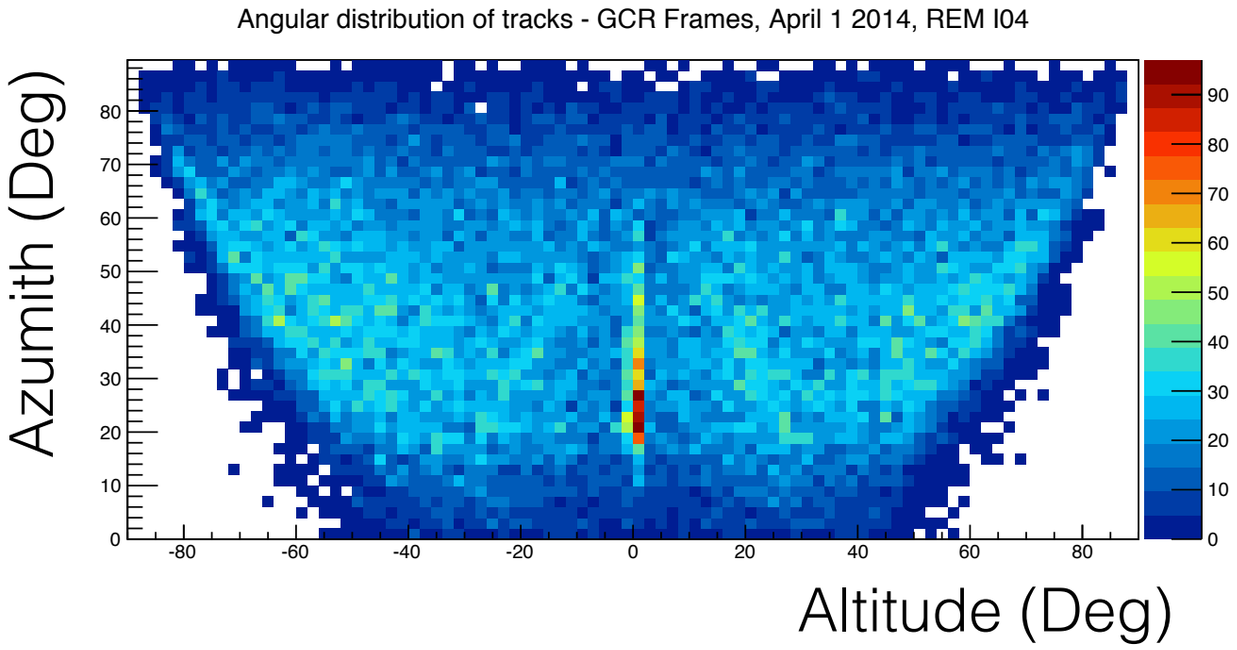


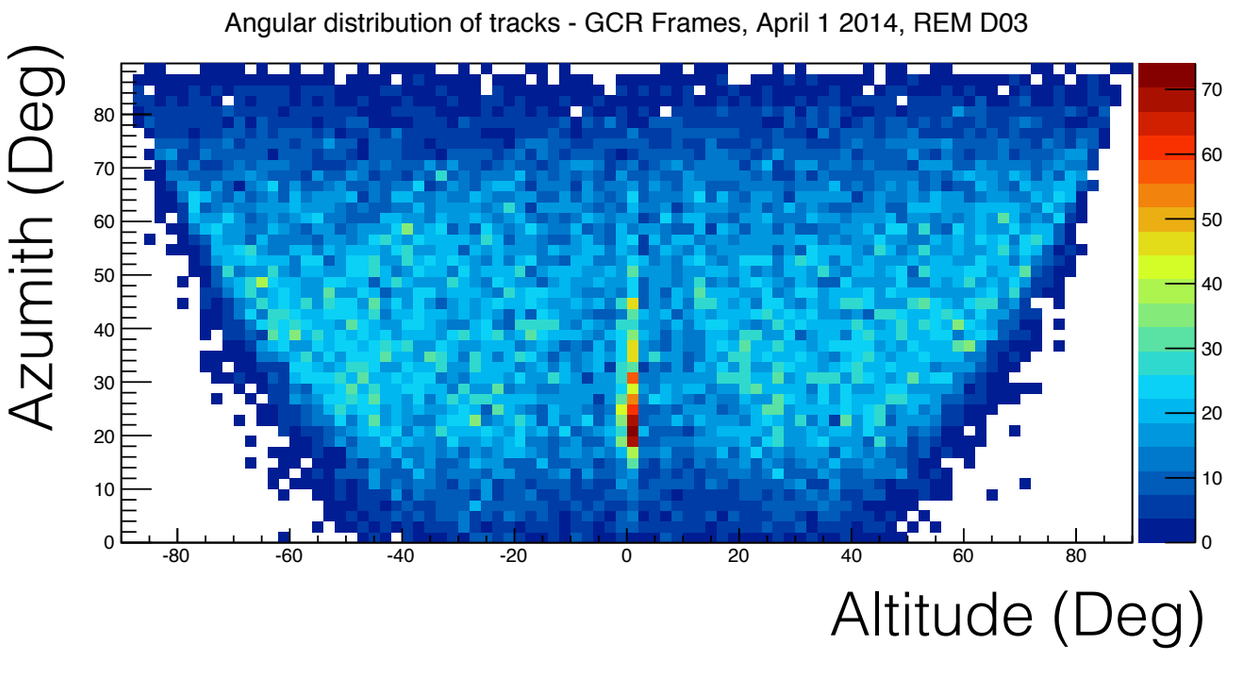
High ϕ tracks (good θ discrimination)

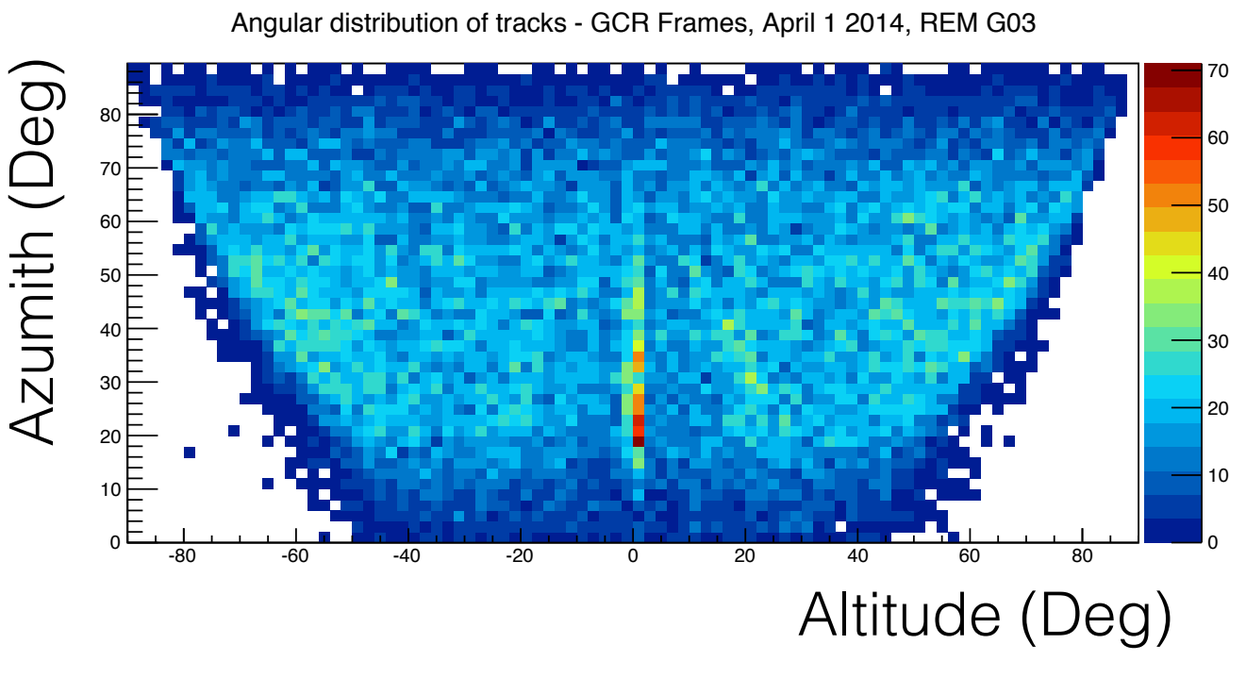
GCR Angular Distributions 1st April 2014

