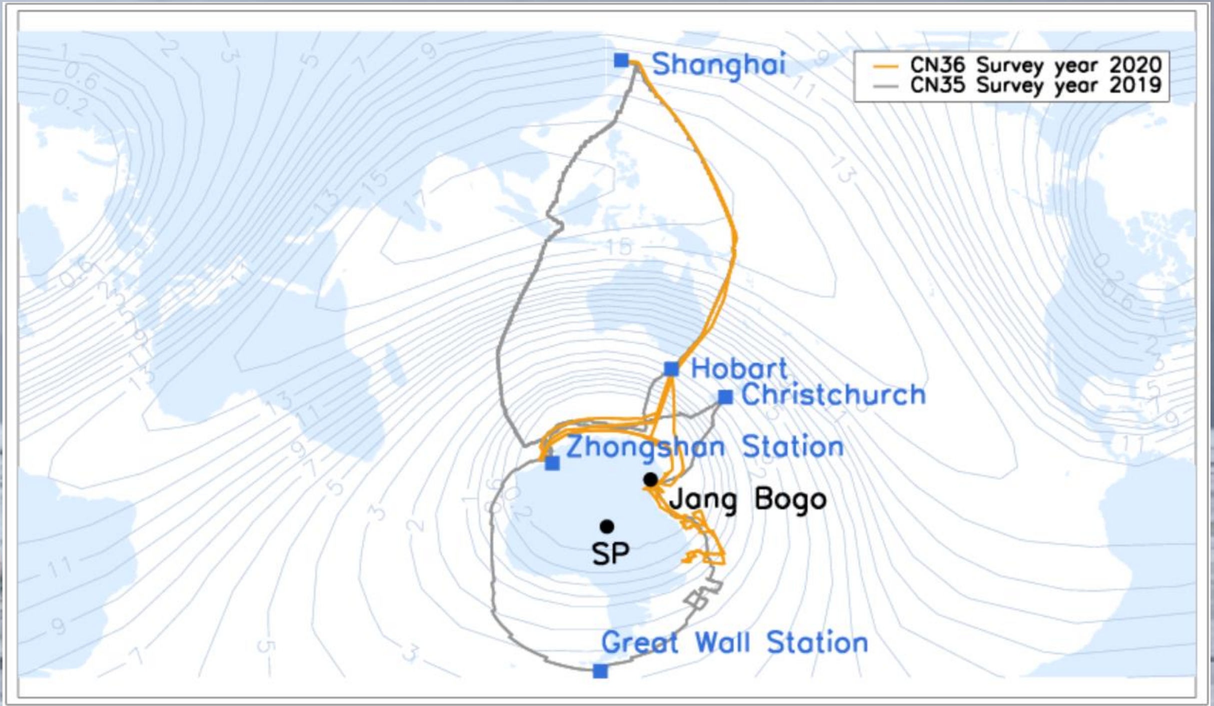
VALIDATION OF MONTE CARLO YIELD FUNCTION OF A SEMI-LEADED NEUTRON MONITOR USING LATITUDE SURVEY DATA IN 2019 AND 2020

A. SERIPIENLERT, W. NUNTIYAKUL, S. KHAMPHAKDEE, P.-S. MANGEARD, A. SÁIZ, D.RUFFOLO, P. EVENSON, K. FONGSAMUT, P. JIANG, P. CHUANRAKSASAT, K. MUNAKATA, J. MADSEN, B. SOONTHORNTHUM AND S. KOMONJINDA

Latitude Survey Project



ATMOSPHERIC SIMULATION

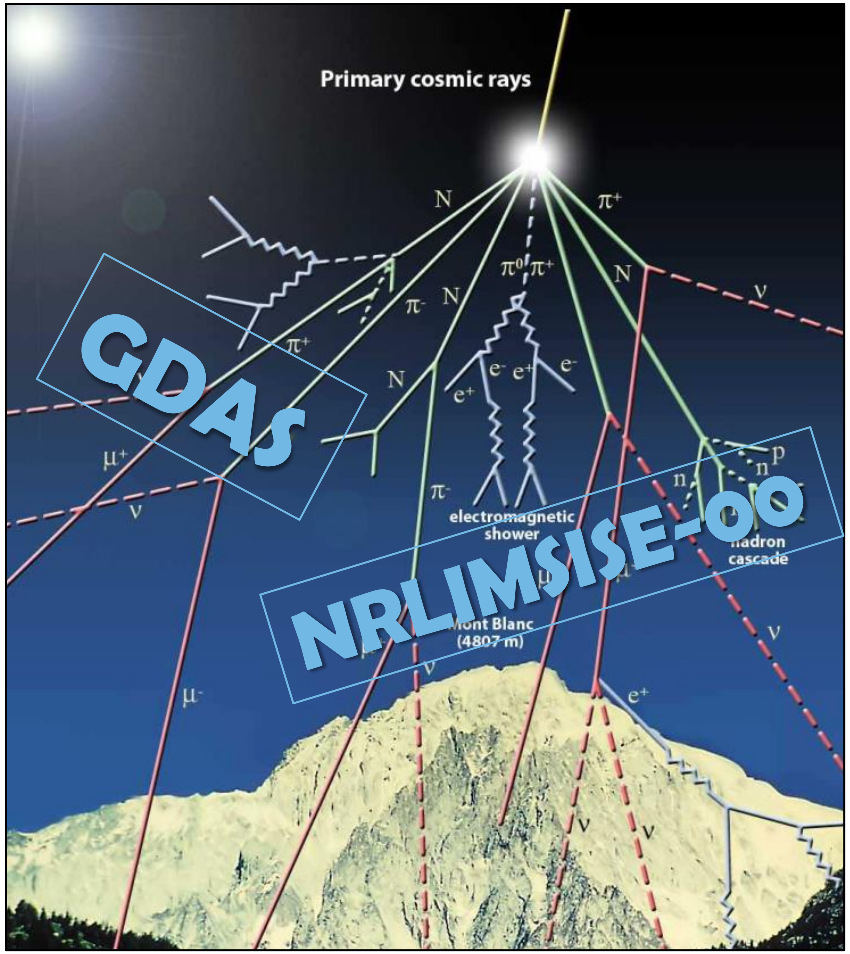
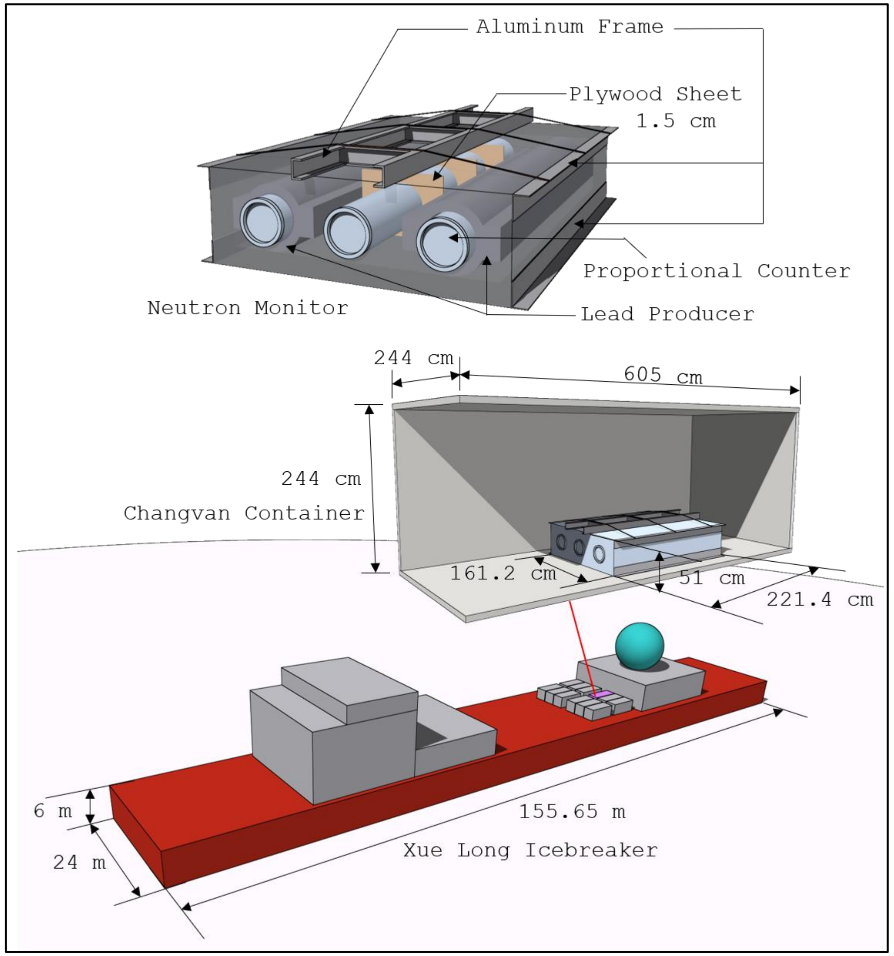