500 um unit



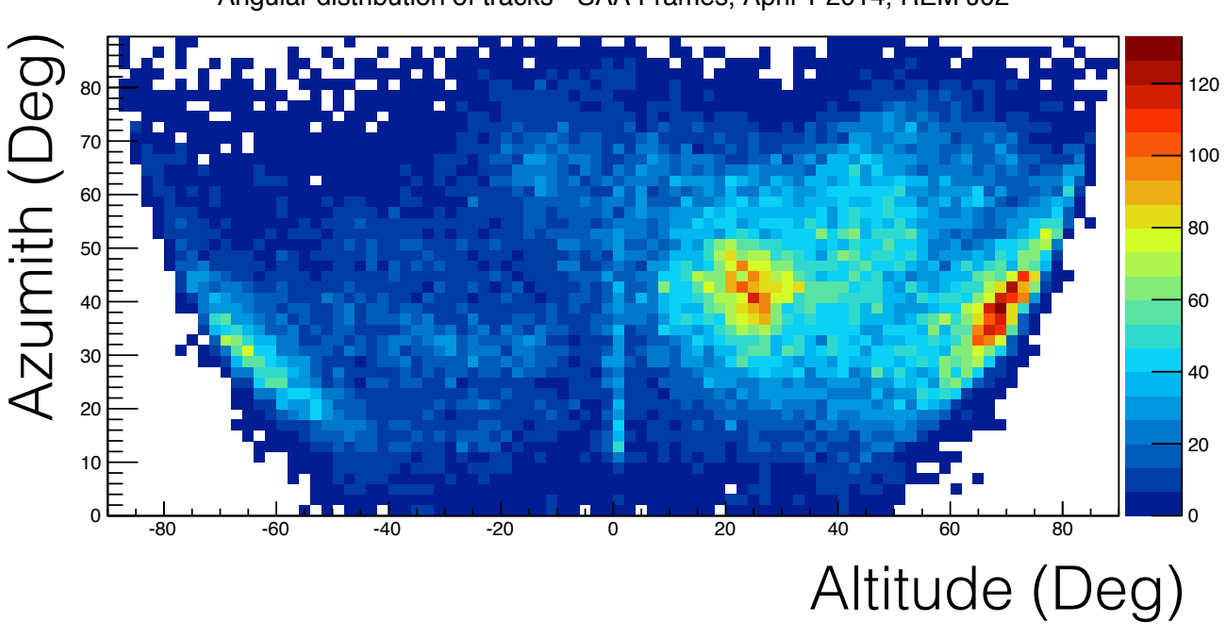


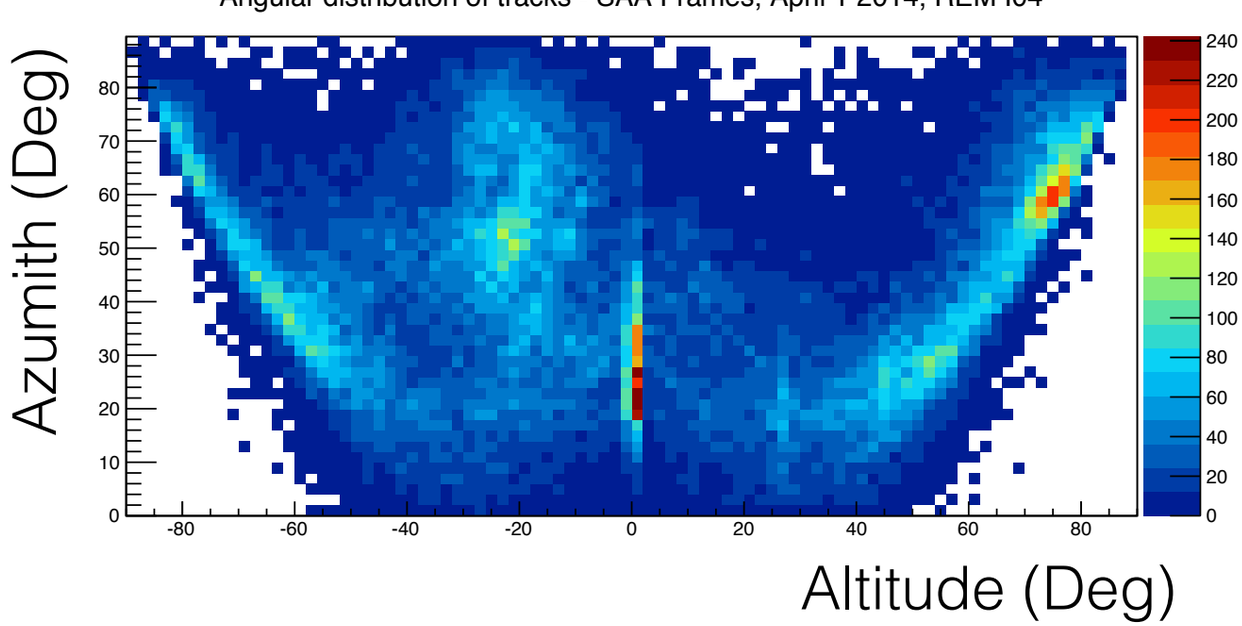


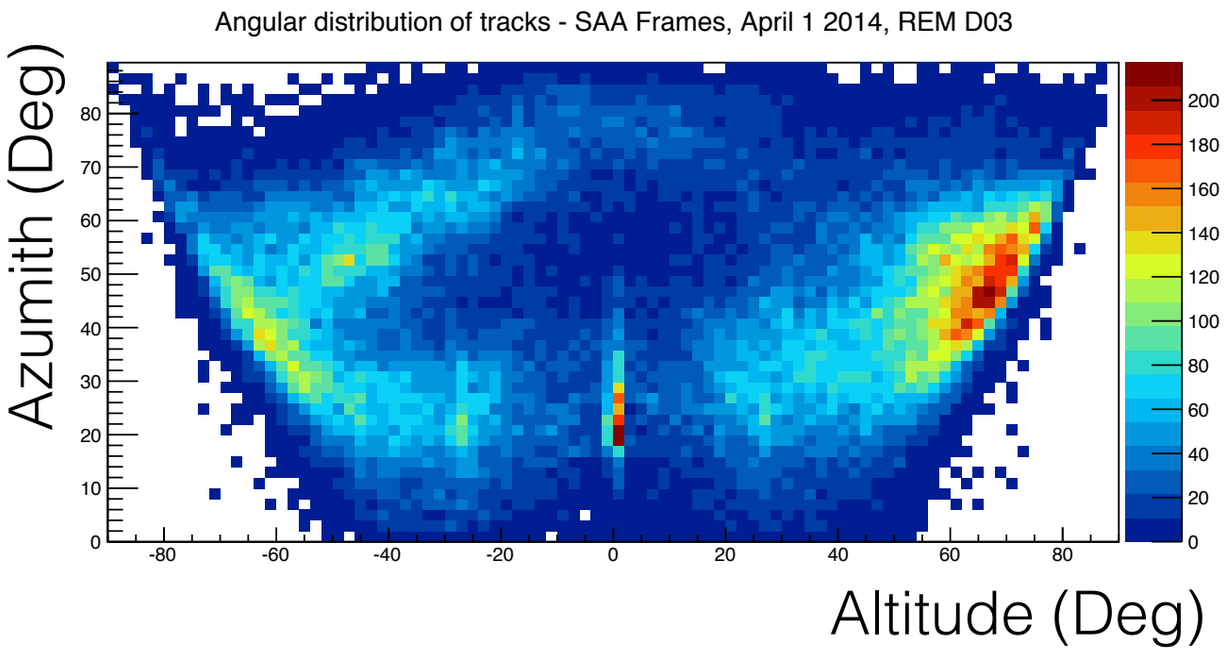


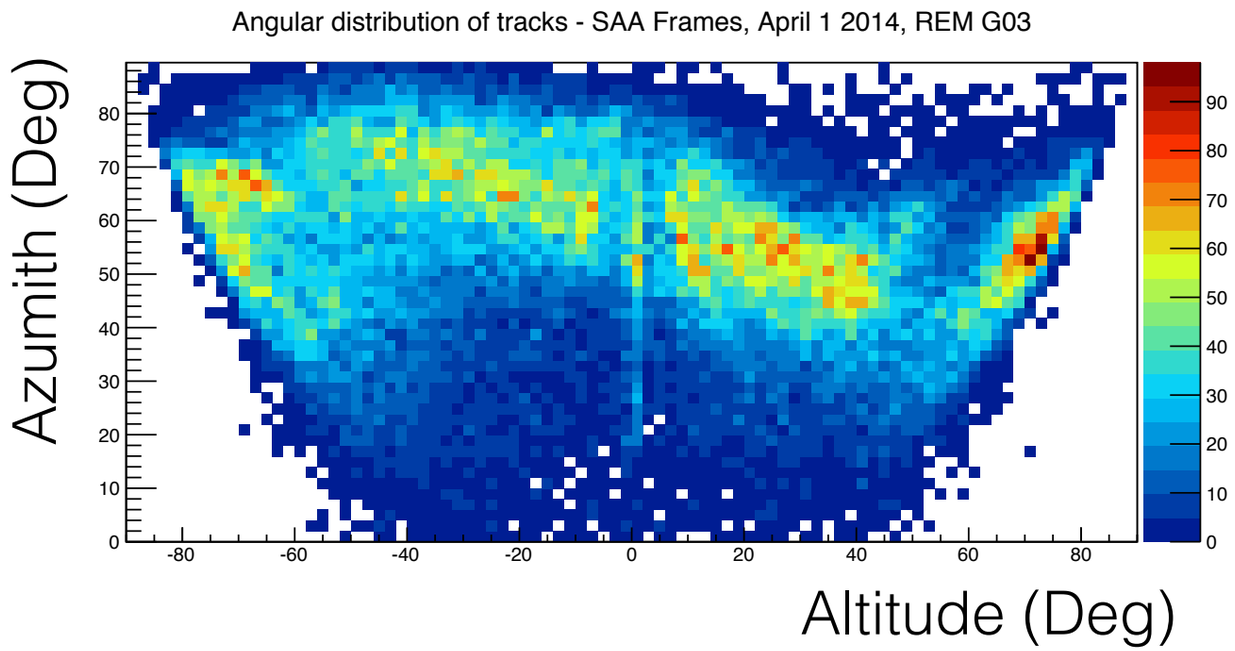
SAA Angular Distributions 1st April 2014