Image credit: http://scifun.ed.ac.uk/card/images/left/cosmic-rays.jpg

DETECTOR SIMULATION



SIMULATION INFORMATION

	Type	No. of simulated particles
Atmospheric simulation	p	1,000,000
	α	1,000,000
Library	n	136,508
	p	13,486
	μ	1,149,070
Detector simulation	n	100,000,000
	p	100,000,000
	μ	75,000,000

YIELD FUNCTION

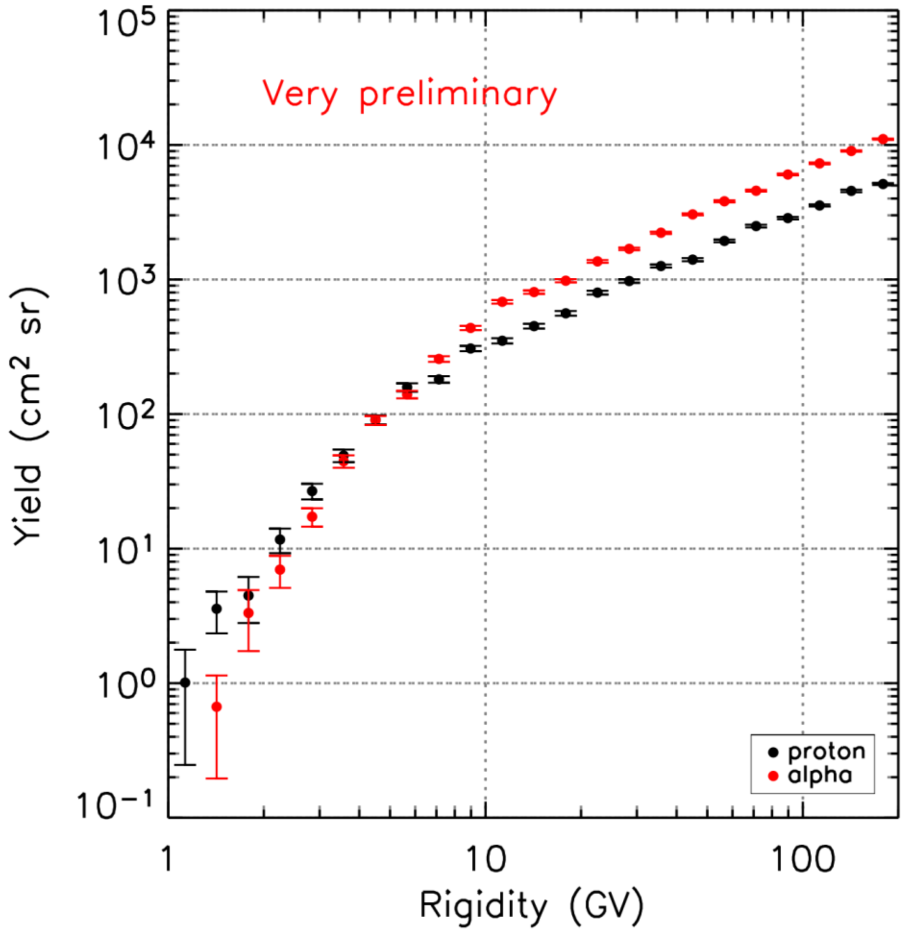


FIGURE 1 Yield functions for protons and alphas of Changvan neutron monitor.

COUNT RATES VS CUTOFF RIGIDITY

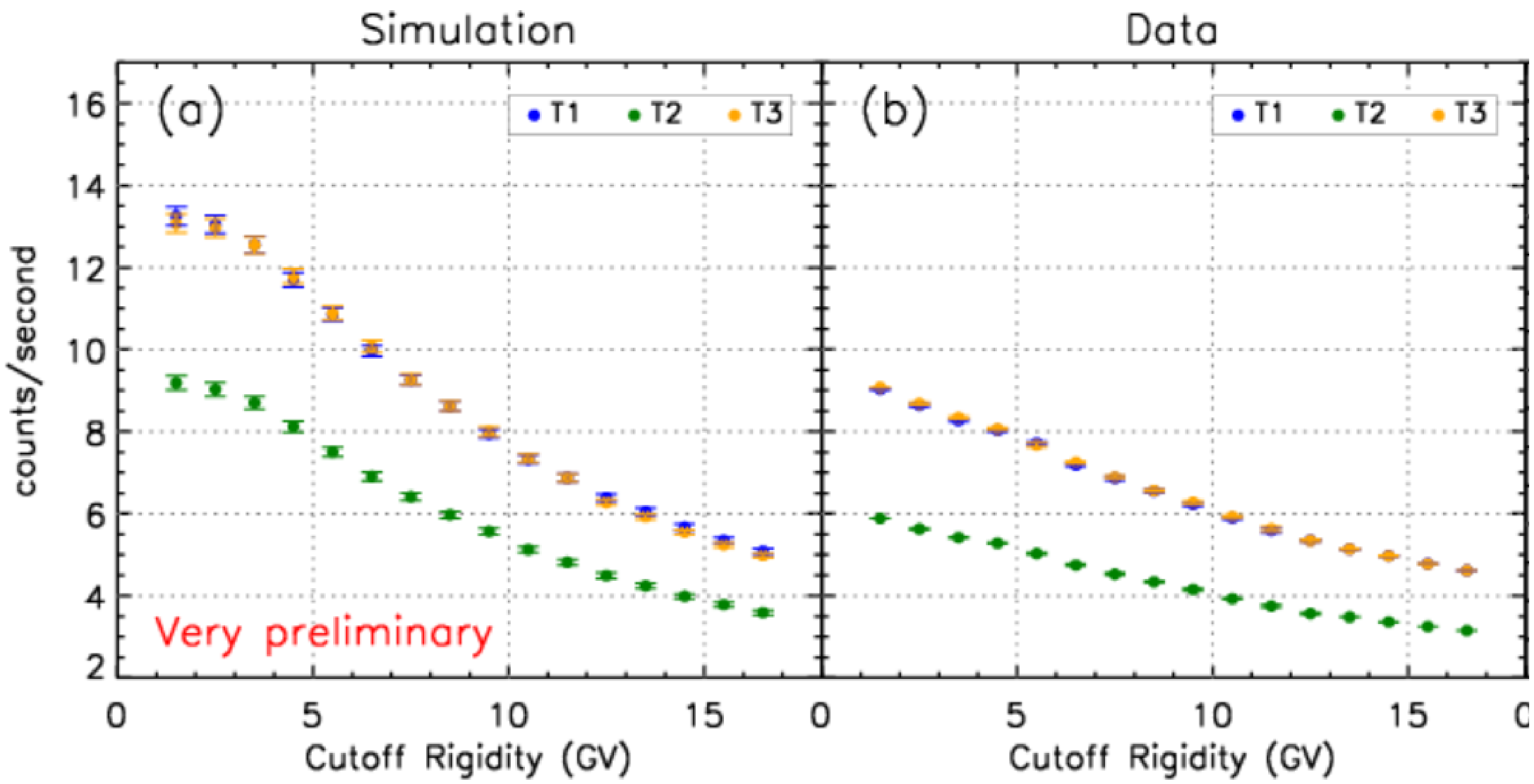


FIGURE 2 (a) Comparison between (a) Simulation count rate and (b) Data count rate. The simulation count rate is higher than the Data count rate.

COUNT RATES RATIOS VS CUTOFF RIGIDITY

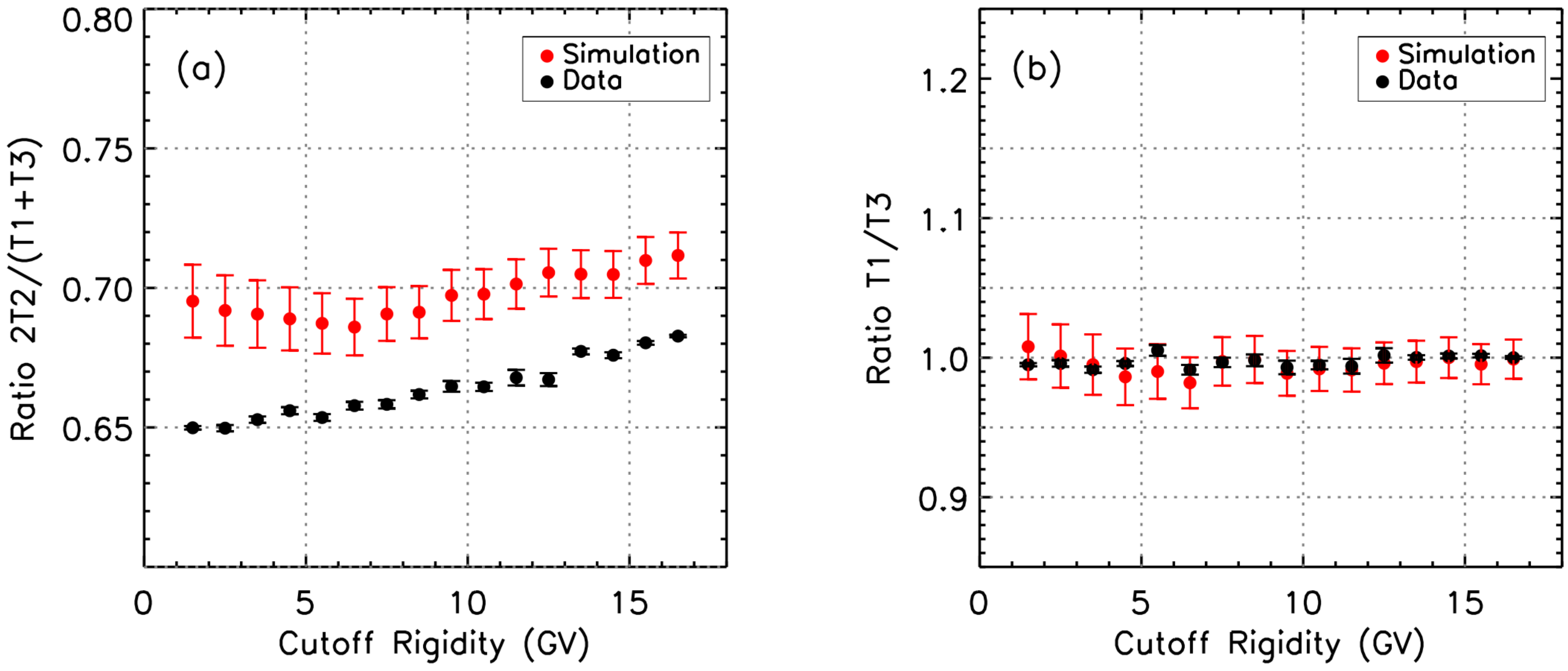


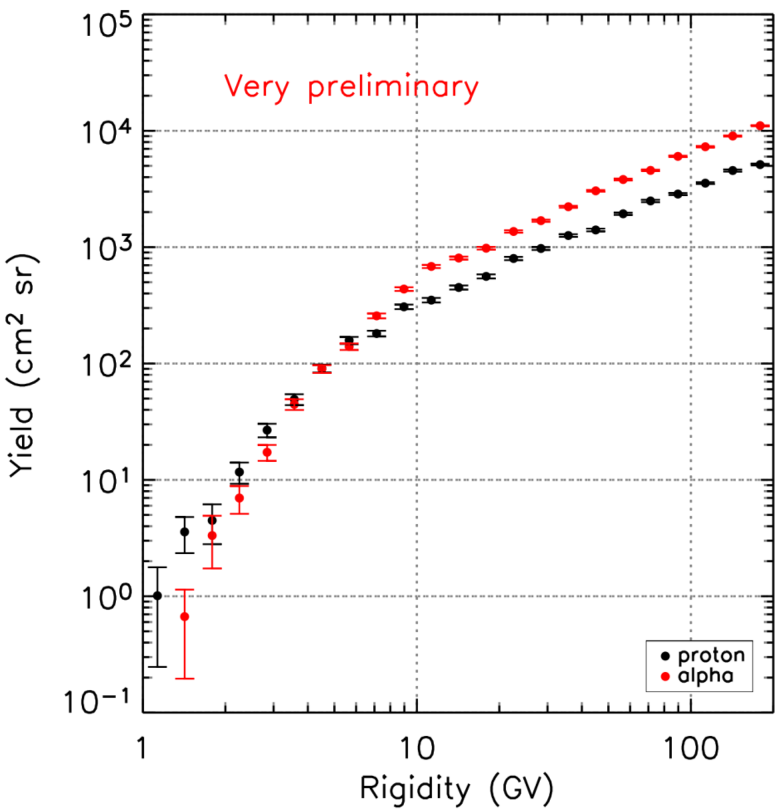
FIGURE 3 (a) The ratios of unleaded/leaded NM count rates. (b) The ratio of leaded/leaded NM rates.

PROGRESS SO FAR

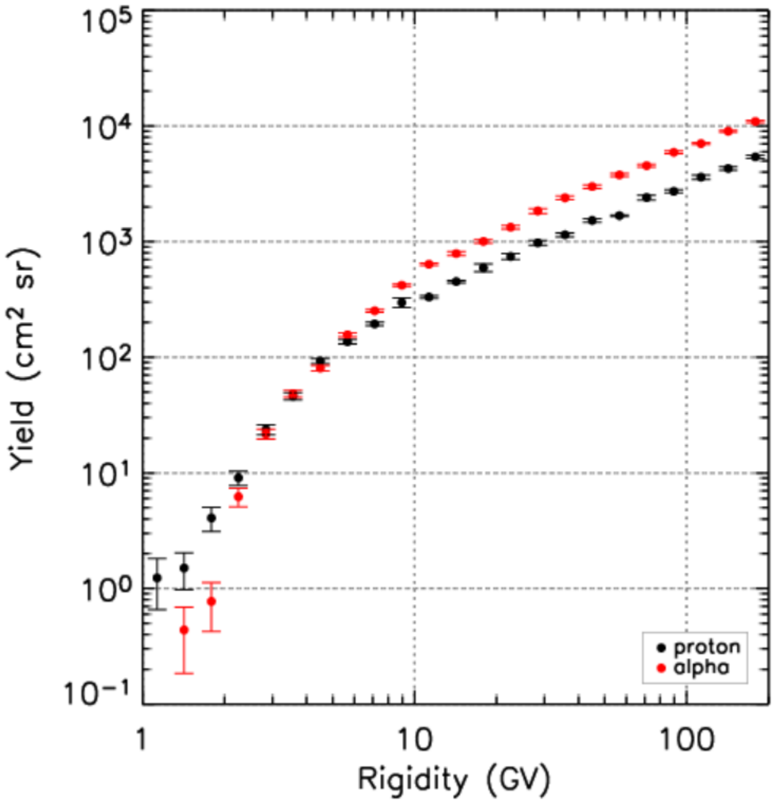
Rigidity 1 – 200 GV → Rigidity 1 – 500 GV