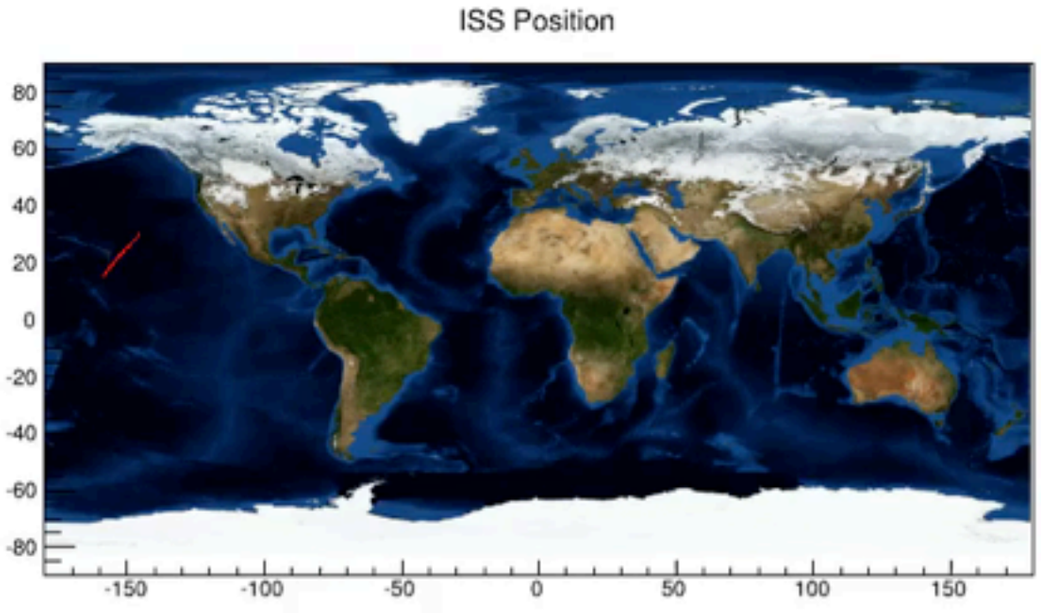
500 um unit

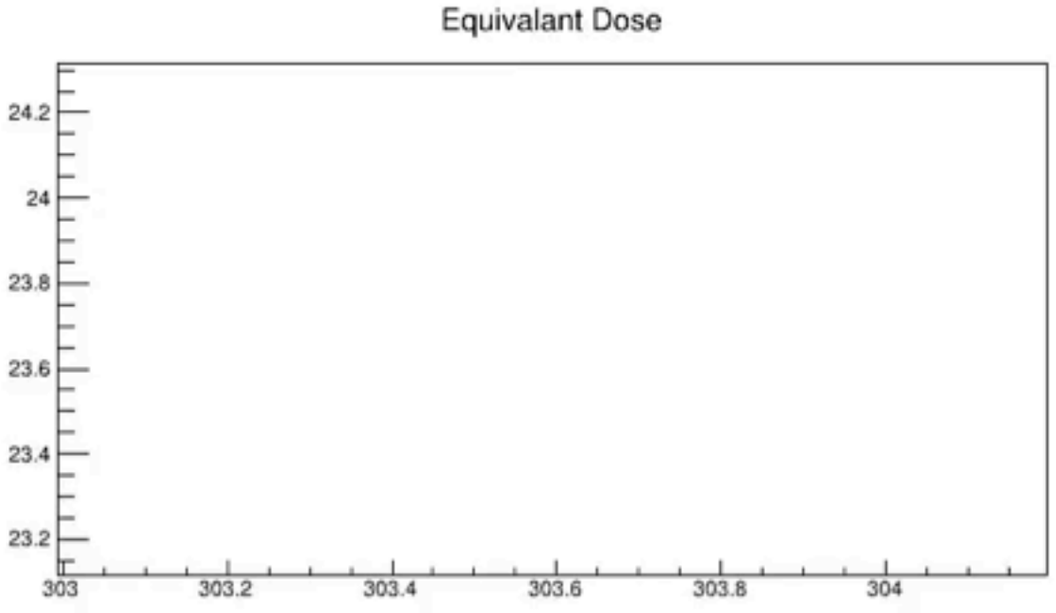


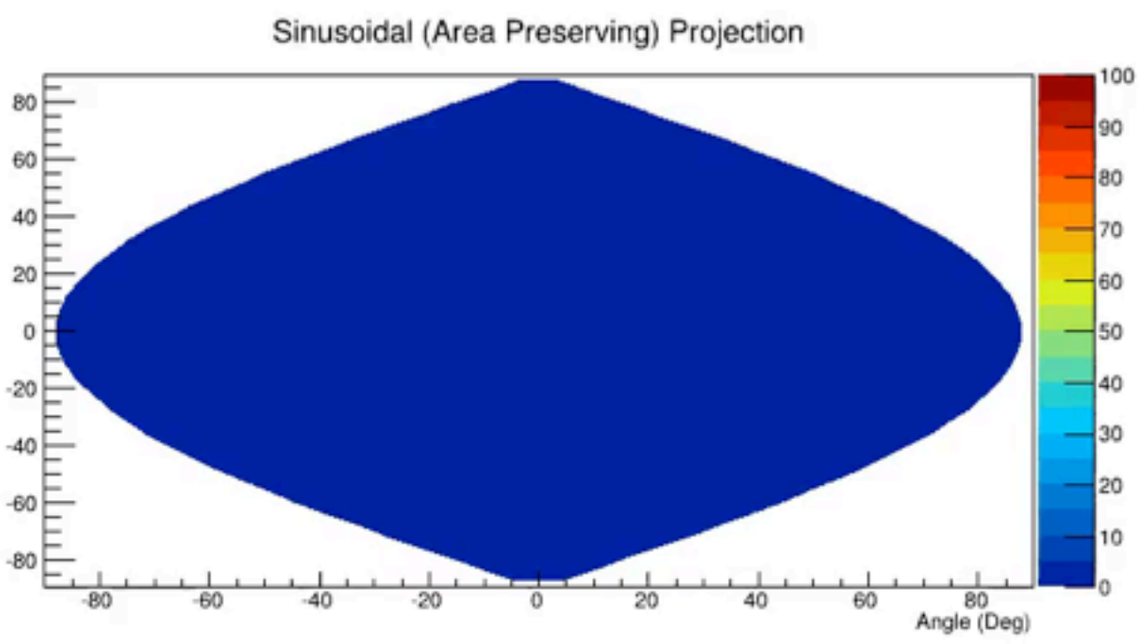


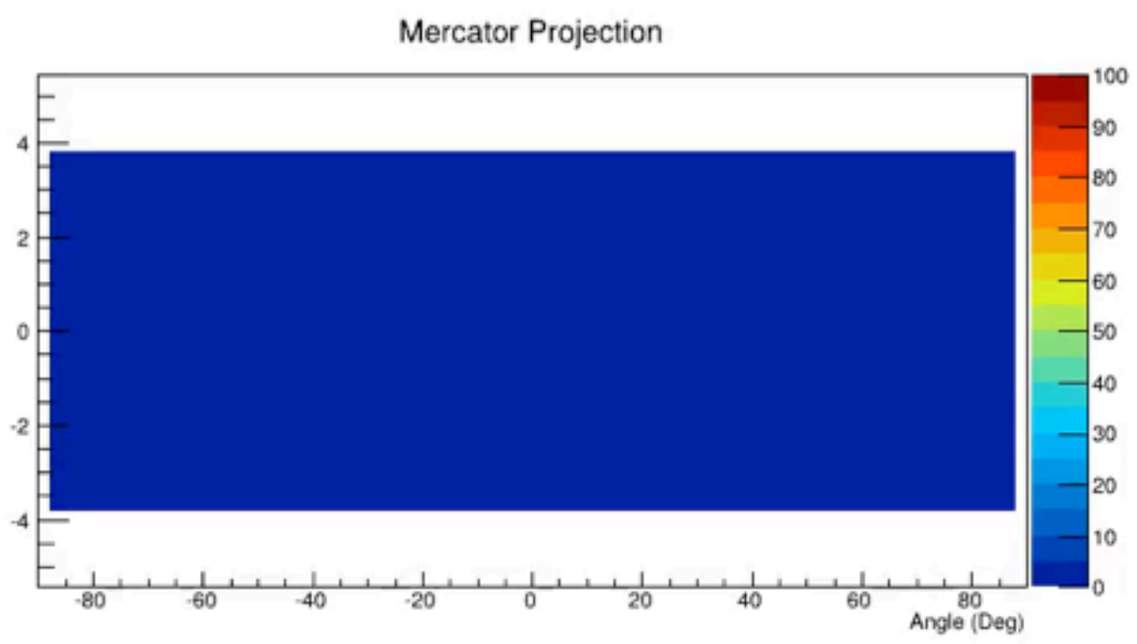






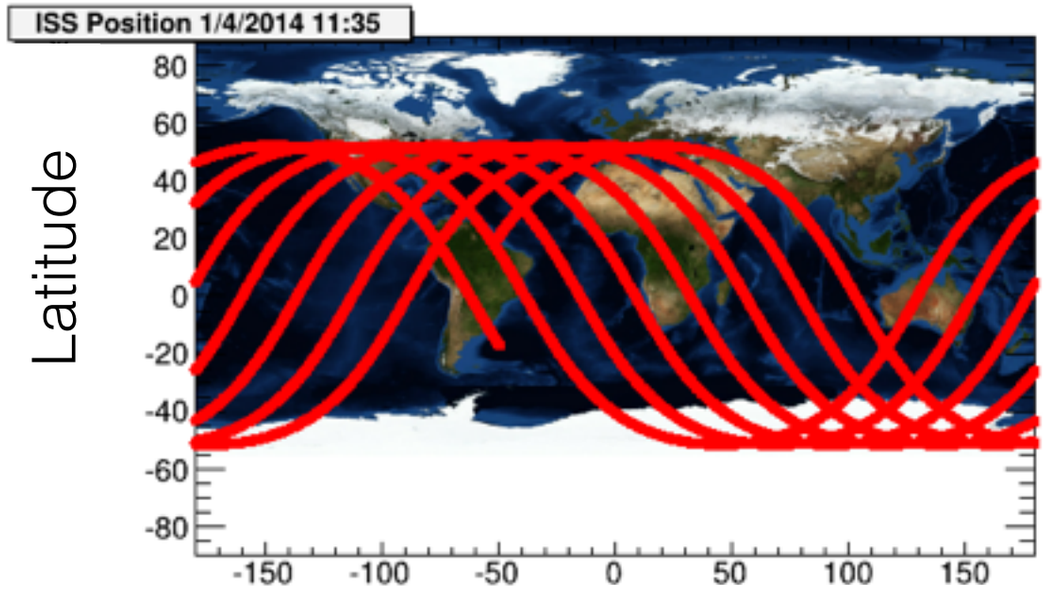


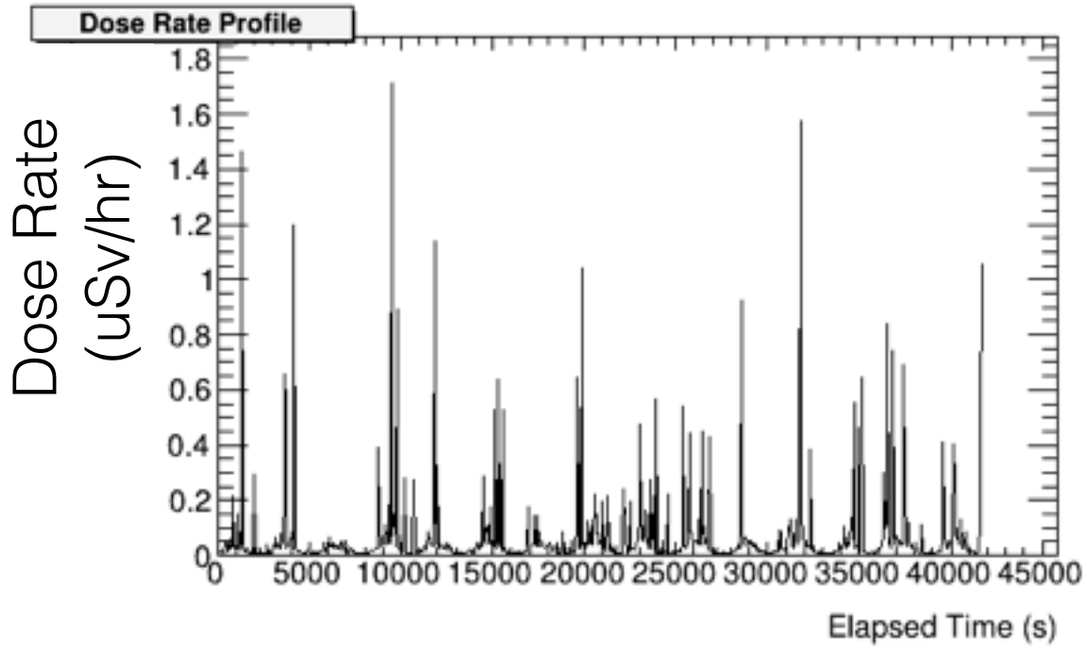


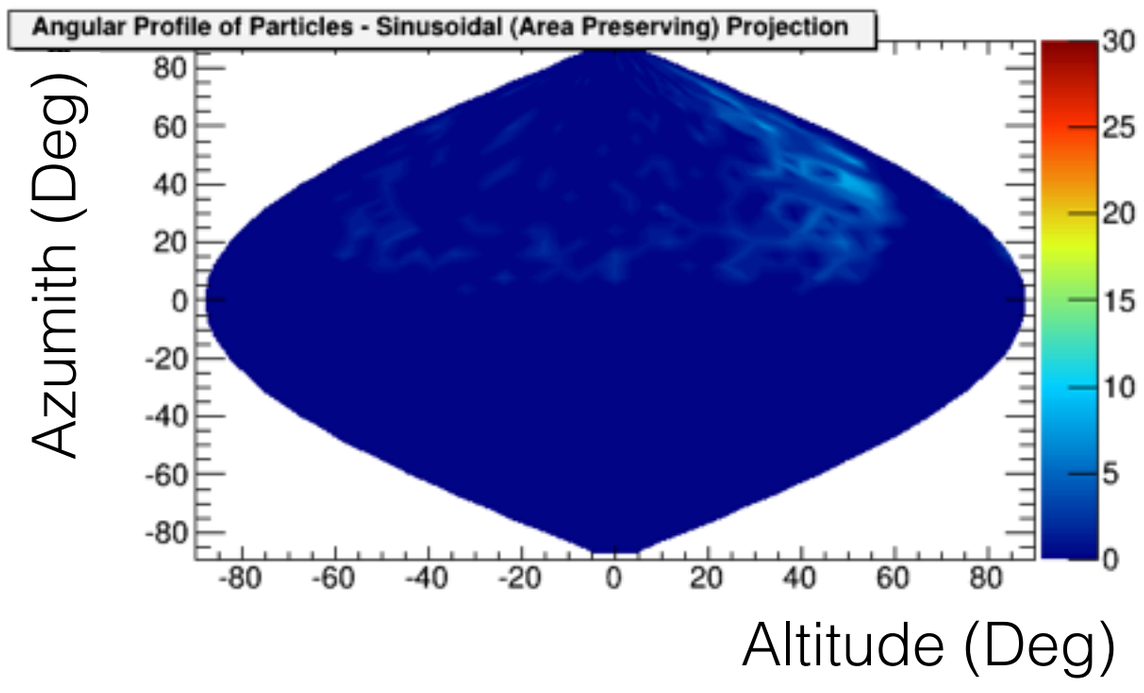


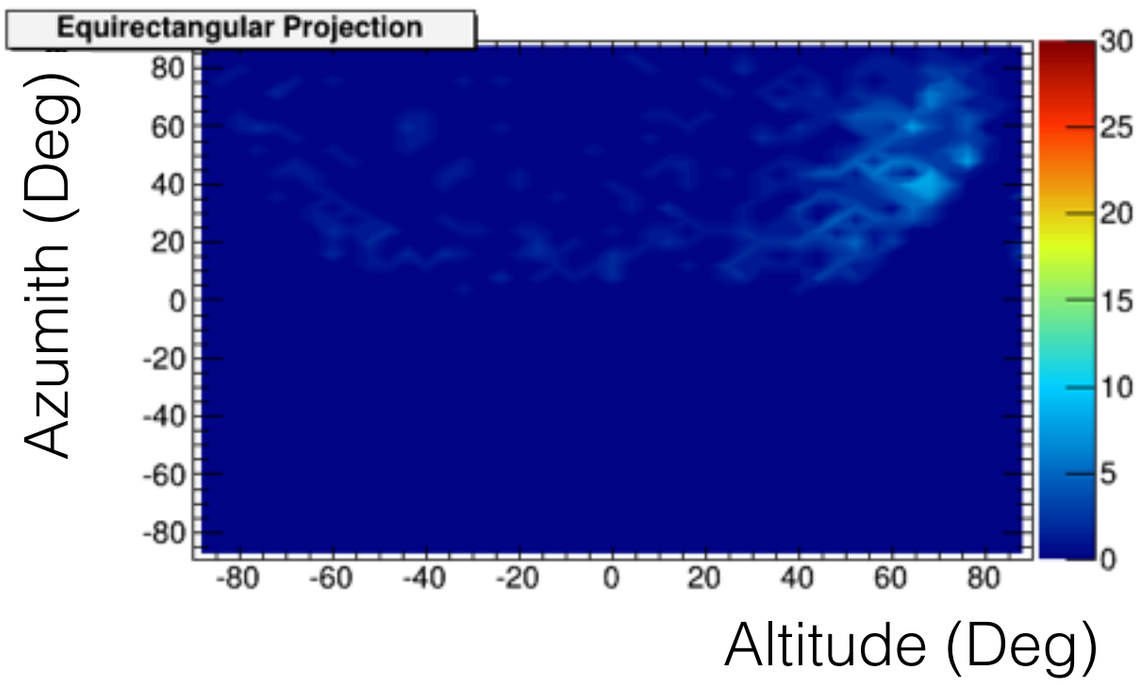
https://dl.dropboxusercontent.com/u/46291346/SAA_20_4_2013.mp4

One Pass, April 1st 2014









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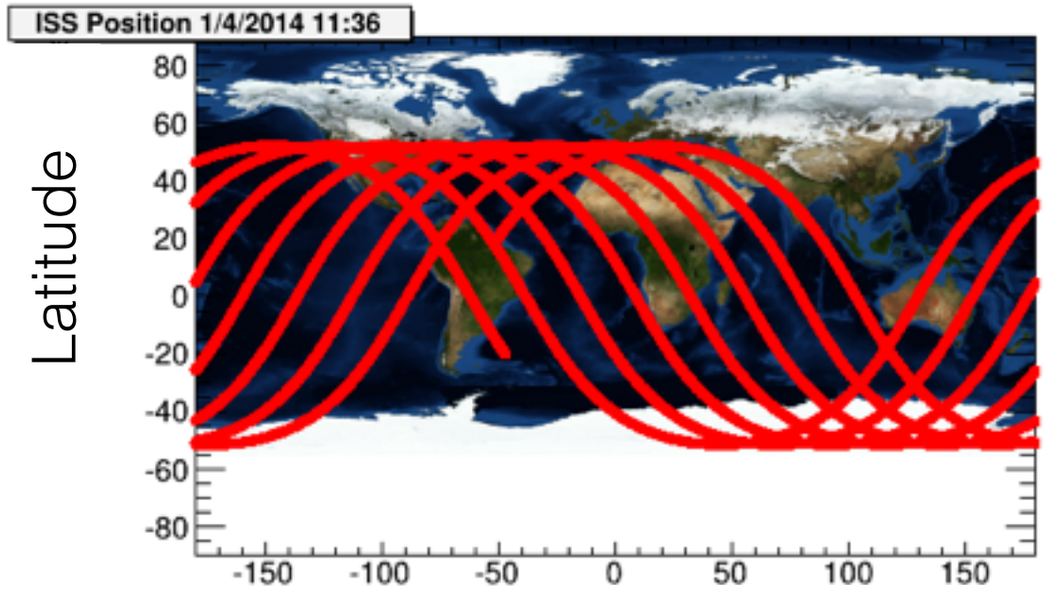

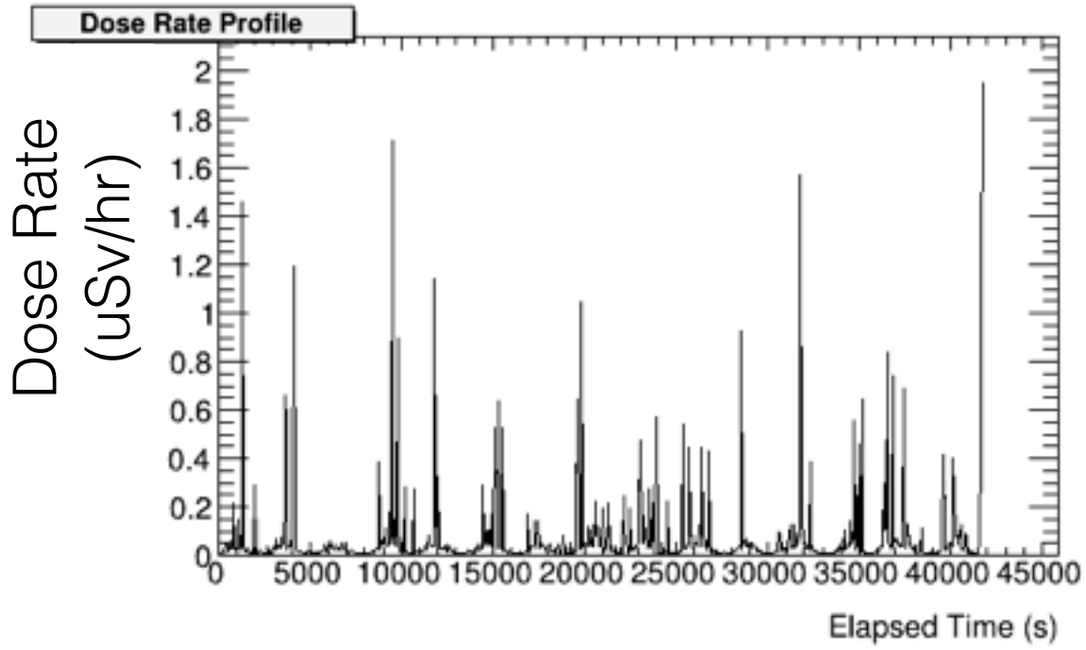

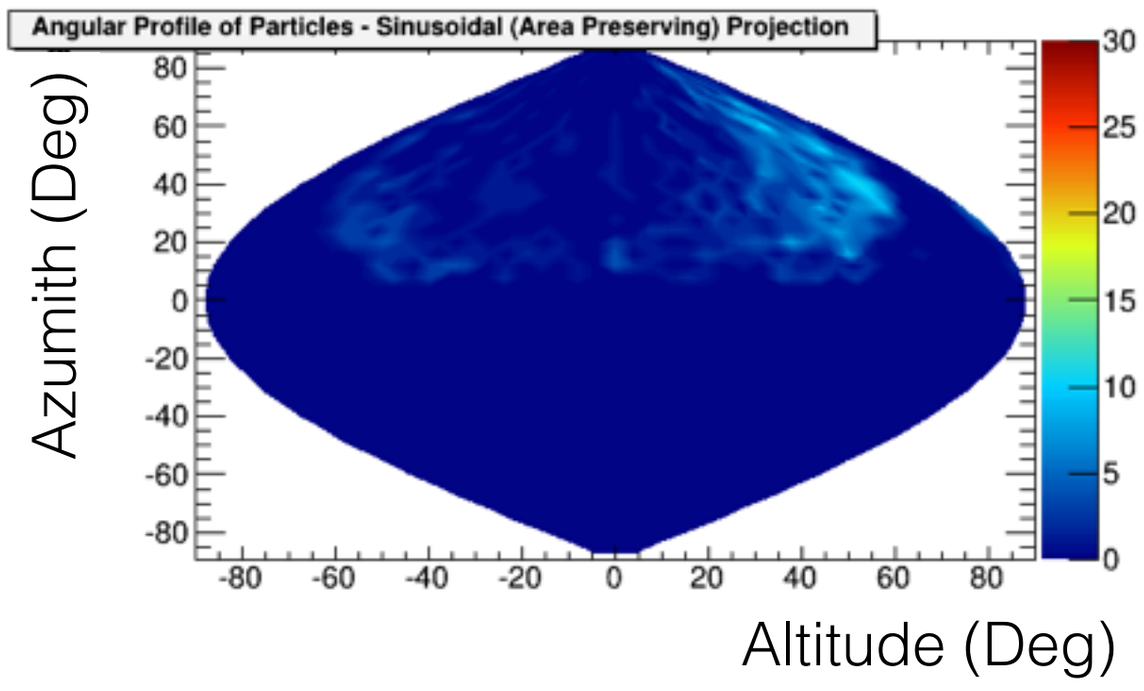

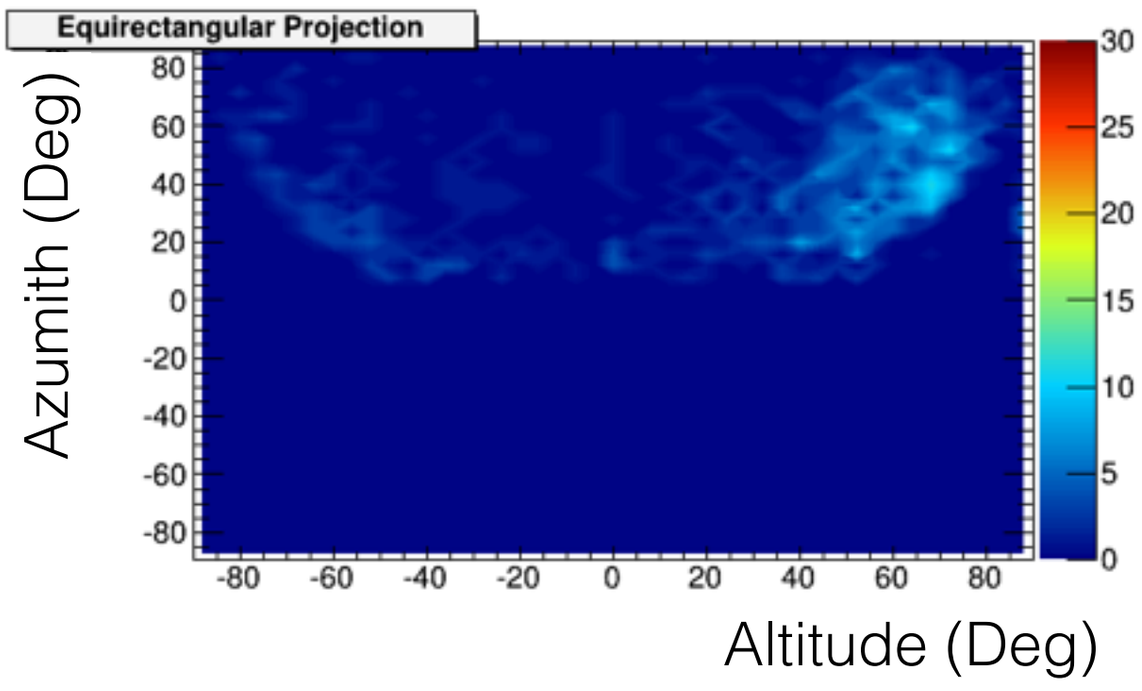

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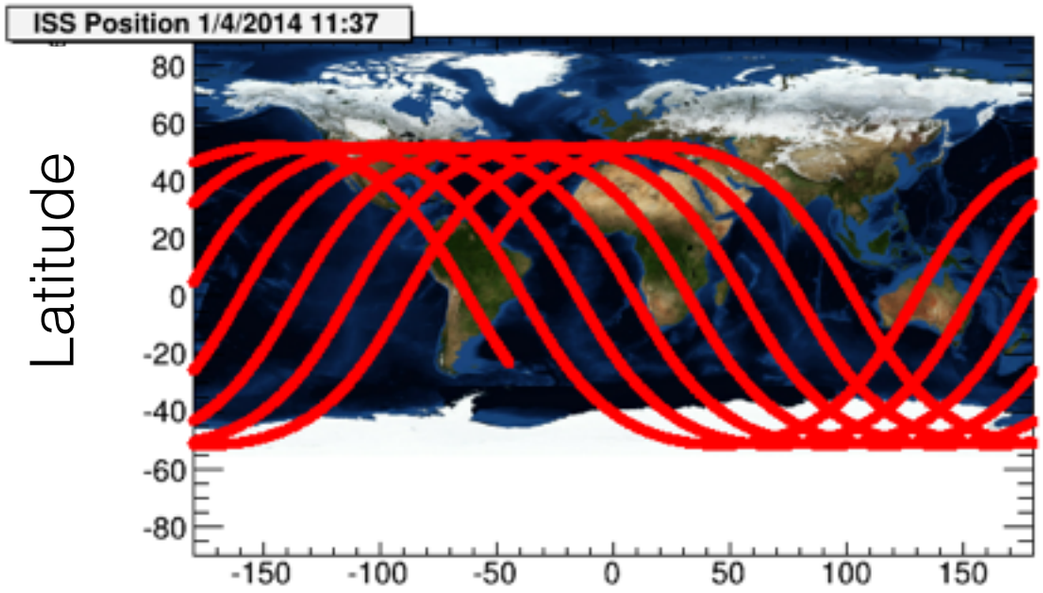

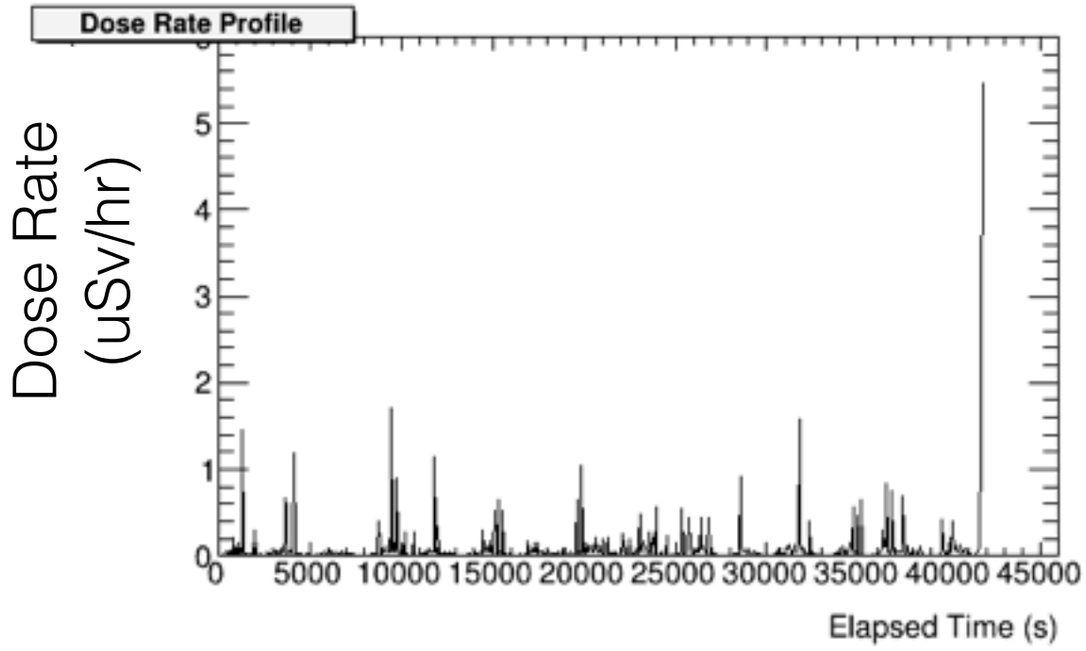

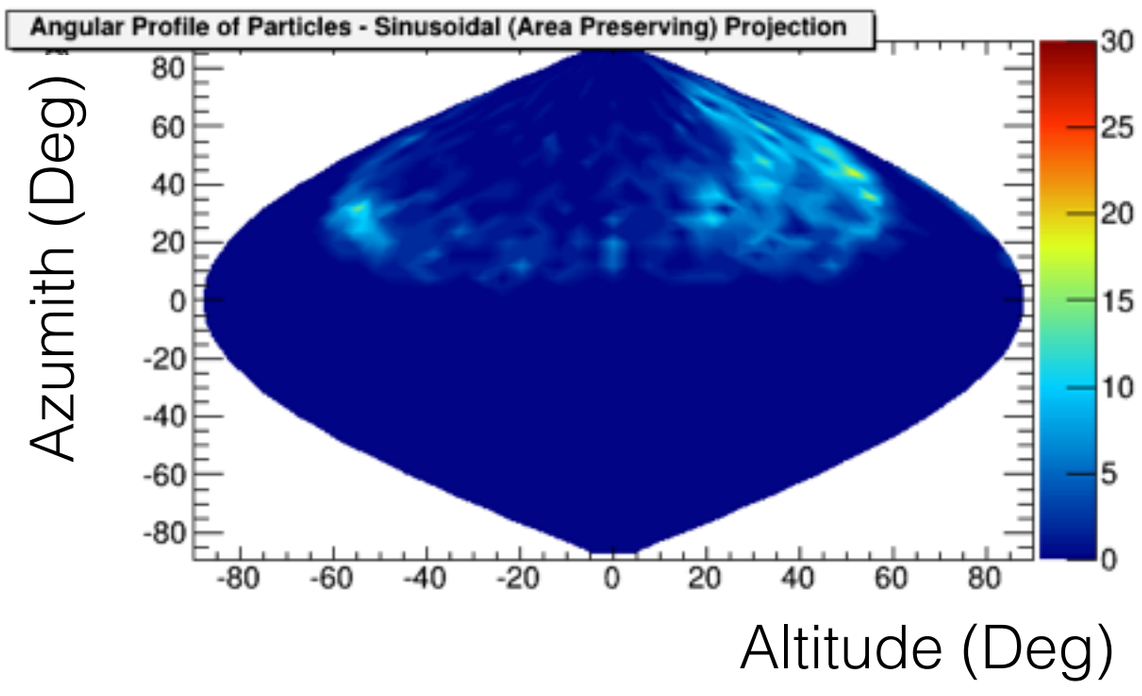

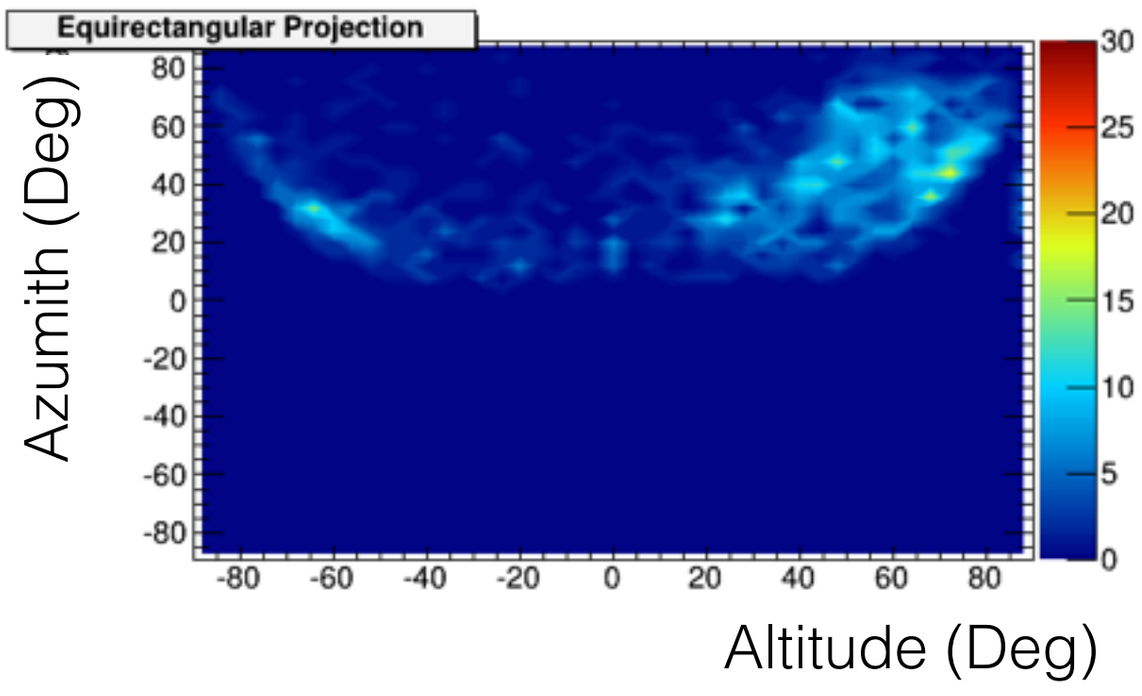

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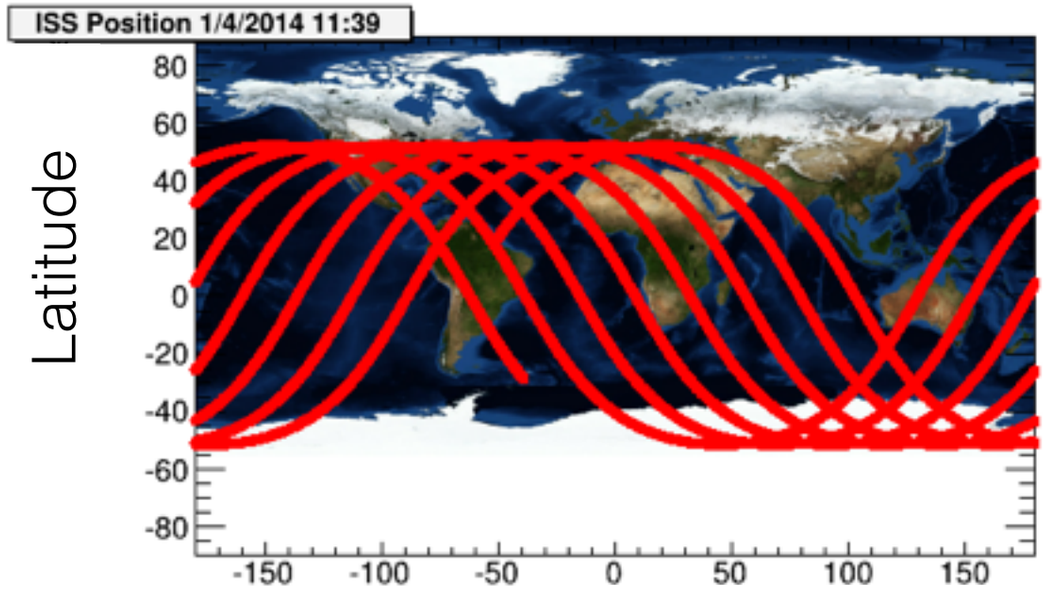