	Type	No. of simulated particles		No. of simulated particles	Status
Atmospheric simulation	p	1,000,000	⇨	5,000,000	✓
	α	1,000,000	⇨	5,000,000	✓
Library	n	136,508	⇨	1,266,246	✓
	p	13,486	⇨	138,271	✓
	μ	1,149,070	⇨	15,399,176	✓
Detector simulation	n	100,000,000	⇨	500,000,000	500M
	p	100,000,000	⇨	500,000,000	250M
	μ	100,000,000	⇨	500,000,000	30.5M

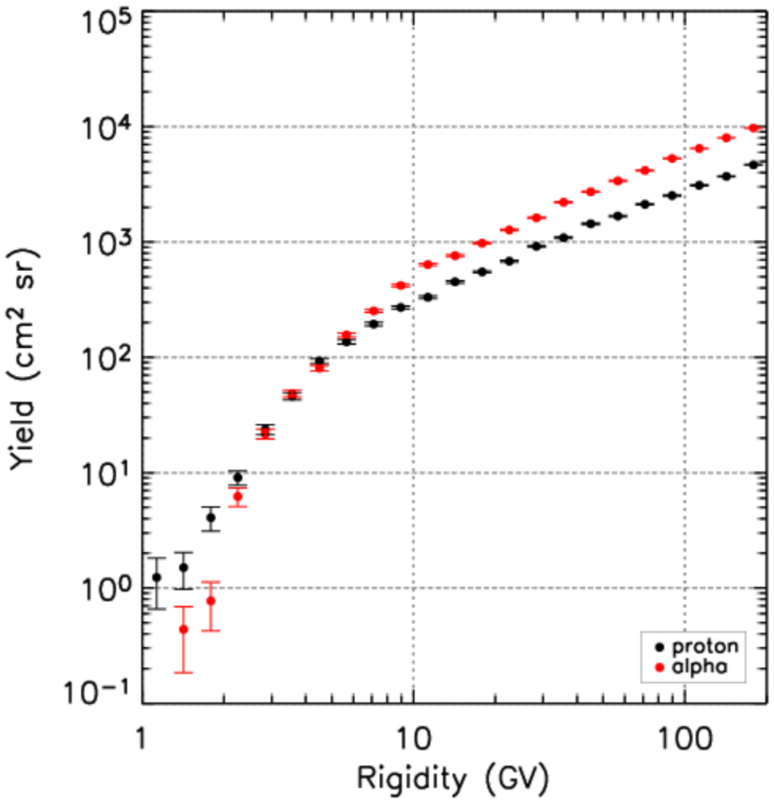
YIELD FUNCTION



ICRC

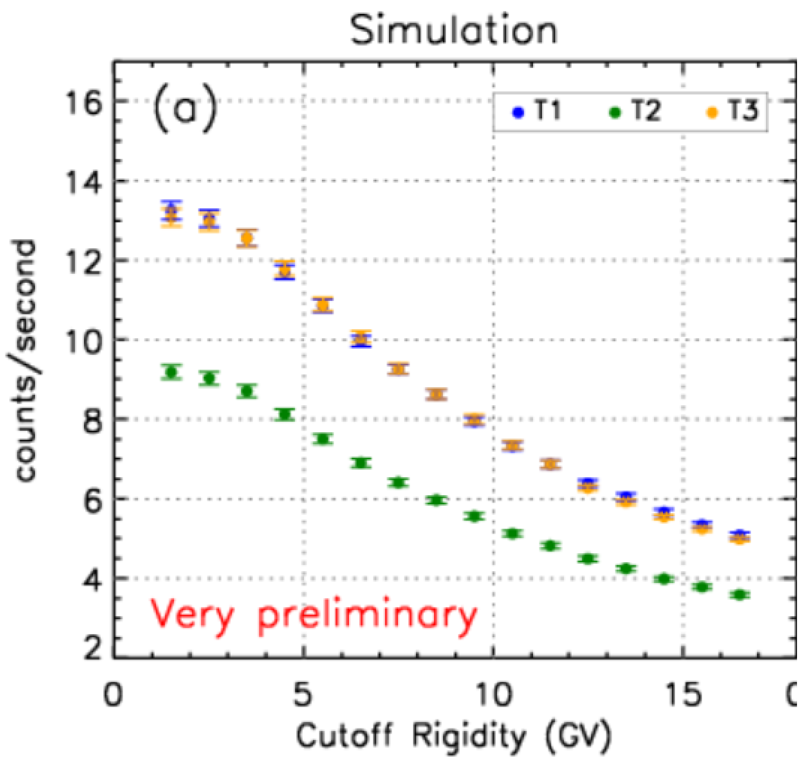


POST-ICRC



POST-ICRC [NO MUON]

COUNT RATES VS CUTOFF RIGIDITY



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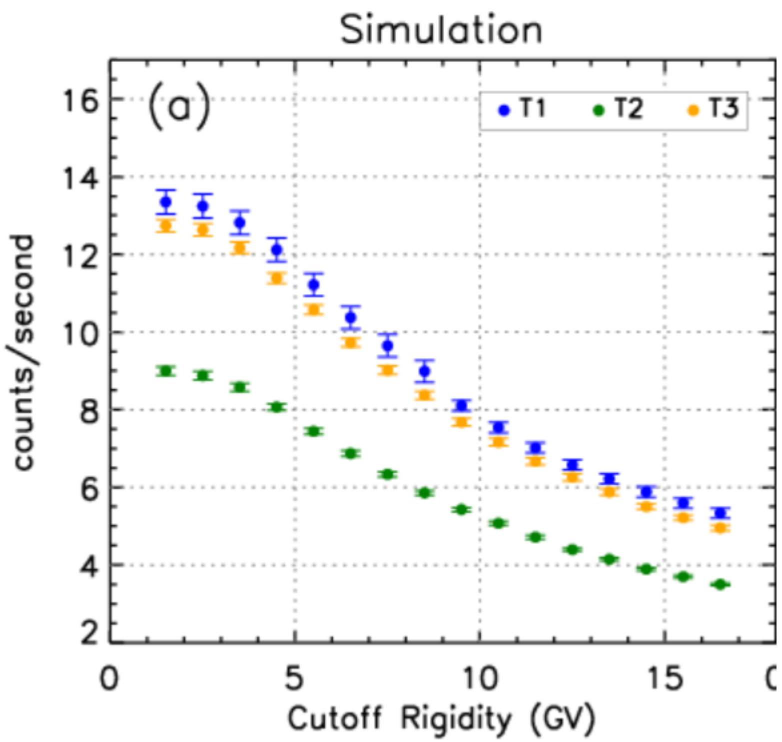