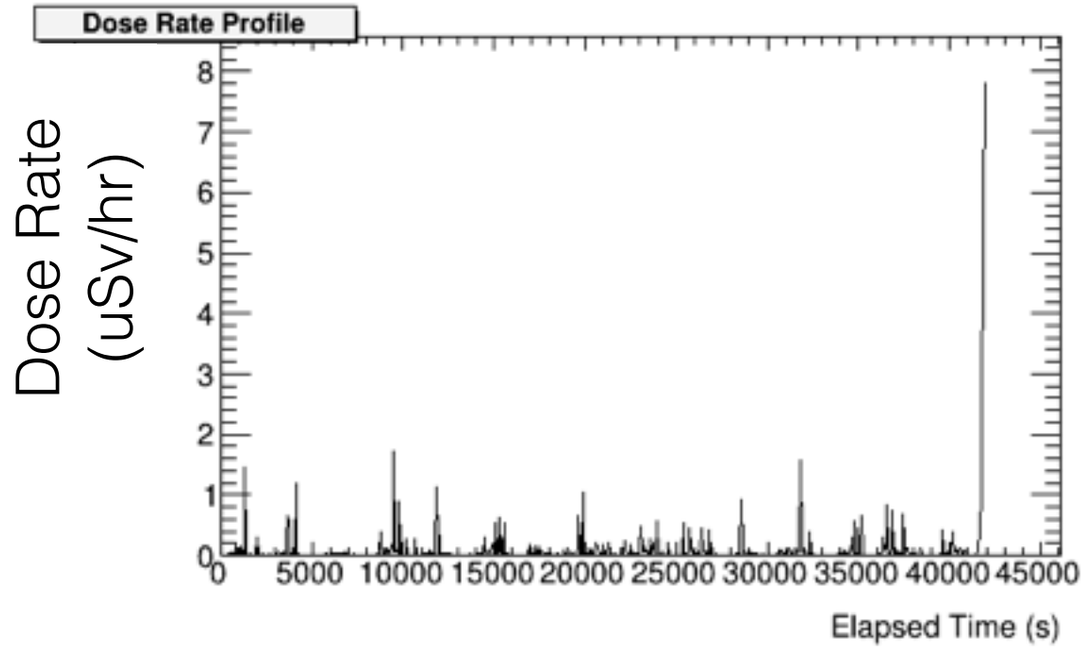

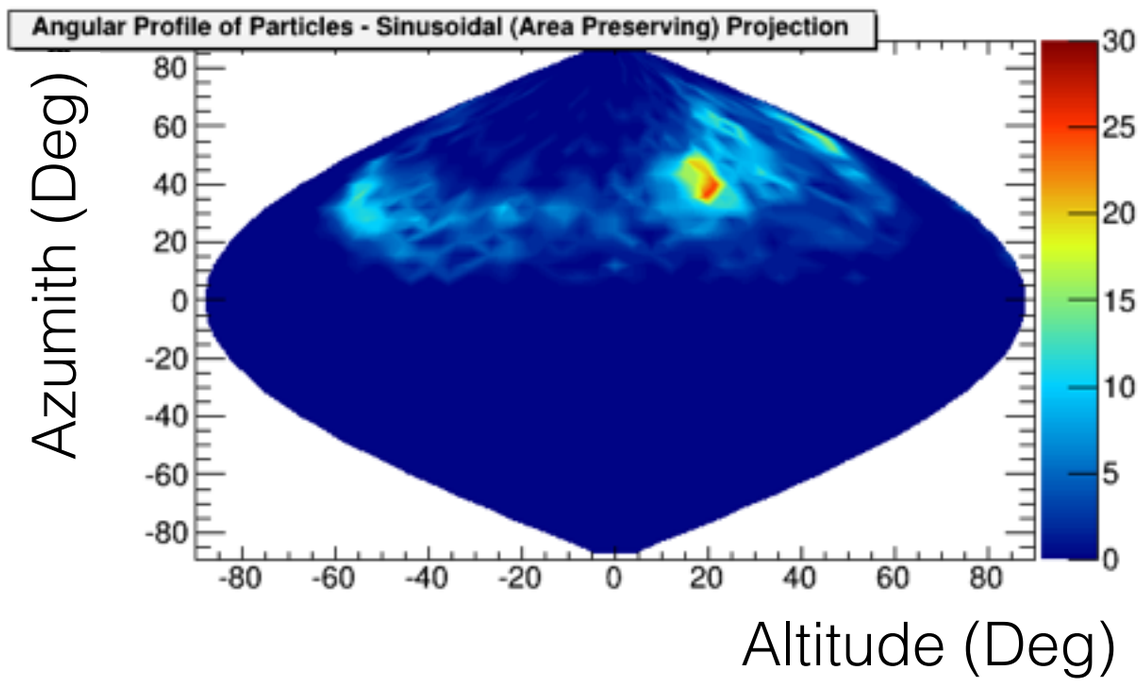

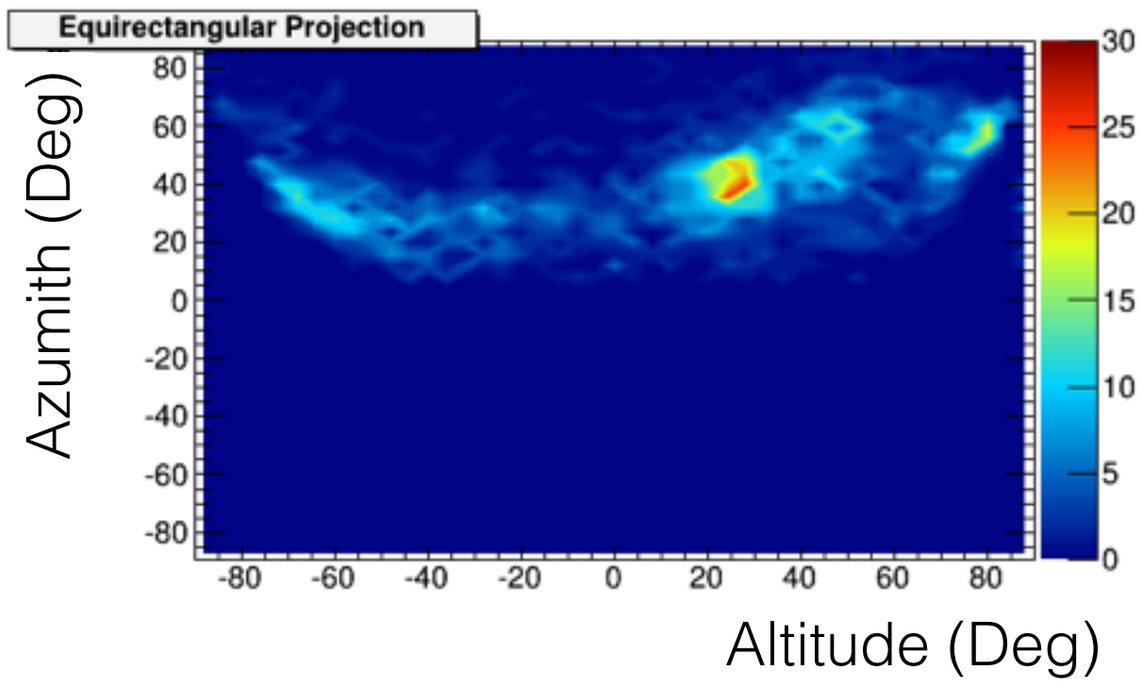

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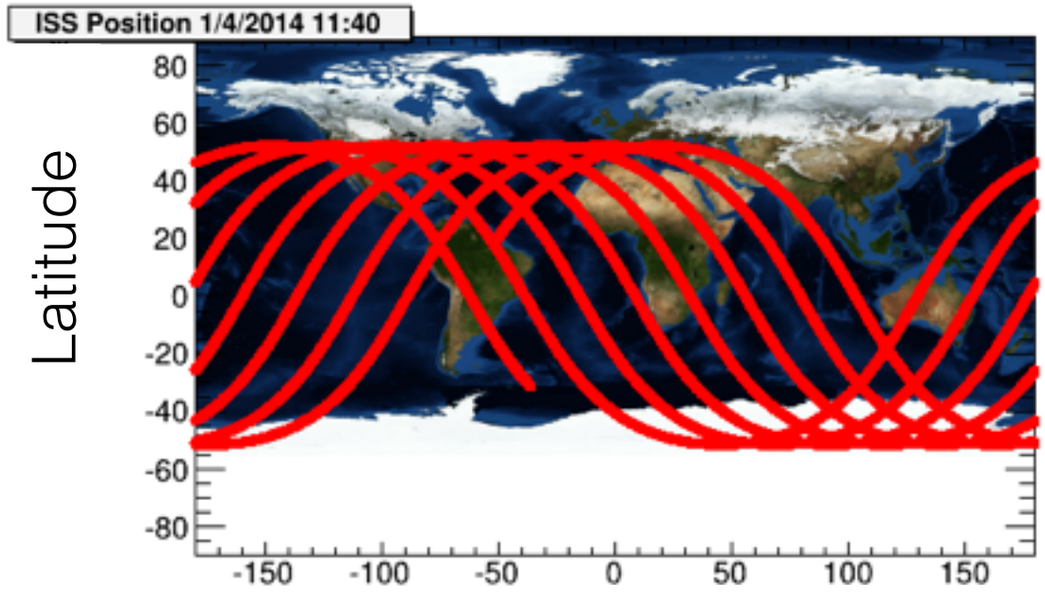

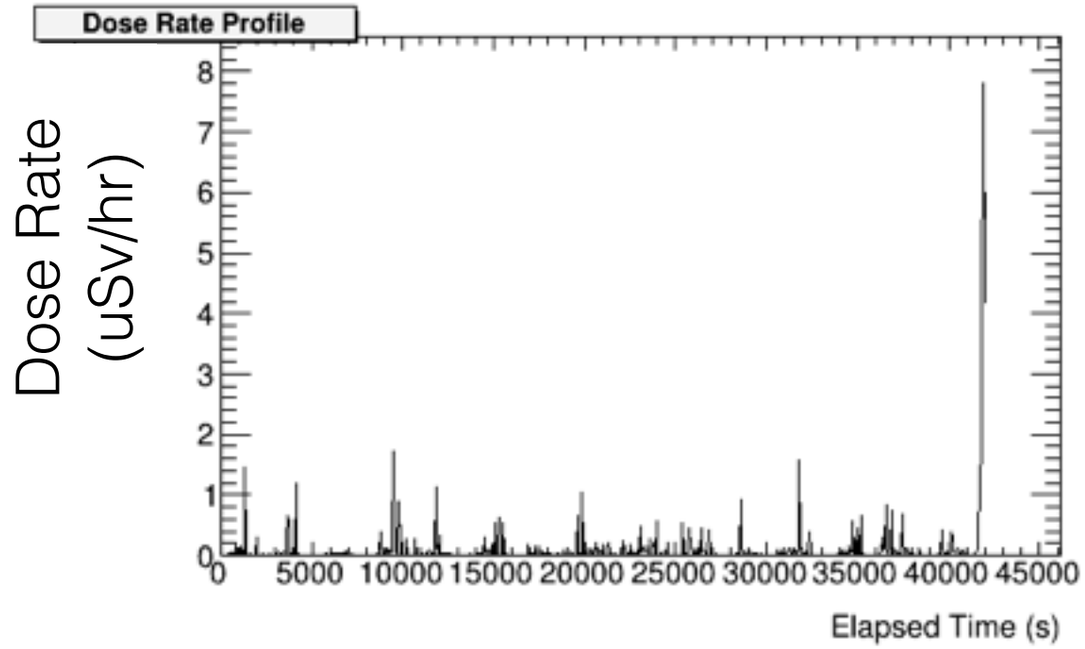

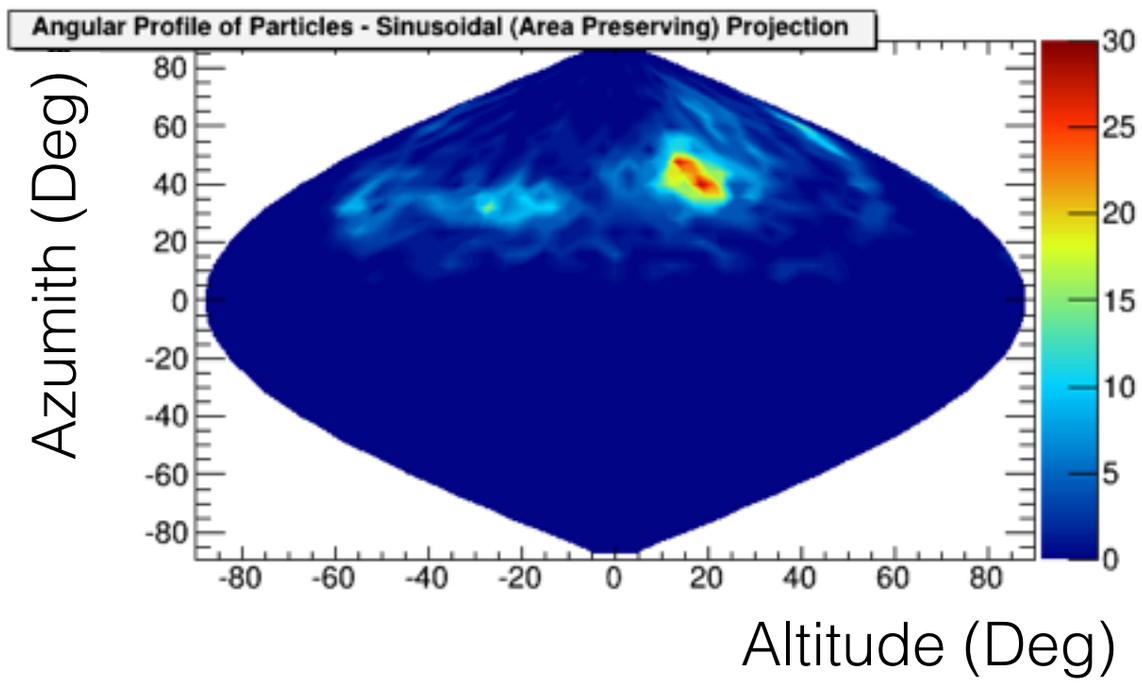

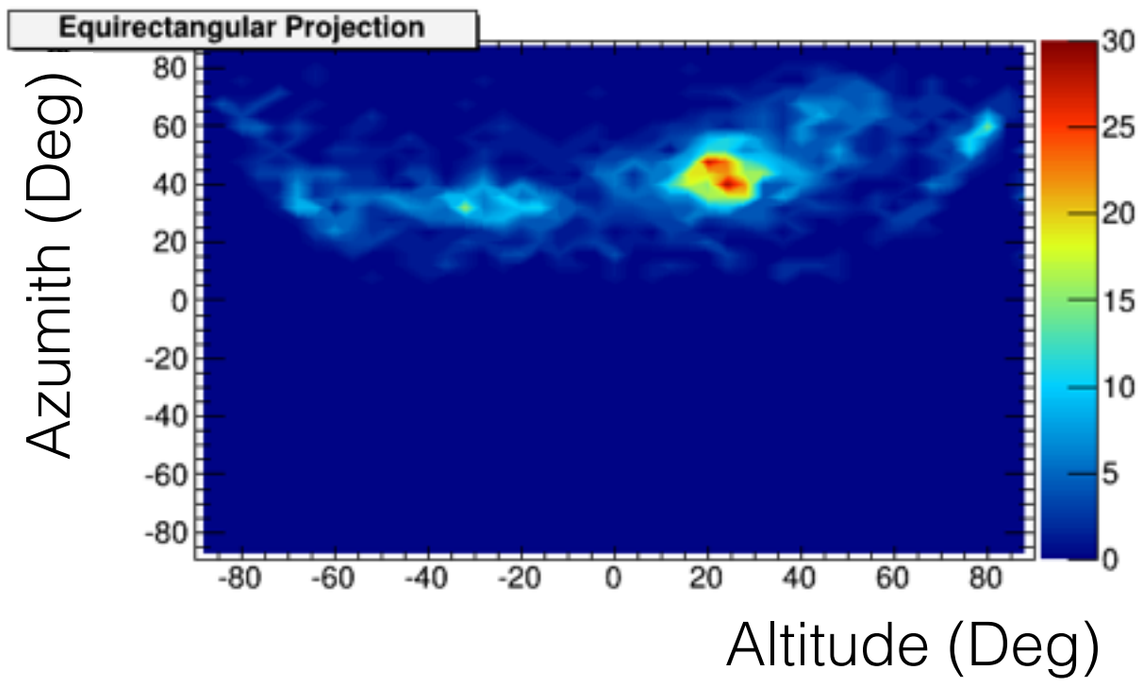

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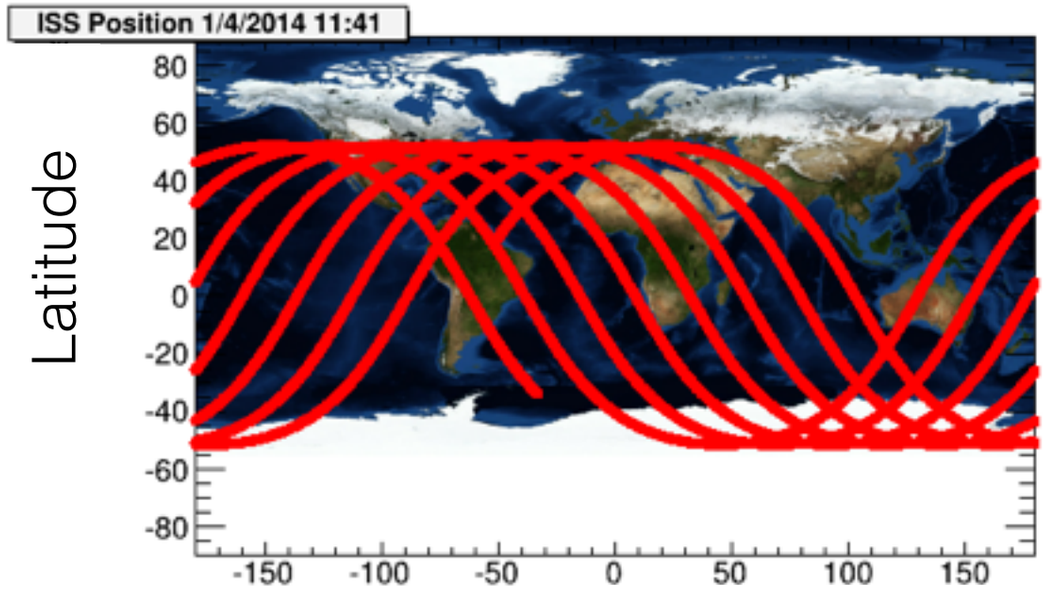