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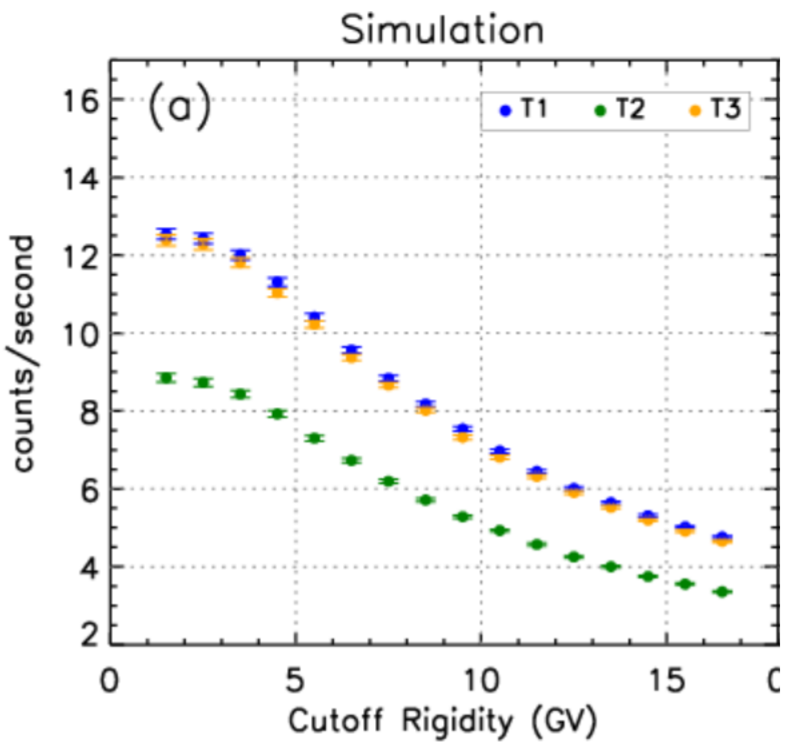
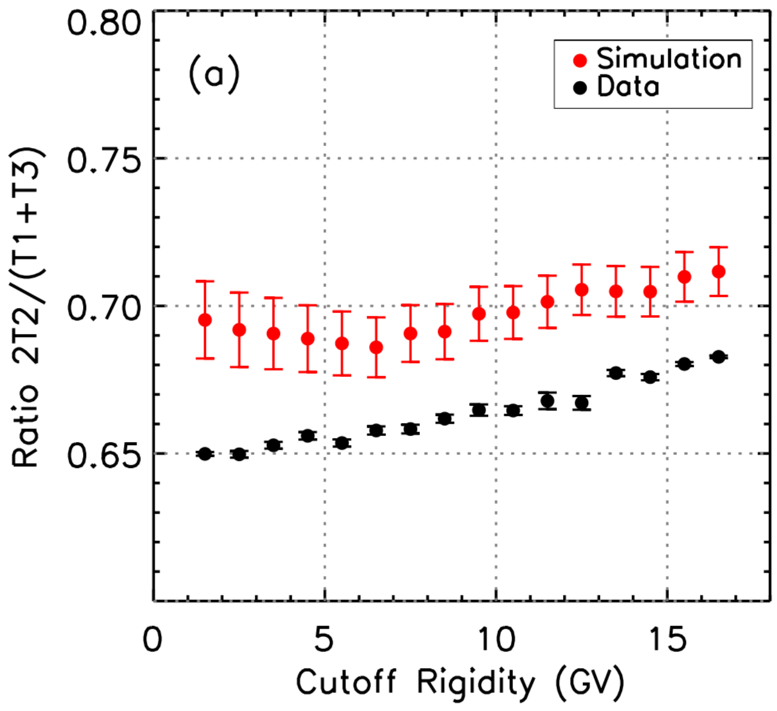


POST-ICRC [NO MUON]

COUNT RATES RATIOS VS CUTOFF RIGIDITY



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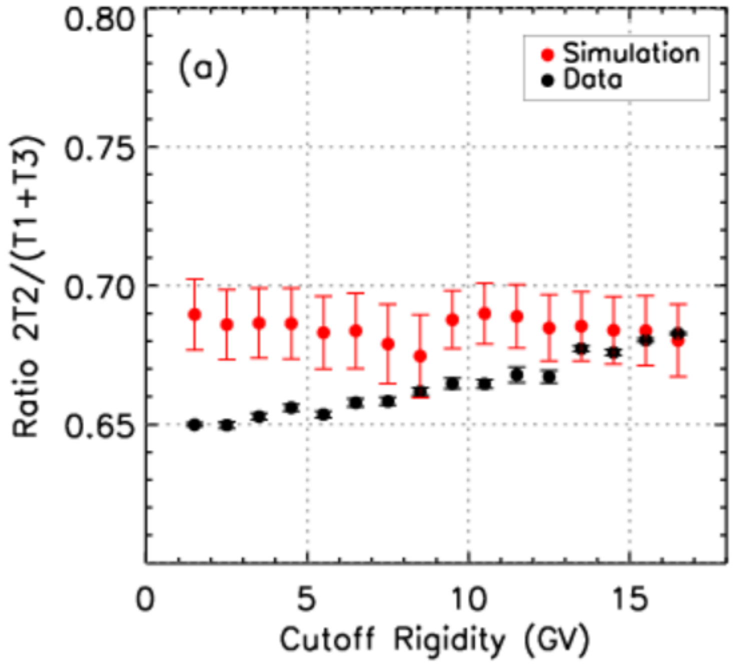

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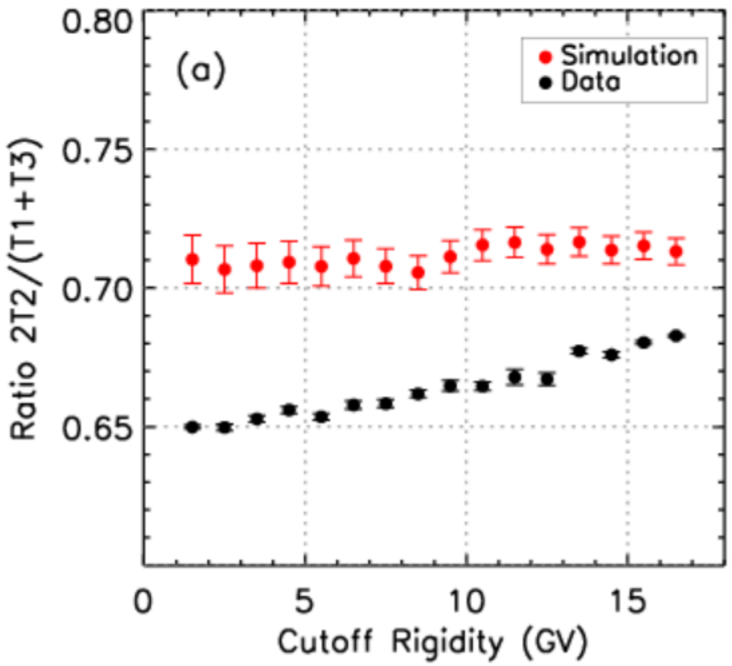
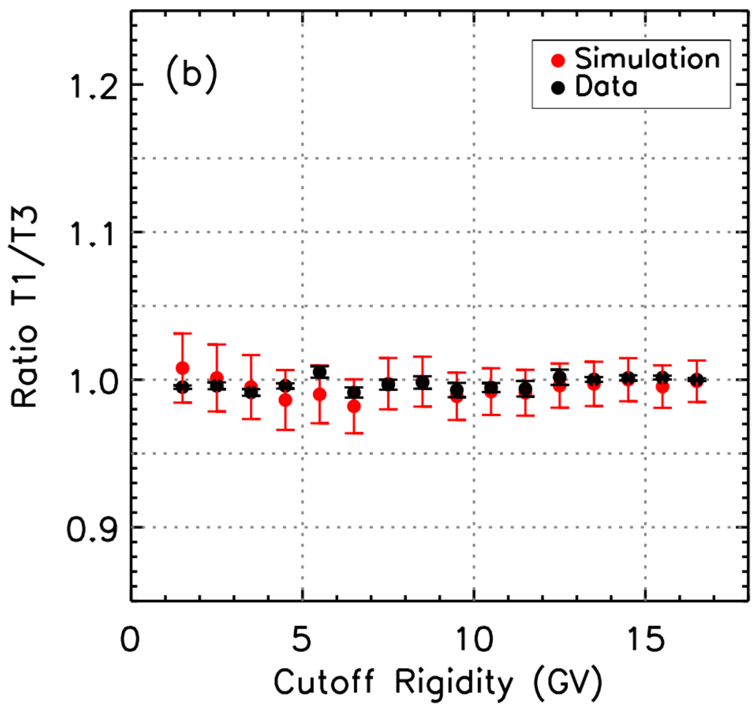


POST-ICRC [NO MUON]

COUNT RATES RATIOS VS CUTOFF RIGIDITY



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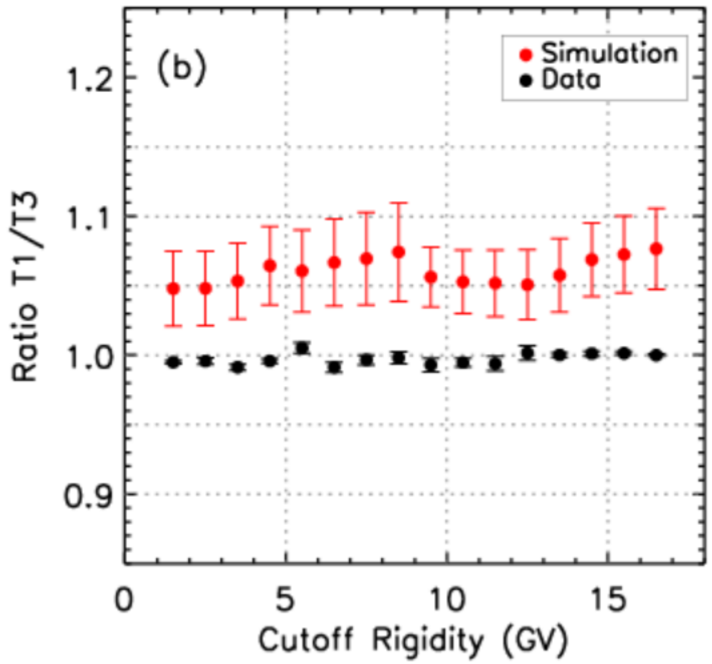

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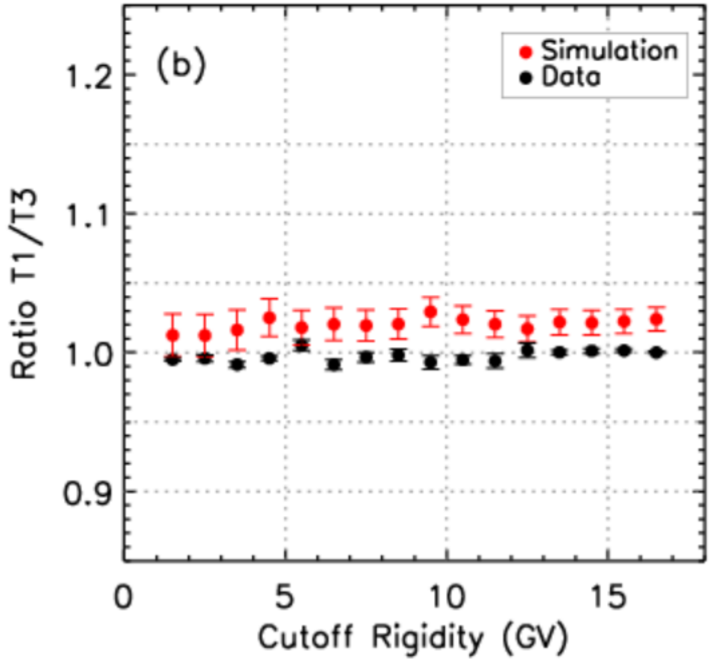
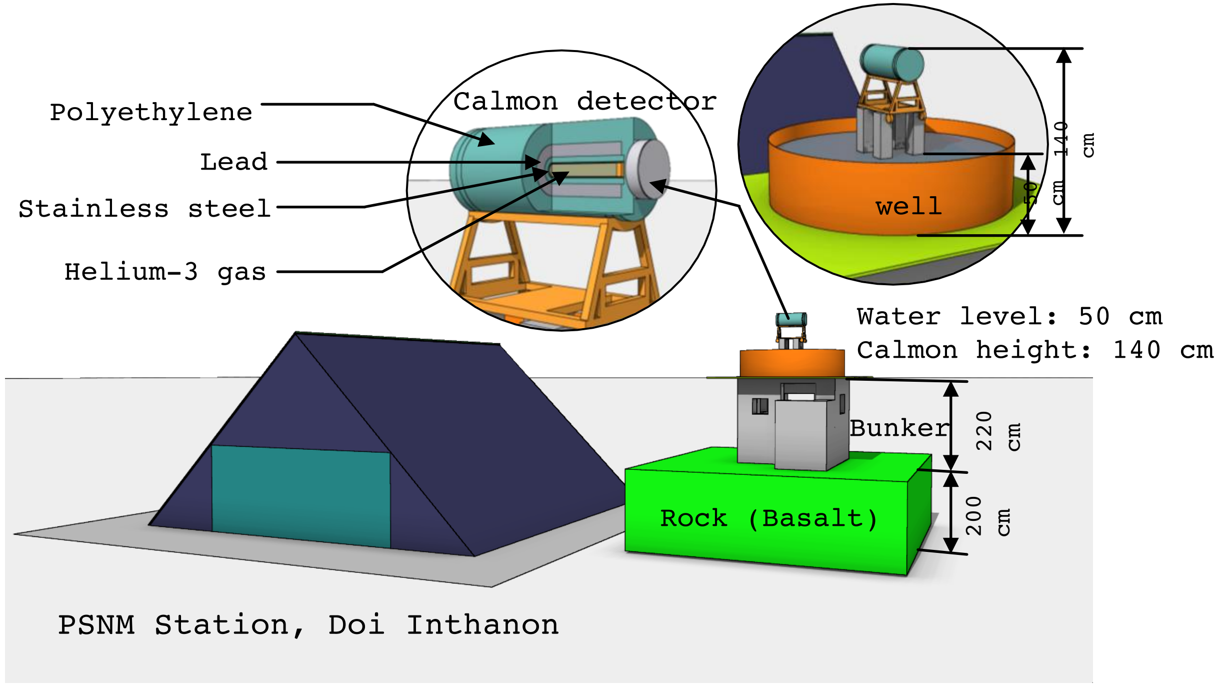


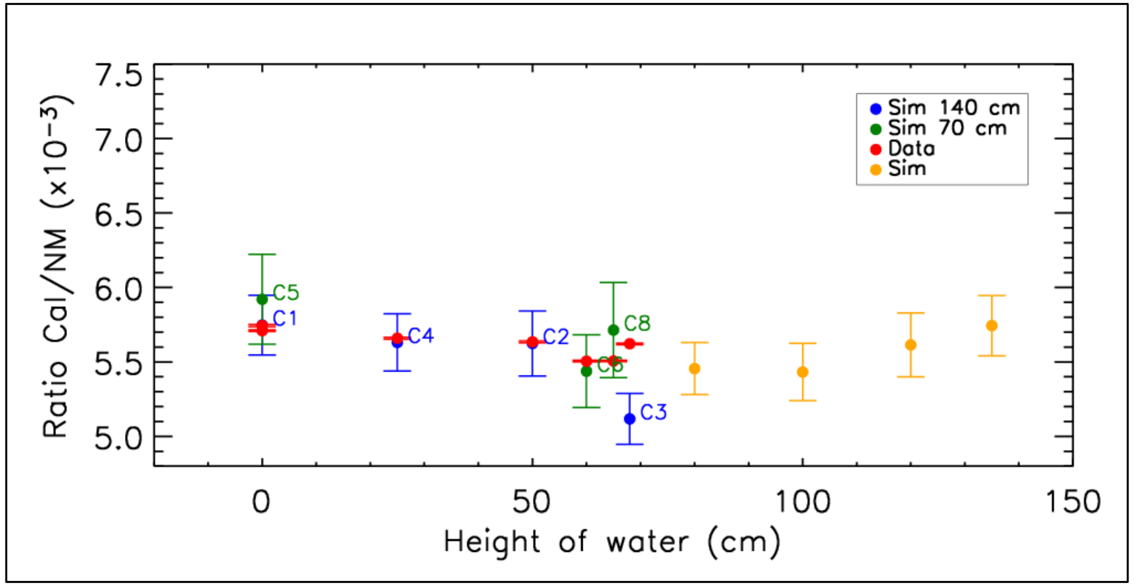
POST-ICRC [NO MUON]