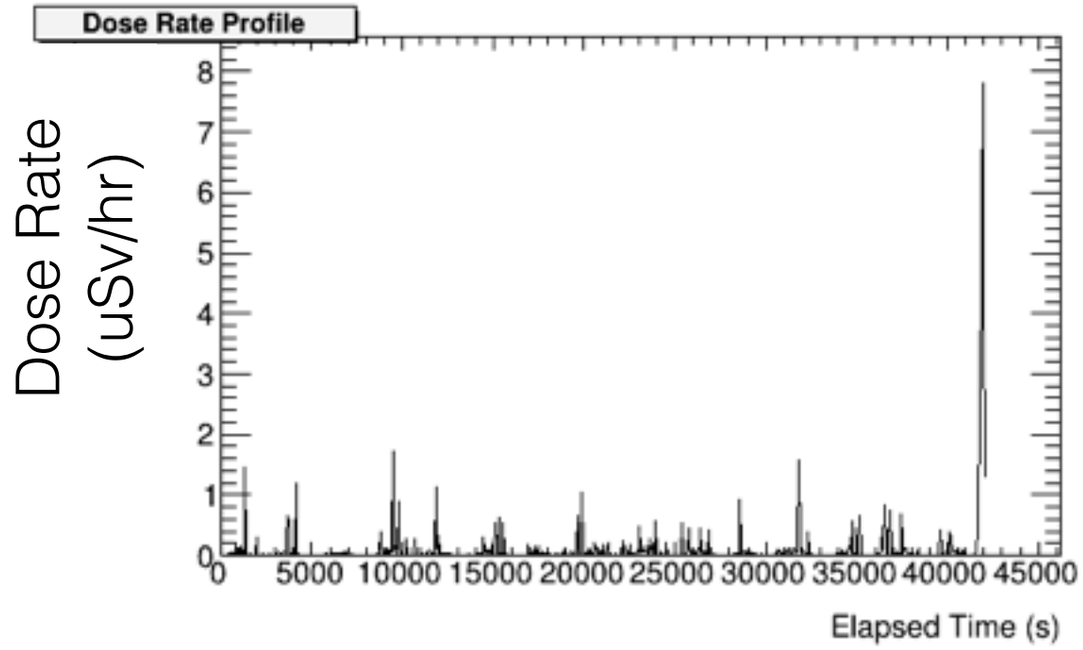

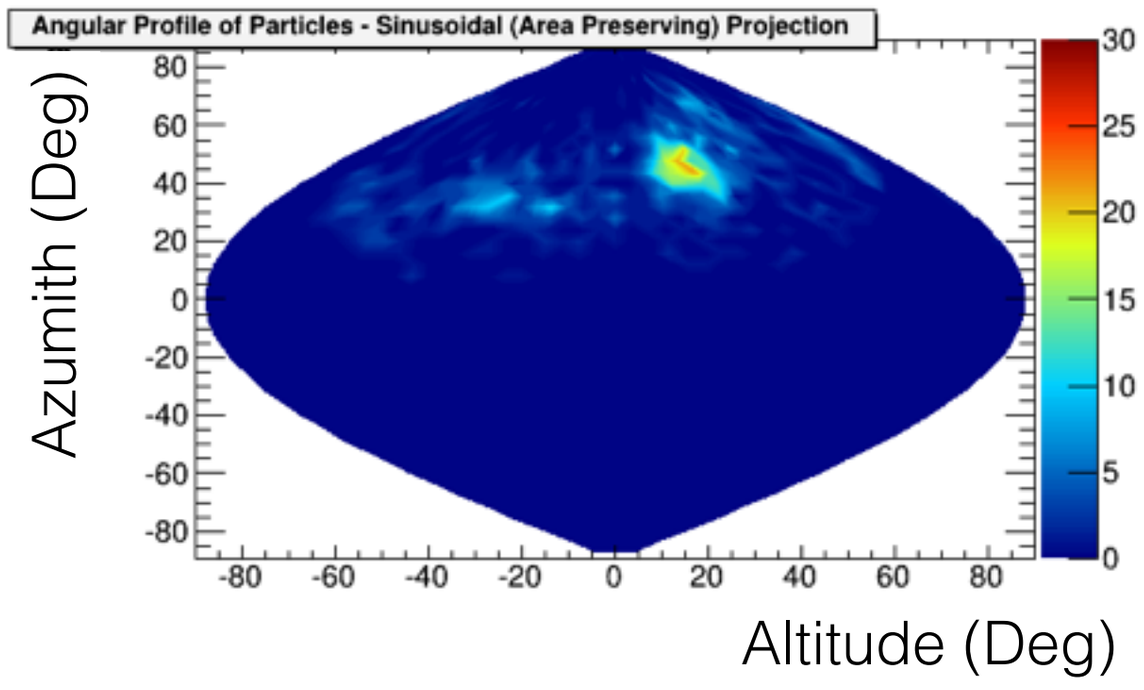

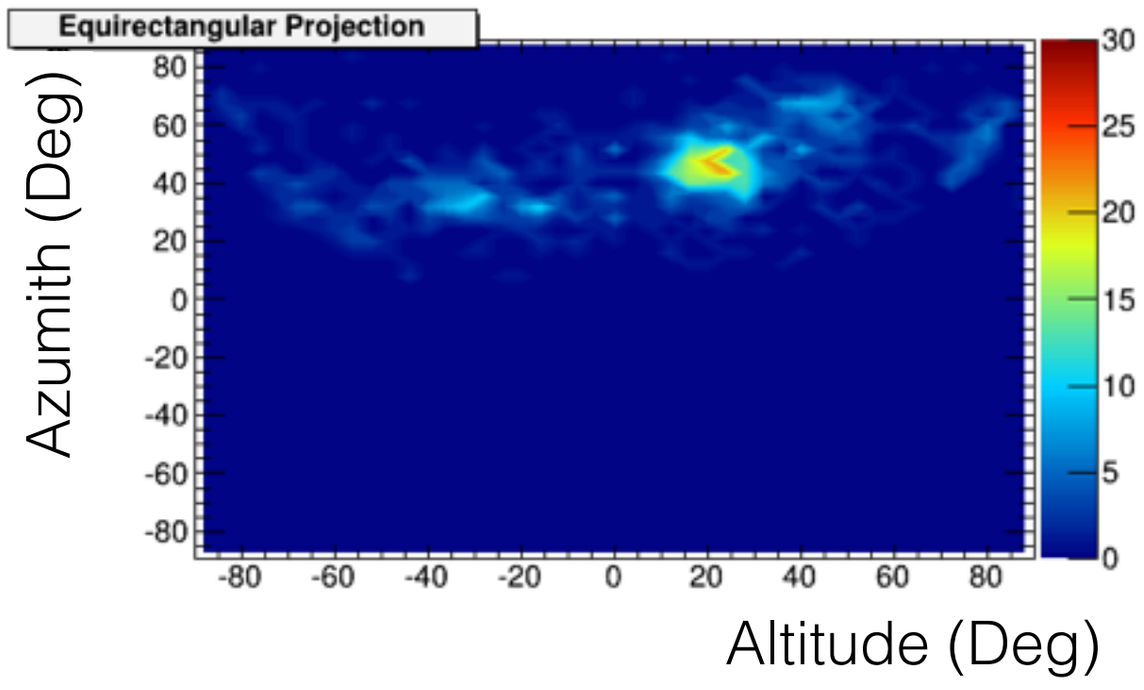

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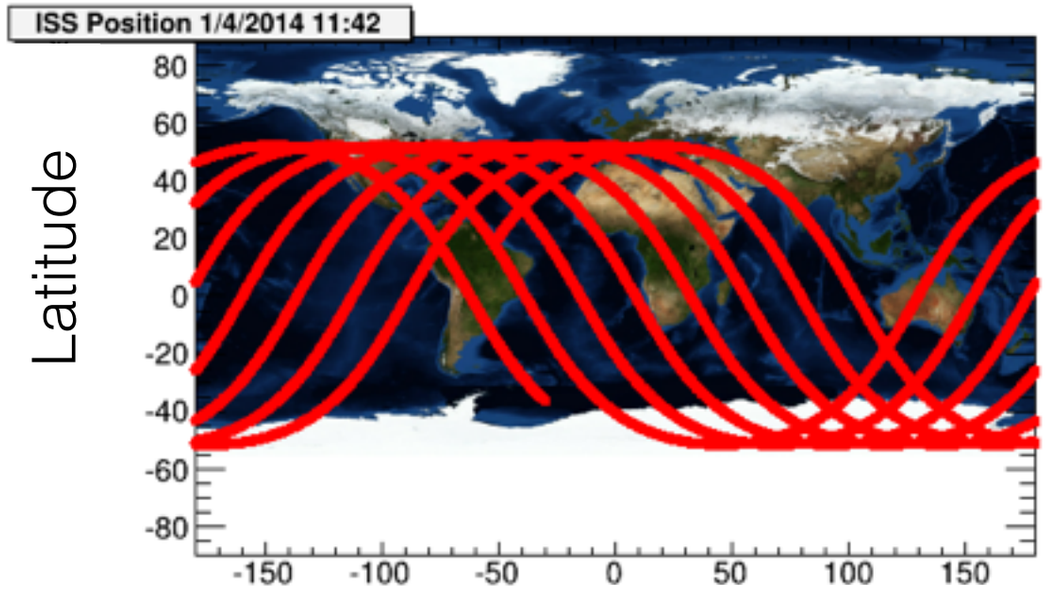
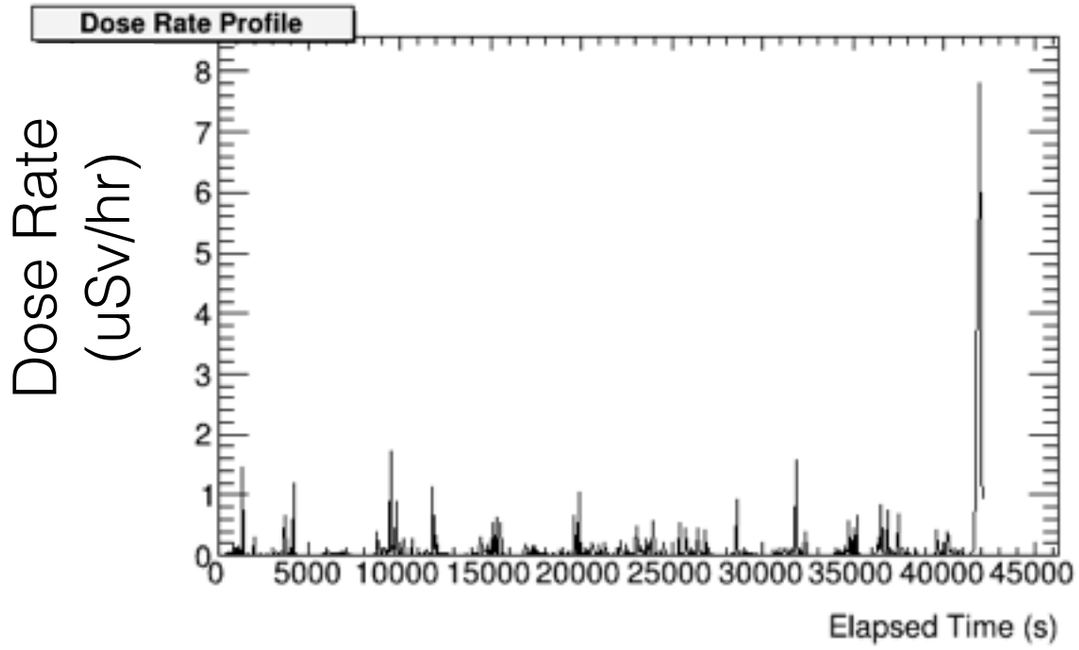
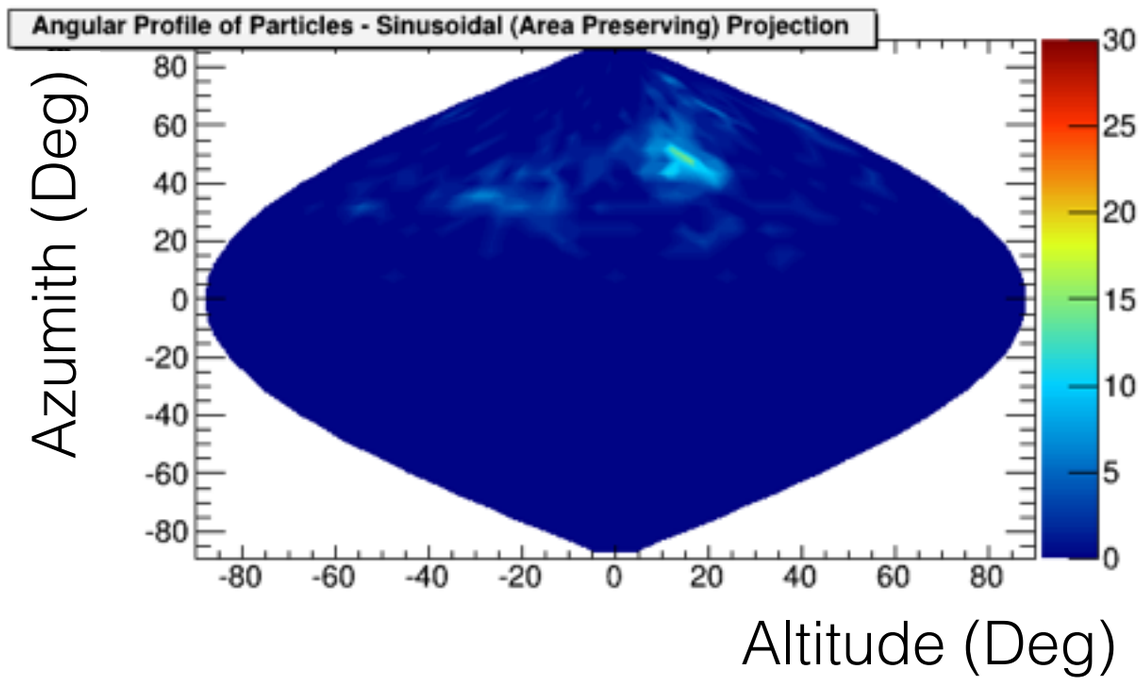
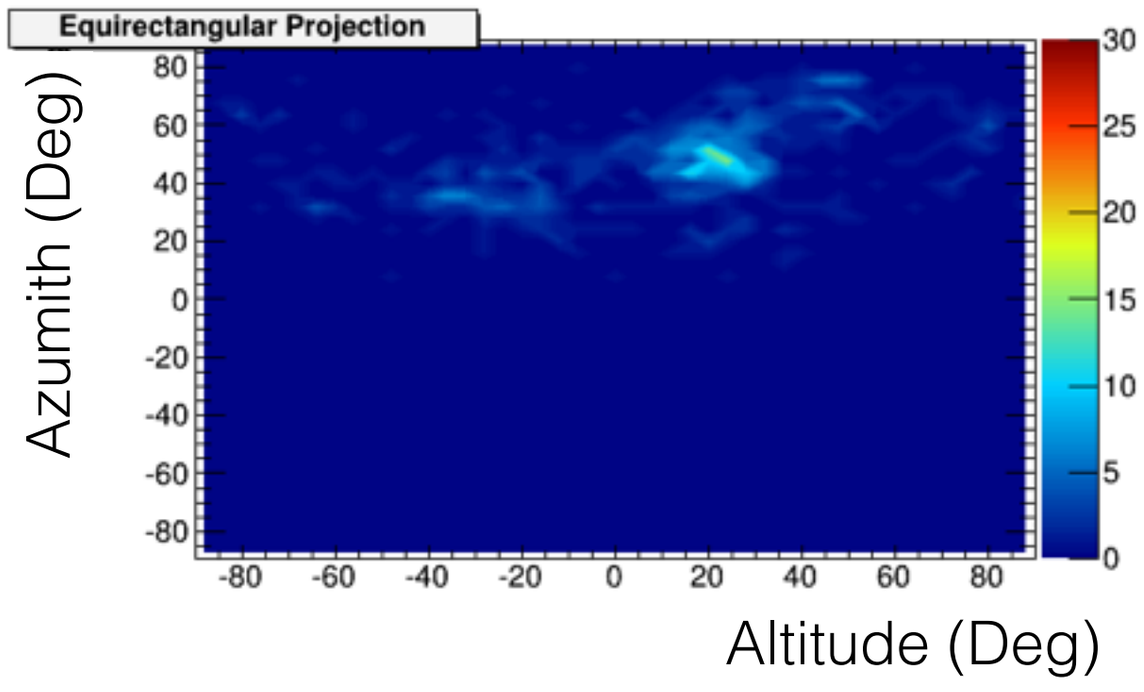
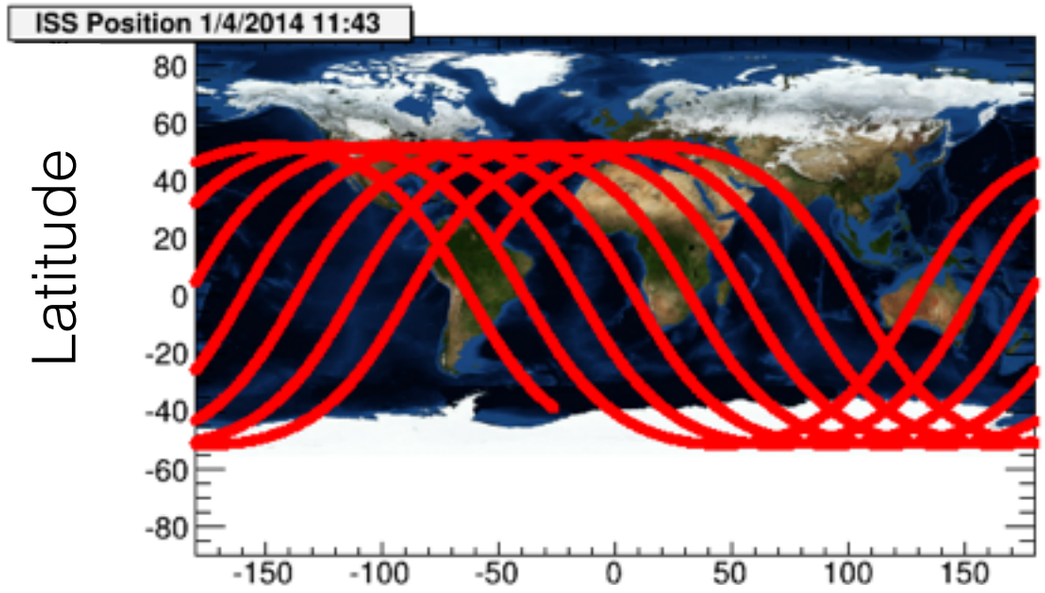