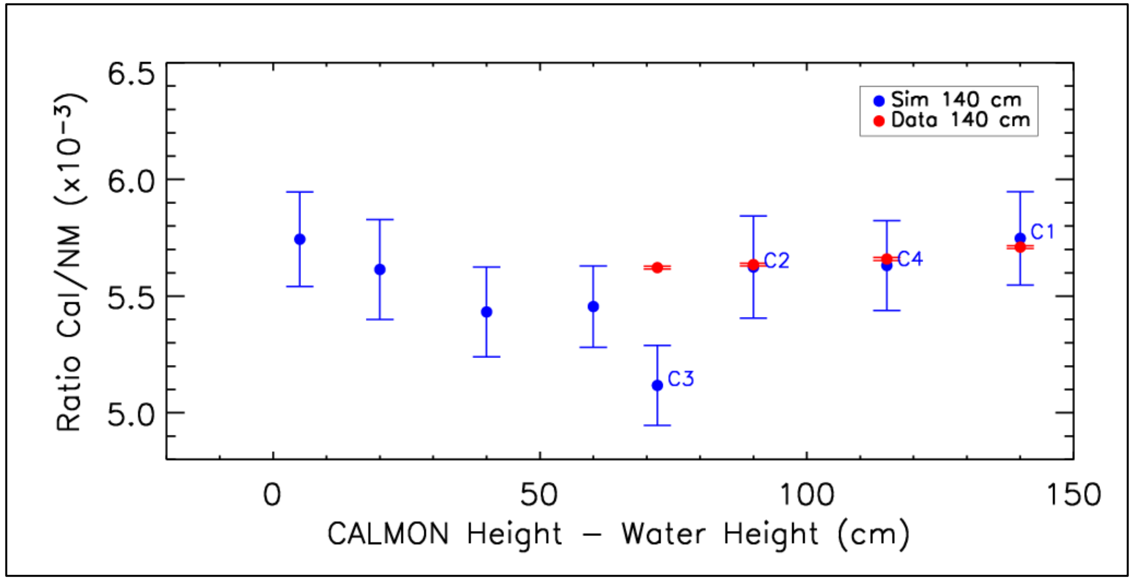
OTHER WORK

- CALMON
- PATHLENGTH
- REMOTE 5.0
- OUTREACH

CALMON SIMULATIONS

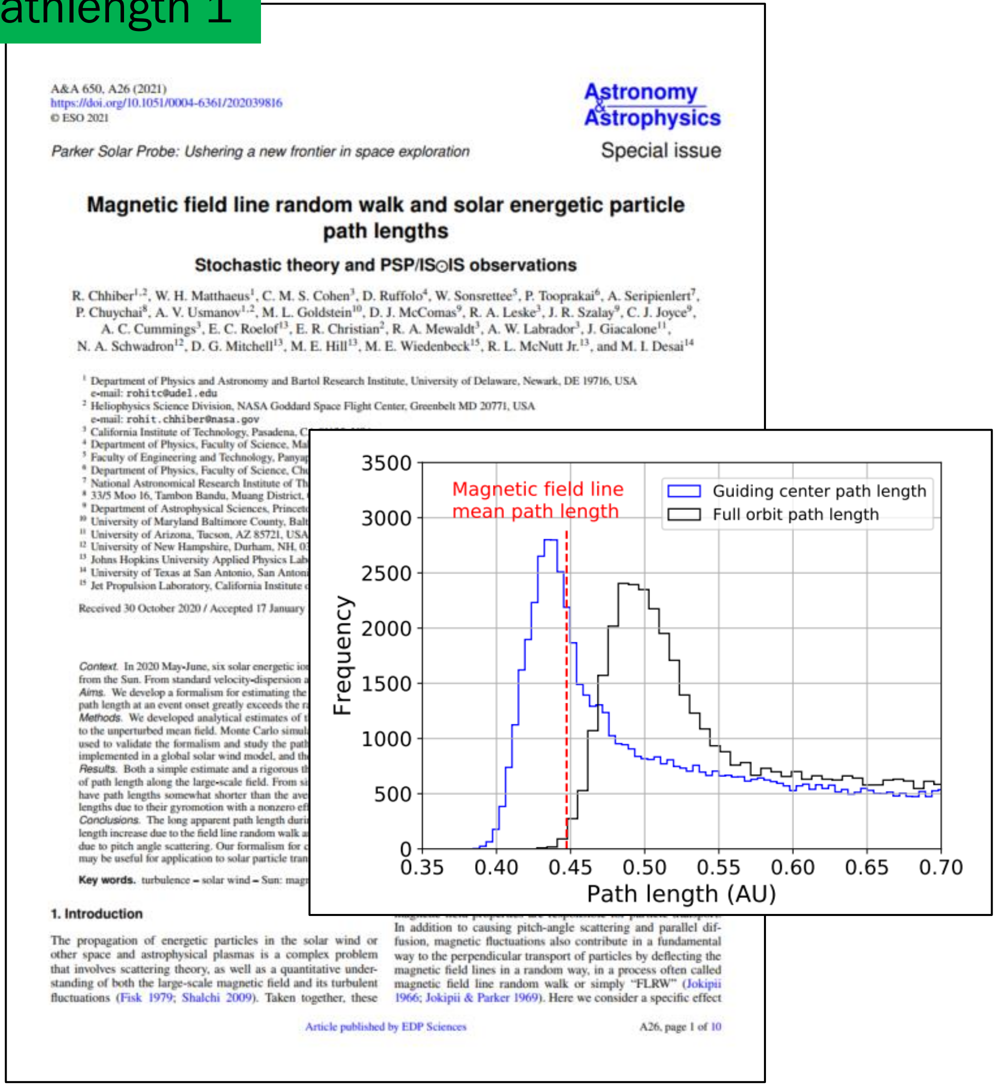






TRACING MAGNETIC FIELD LINES AND PARTICLE MOTION

Pathlength 1



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Astronomy & Astrophysics

Parker Solar Probe: Ushering a new frontier in space exploration — Special issue

Magnetic field line random walk and solar energetic particle path lengths

Stochastic theory and PSP/IS⊙IS observations

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[15] Jet Propulsion Laboratory, California Institute

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Context. In 2020 May-June, six solar energetic io... from the Sun. From standard velocity-dispersion a...
Aims. We develop a formalism for estimating the ... path length at an event onset greatly exceeds the r...
Methods. We developed analytical estimates of t... to the unperturbed mean field. Monte Carlo simul... used to validate the formalism and study the path... implemented in a global solar wind model, and the...
Results. Both a simple estimate and a rigorous th... of path length along the large-scale field. From si... have path lengths somewhat shorter than the ave... lengths due to their gyromotion with a nonzero ef...
Conclusions. The long apparent path length duri... length increase due to the field line random walk a... due to pitch angle scattering. Our formalism for c... may be useful for application to solar particle tran...

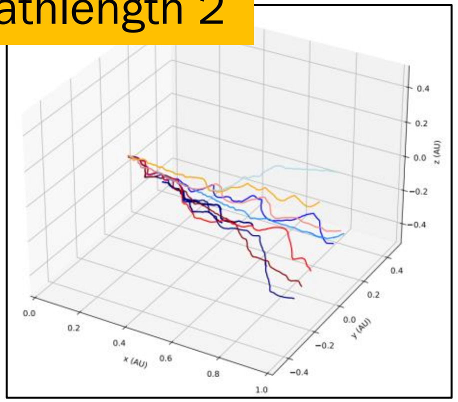
Key words. turbulence – solar wind – Sun: magn...