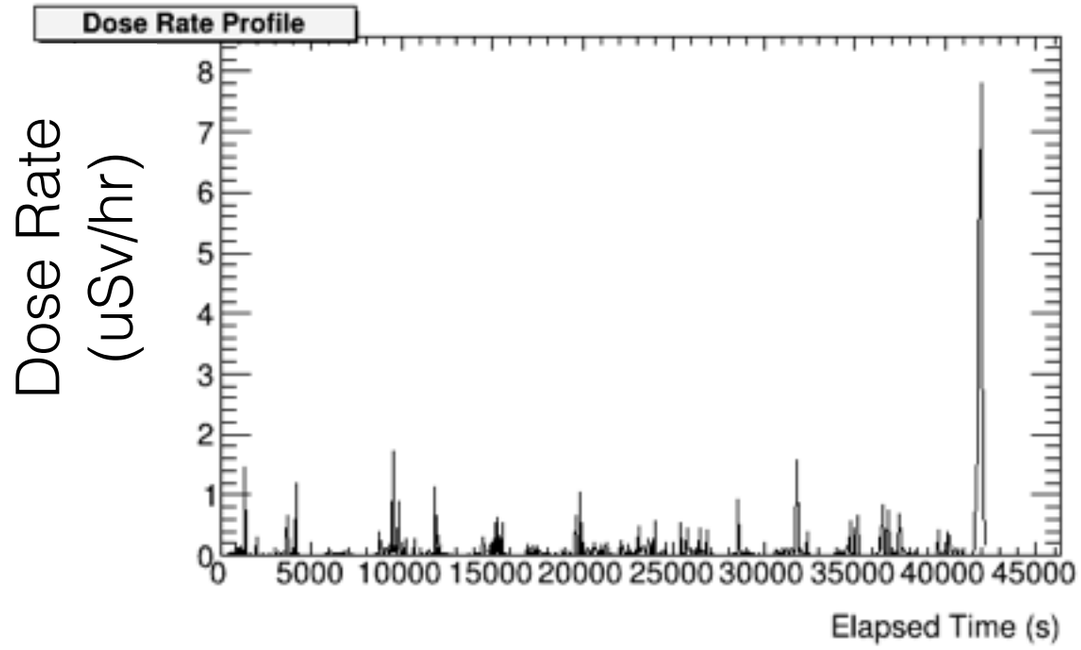


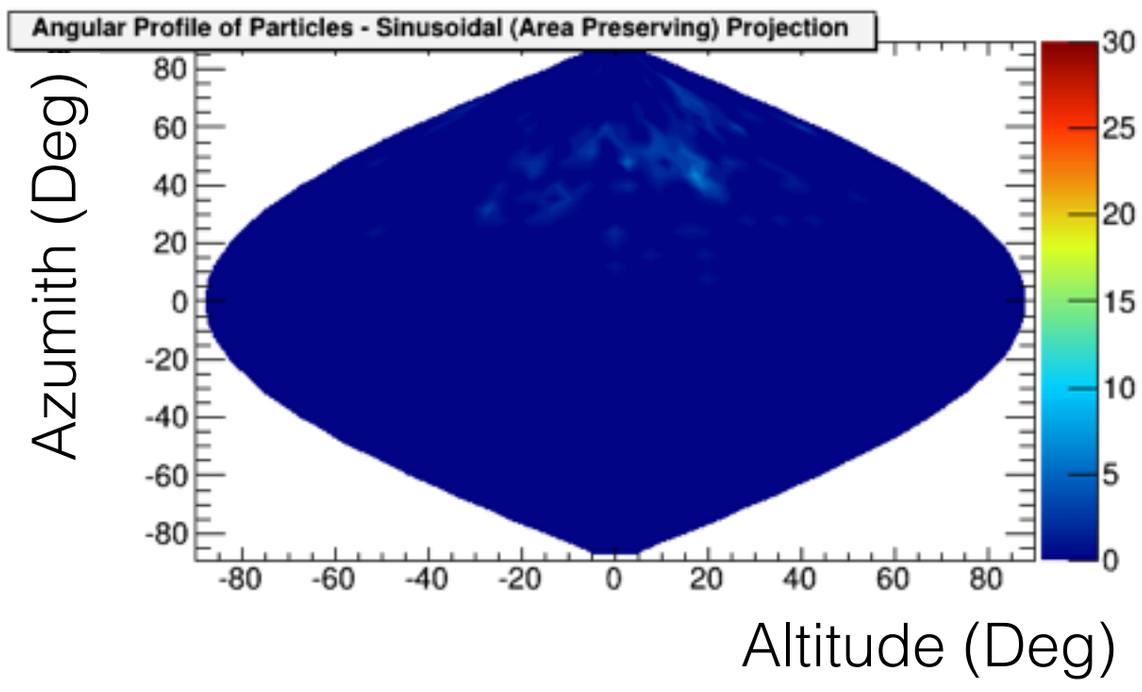


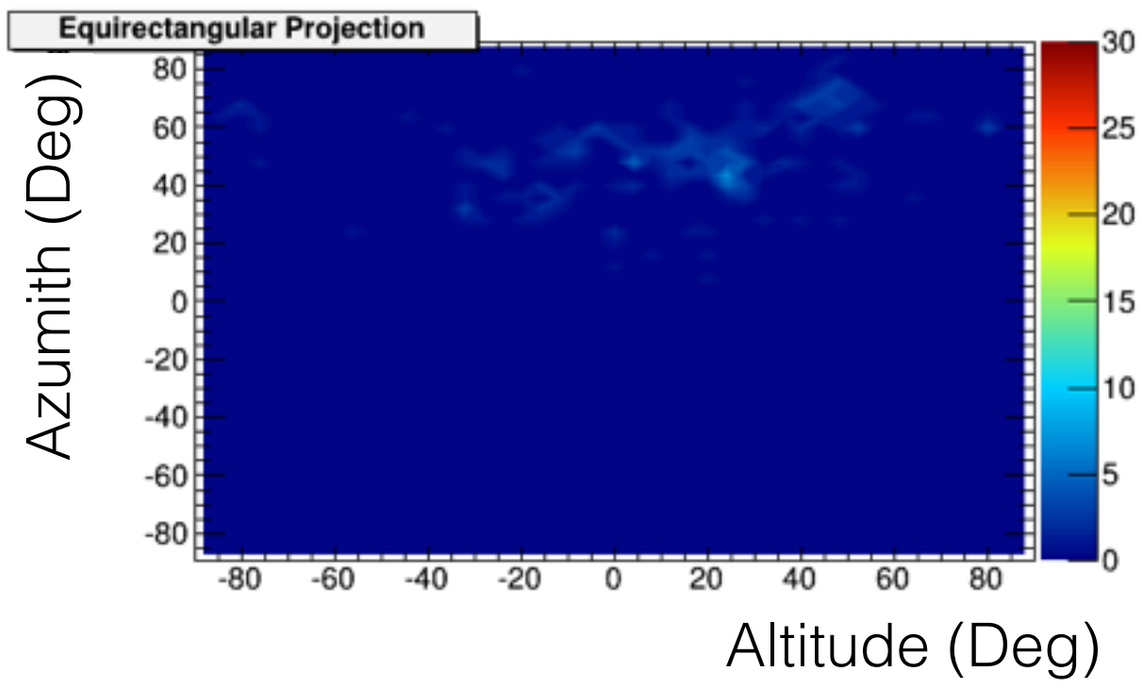


One Pass, April 1st 2014



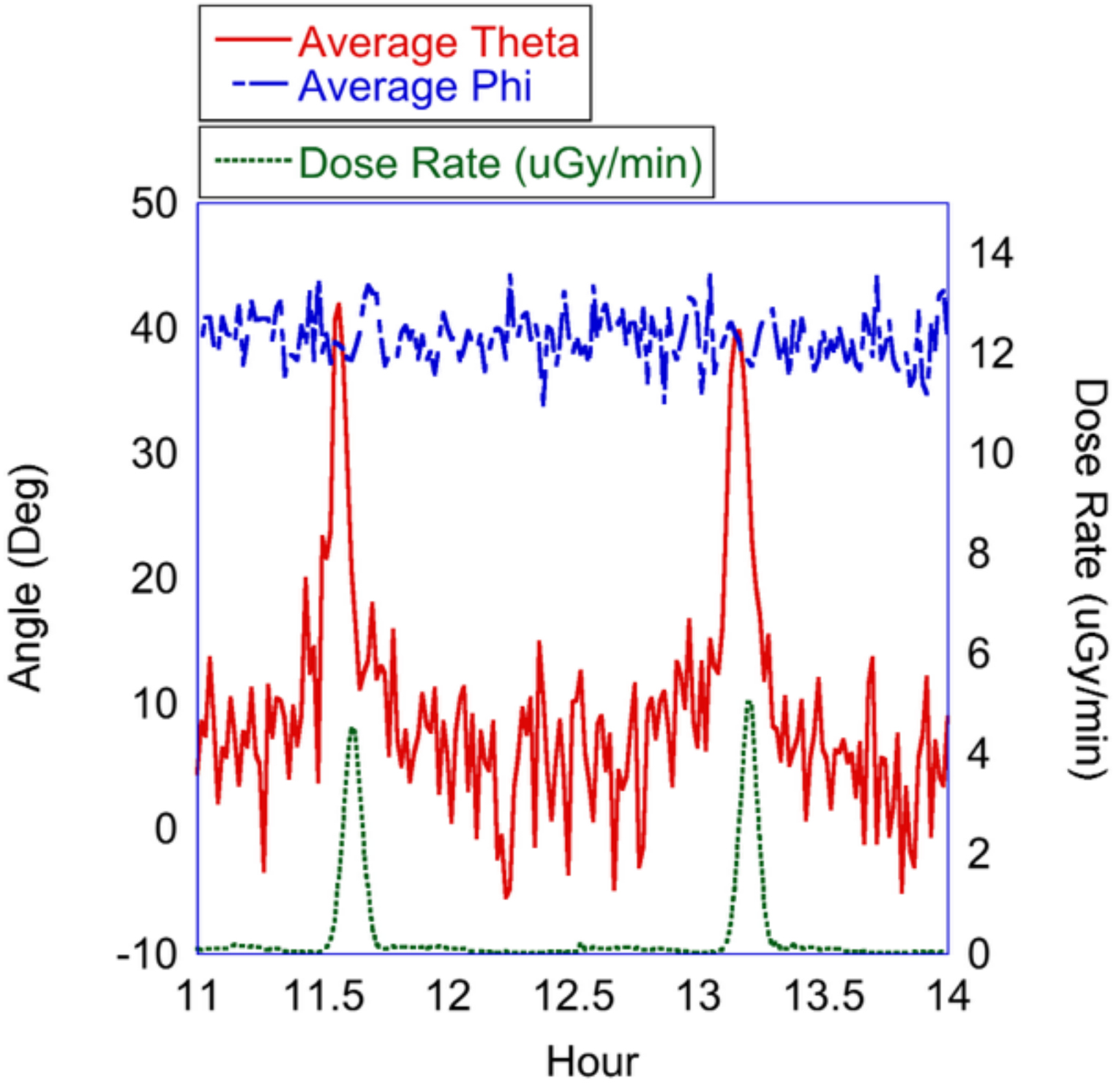






One Pass, April 1st 2014

- SAA associated with change in average angle
- Average theta for GCR (~5 degrees) - offset
- Average GCR phi 40 degrees) - should be 45

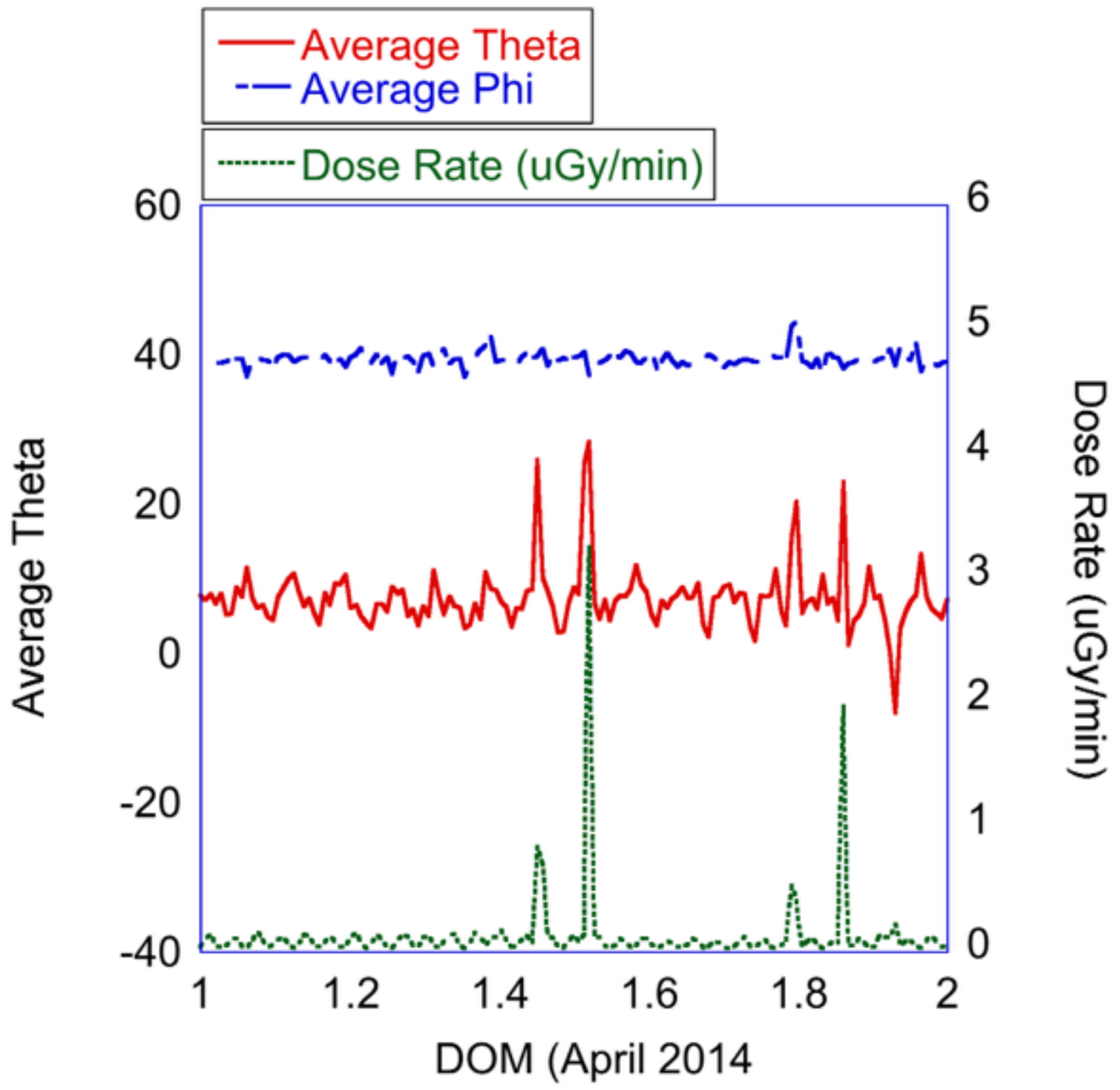


Angle and Dose Rate

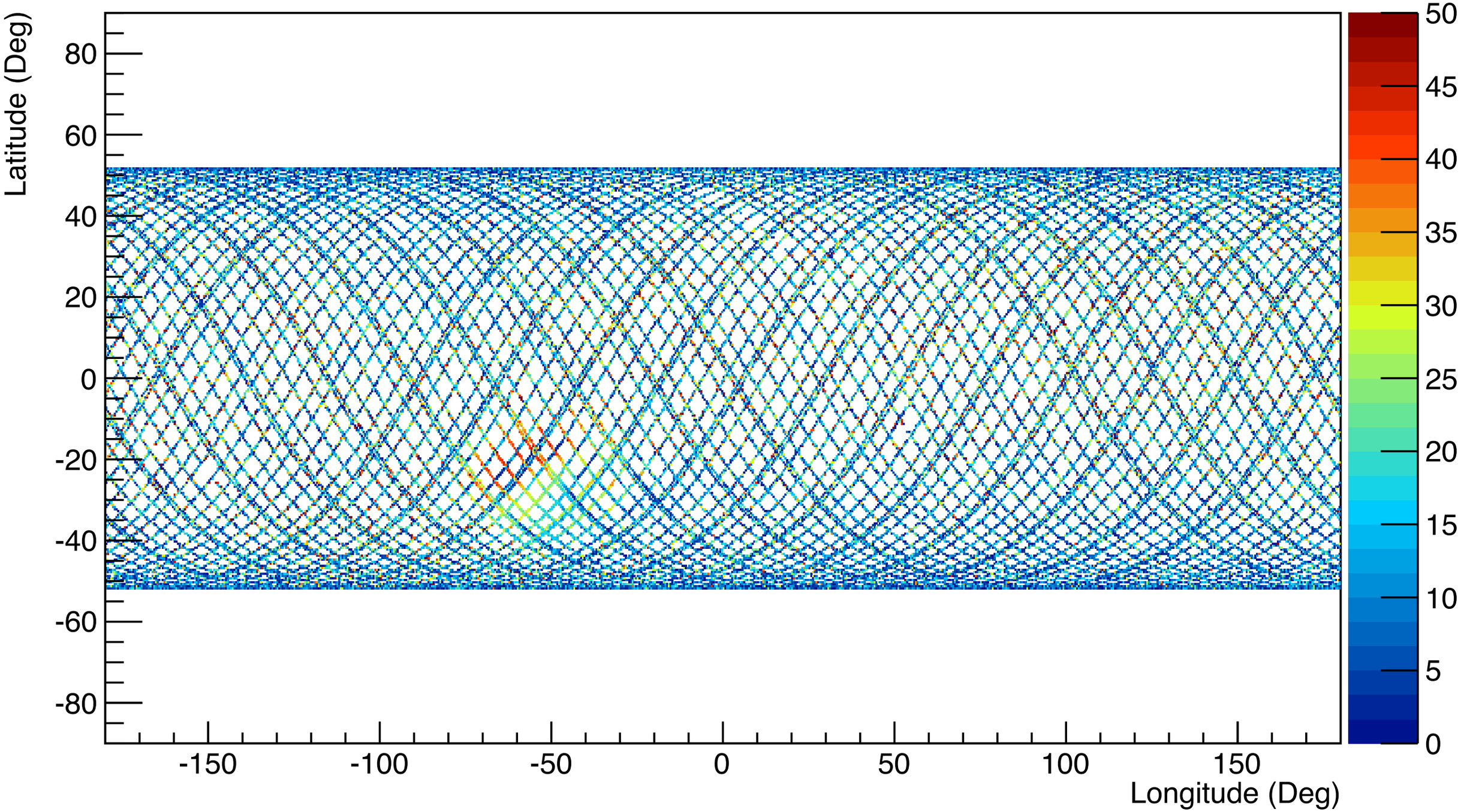
- SAA associated with change in average angle

- Average theta for GCR (~5 degrees) - offset

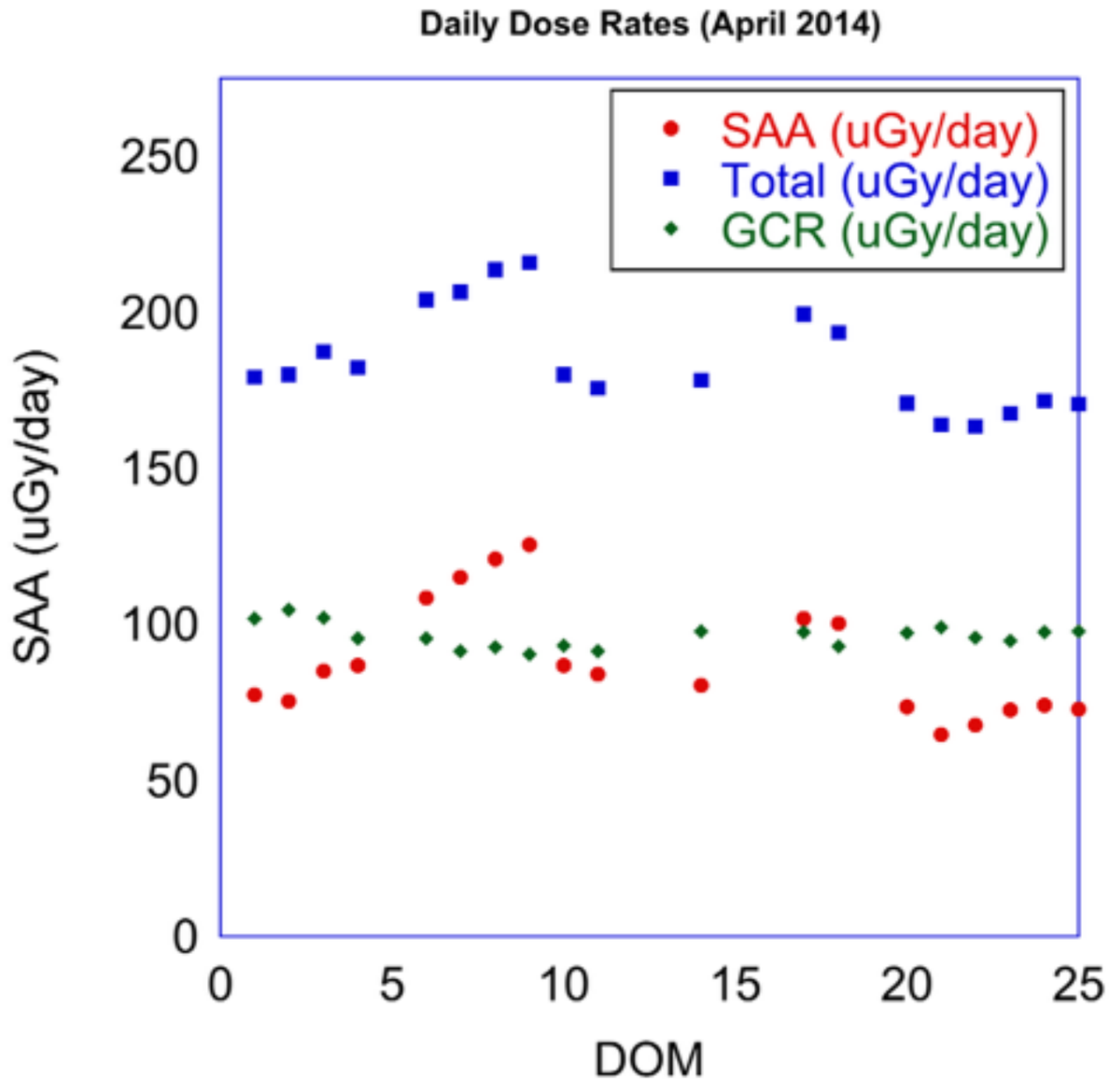
- Average GCR phi 40 degrees) - should be 45

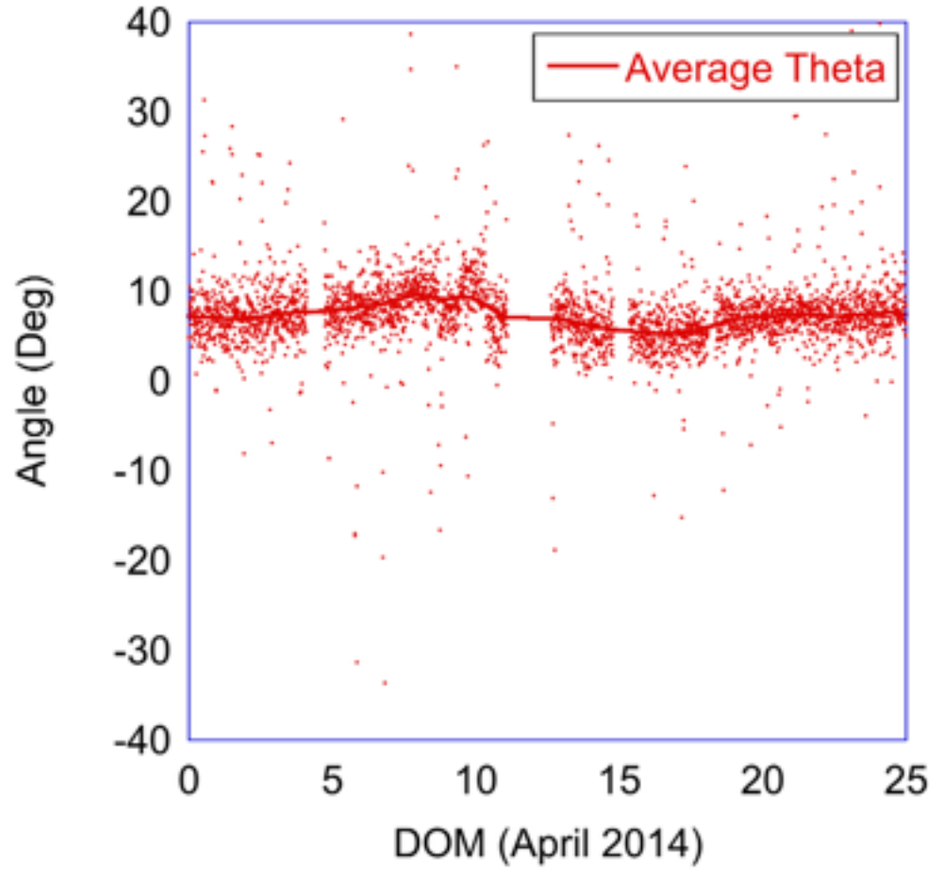


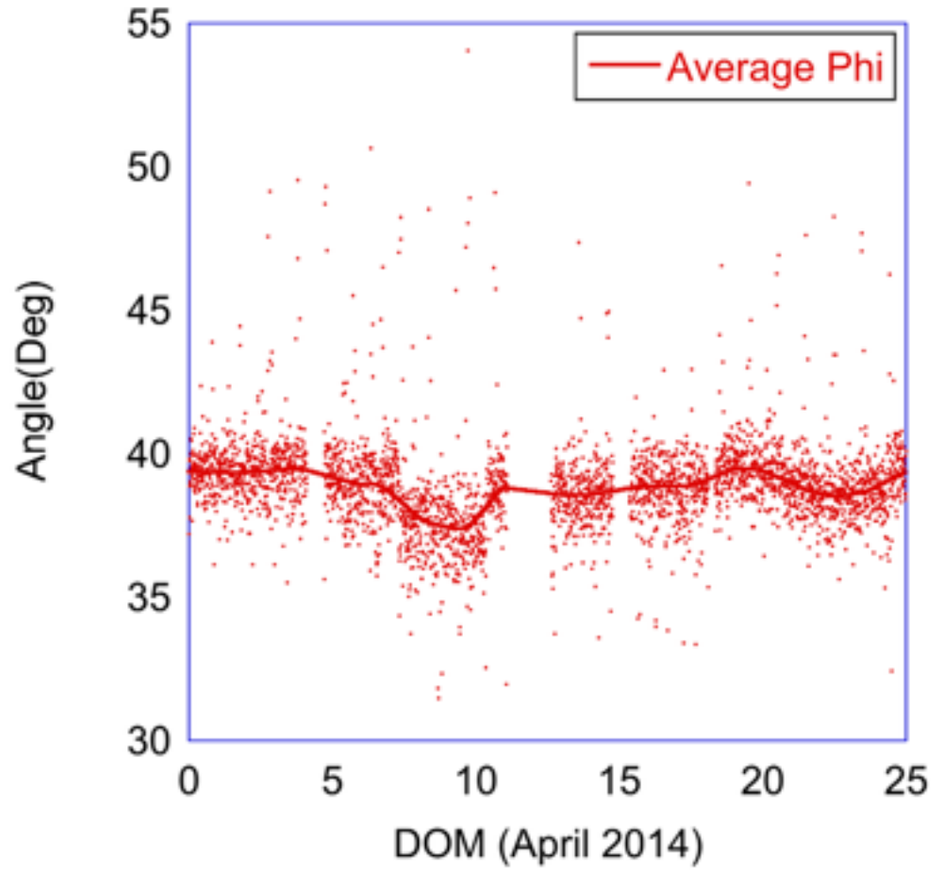
Average (absolute) Theta Angle, Unit J02 (Columbus Module), 1st-5th April 2015



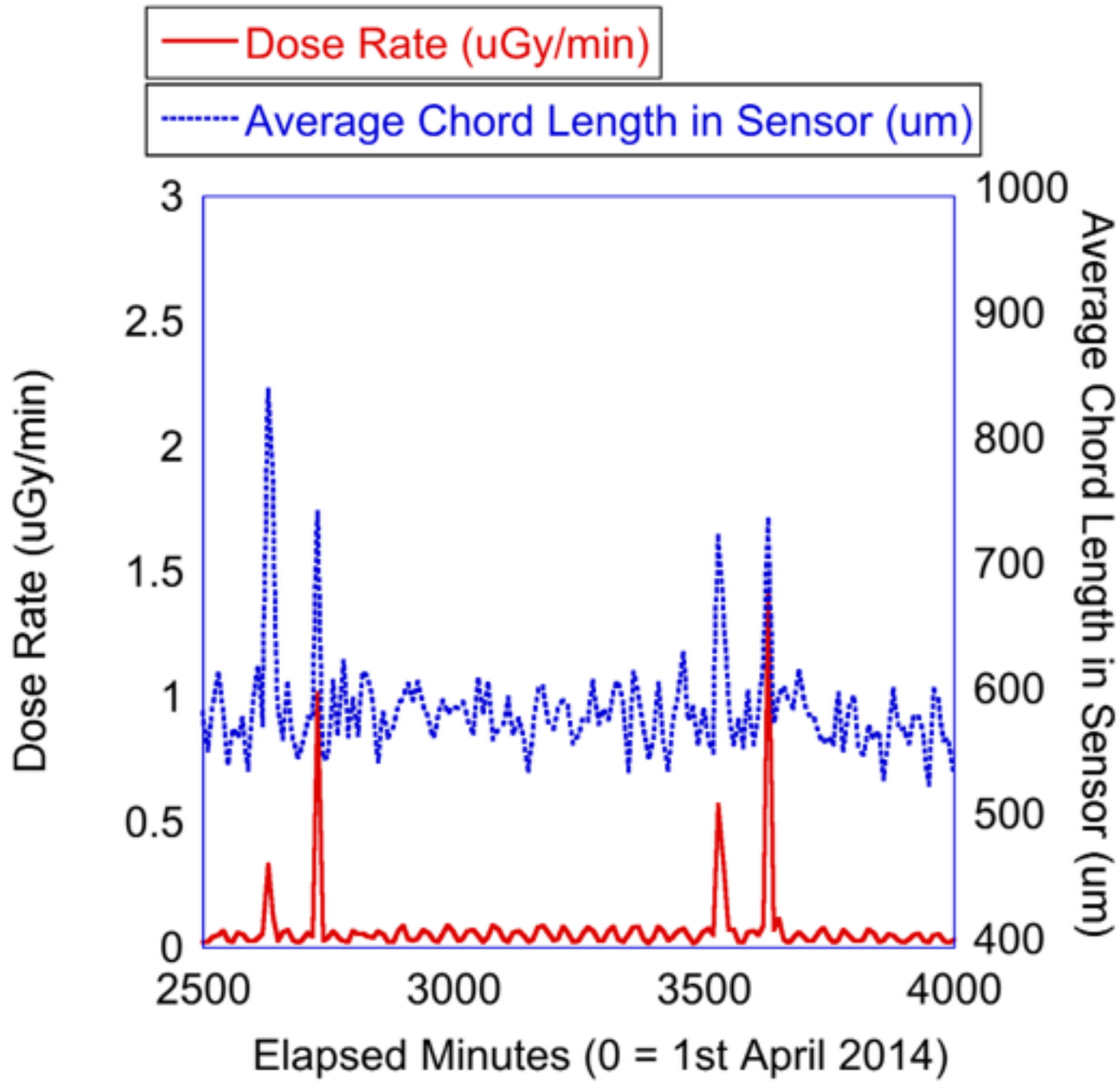
Dose Rate Correlations







Mean Chord Lengths



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