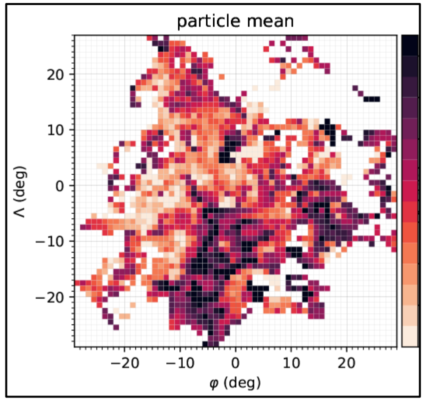
1. Introduction

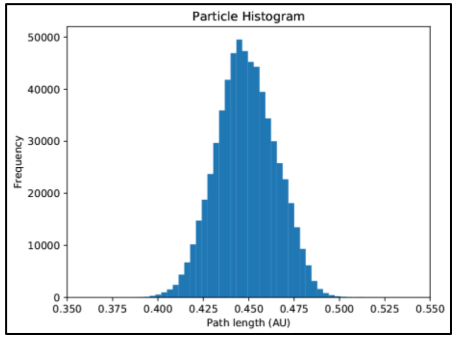
The propagation of energetic particles in the solar wind or other space and astrophysical plasmas is a complex problem that involves scattering theory, as well as a quantitative understanding of both the large-scale magnetic field and its turbulent fluctuations (Fisk 1979; Shalchi 2009). Taken together, these ... In addition to causing pitch-angle scattering and parallel diffusion, magnetic fluctuations also contribute in a fundamental way to the perpendicular transport of particles by deflecting the magnetic field lines in a random way, in a process often called magnetic field line random walk or simply "FLRW" (Jokipii 1966; Jokipii & Parker 1969). Here we consider a specific effect

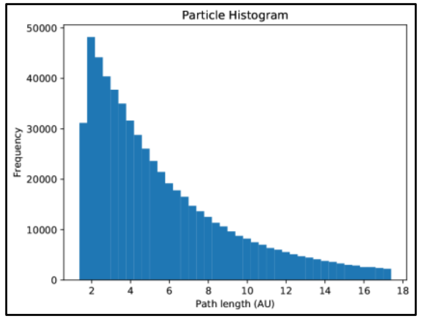
Article published by EDP Sciences — A26, page 1 of 10

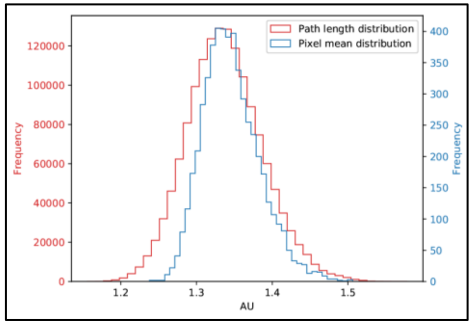
Pathlength 2

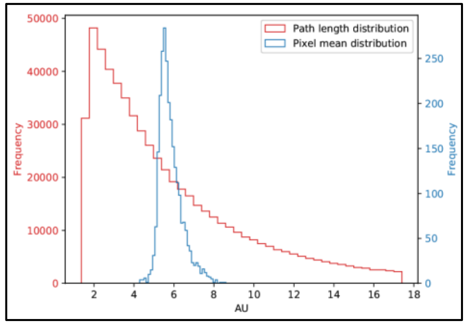






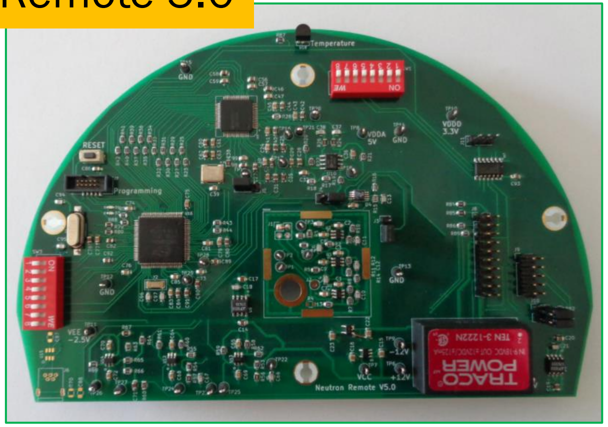


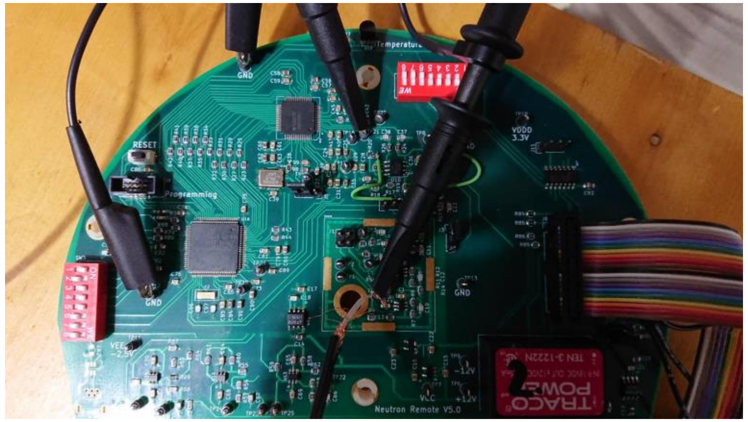


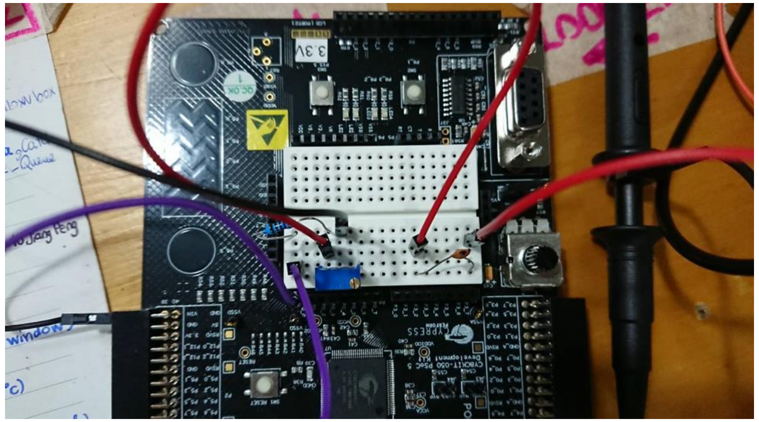


ELECTRONICS

Remote 5.0







OUTREACH

- Translation IceCube comic books.

FUTURE WORK

- Changvan Simulation manuscript
- Pathlength 2 manuscript
- Ice Cherenkov Detector Simulation
- Remote 5.0

SPEED LIMIT OF SOLAR ENERGETIC PARTICLES AND IMPLICATION FOR VELOCITY DISPERSION ANALYSIS

A. Seripienlert, A. Sáiz, D. Ruffolo, P. Tooprakai, and W. H. Matthaeus

Received 2021 February 26; accepted 2021 June 15; published 2021

ABSTRACT

We study the transport of solar energetic particles (SEPs) in the interplanetary medium using a two-component turbulent magnetic field model in spherical geometry. This model includes a radial mean field and fluctuating field. The fluctuating field consists of slab and 2D components. A common expectation is that SEPs can and frequently do travel almost directly along a magnetic field line without scattering, with a parallel speed ranging up to the total speed v. However, we found that the distribution of parallel speeds drops off sharply at a value substantially less than v for reasonable values of the turbulence amplitude. We call this phenomenon a "speed limit." We perform computer simulations of protons of energies from 1 MeV to 1 GeV in different representations of 2D and slab turbulent magnetic fields with varying turbulence amplitude. We found that the speed limit decreases with increasing turbulent energy. This effect may have implications for velocity dispersion analysis.

Key words: solar energetic particles – parallel transport – magnetic turbulence

I. INTRODUCTION

[First paragraph]
- Introduce transport
- Introduce parallel transport
- Explain physics of focus transport
- Expected focus transport
Literatures to read: Ruffolo91, Ruffolo95, BieberEA94, Palmer82, …

[Second paragraph]
- Introduce two component of magnetic field model (in interplanetary medium)
- Briefly explain the model

[Third paragraph]
- What we do in this work
- What we found in our work
- Link to onset time

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