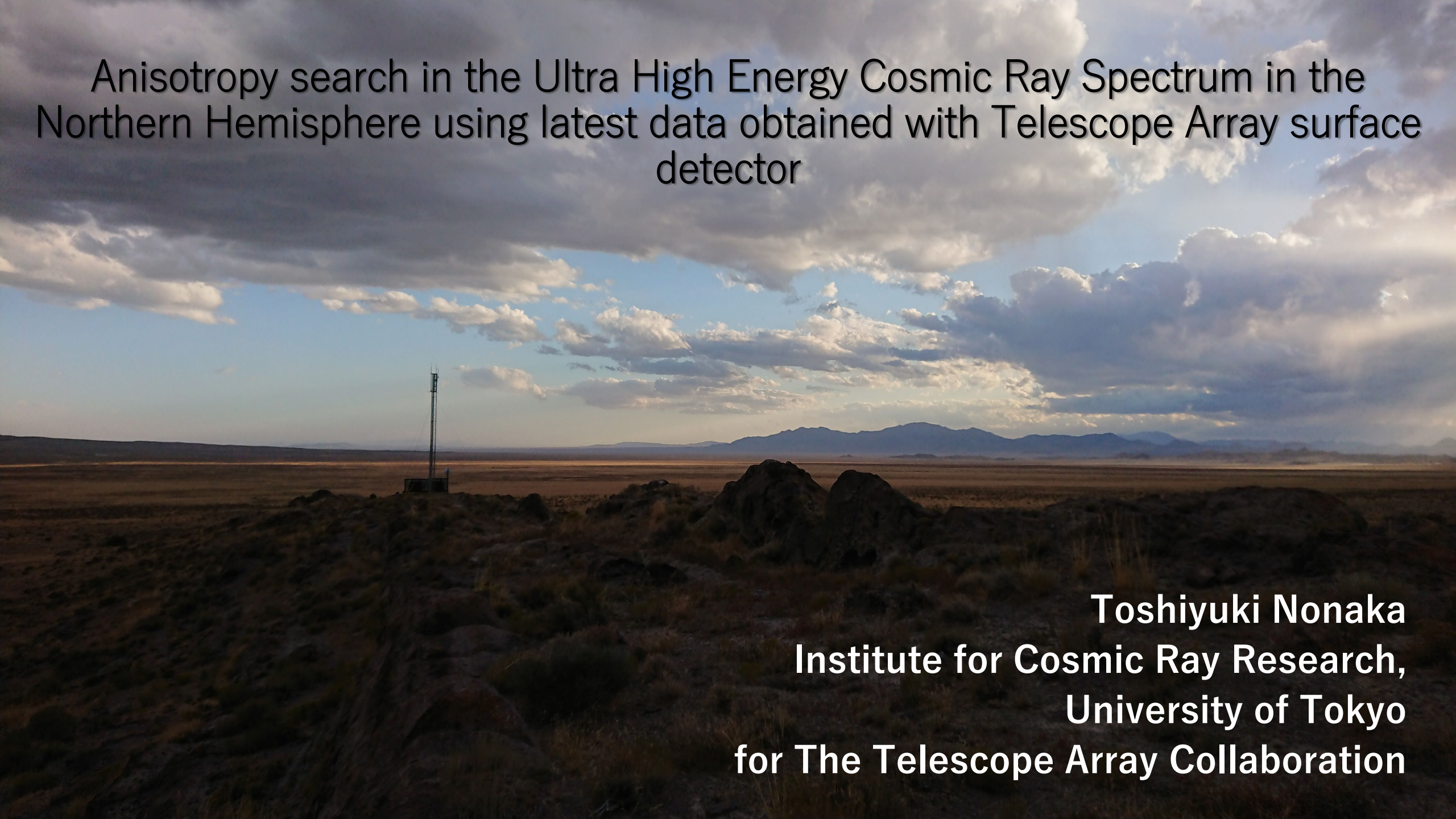
Anisotropy search in the Ultra High Energy Cosmic Ray Spectrum in the Northern Hemisphere using latest data obtained with Telescope Array surface detector



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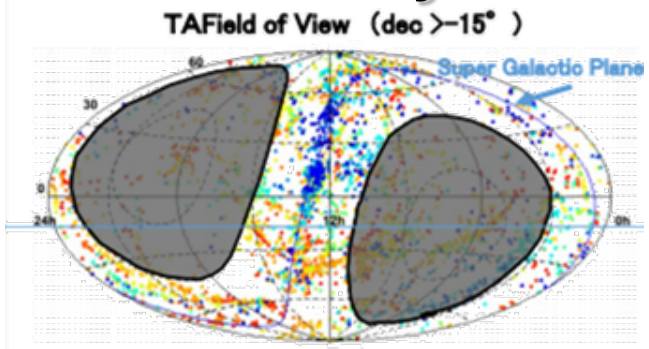
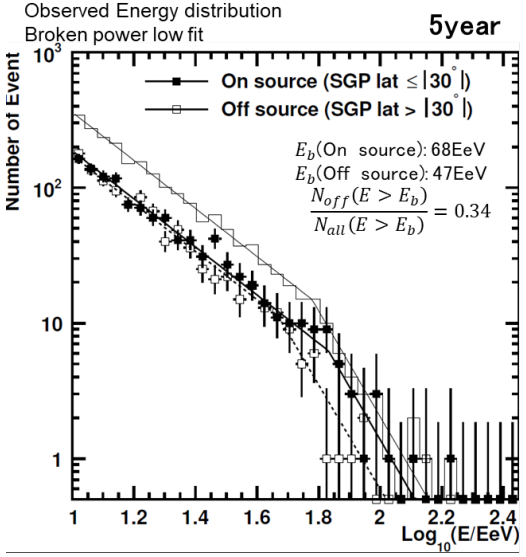
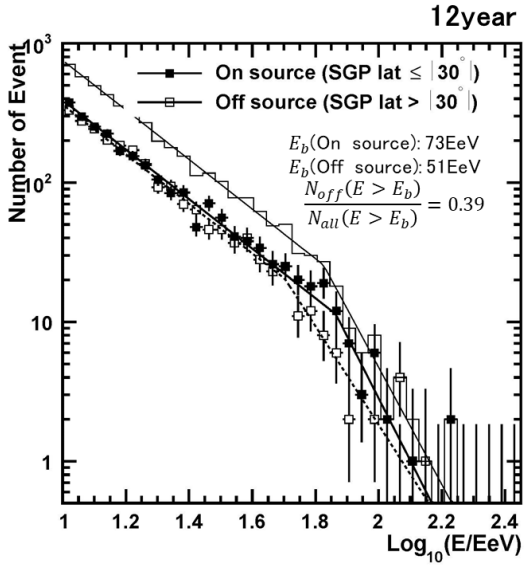
Summary slide (1)



SGP latitude <|30° | (On source)
SGP latitude >|30° | (Off source)
Fraction in Exposure (52% vs 48%)

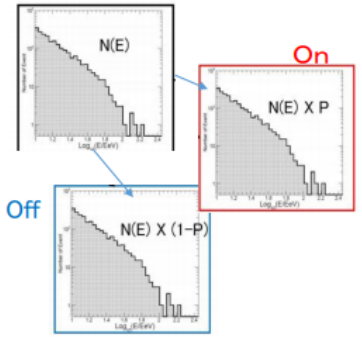
Observed Energy distribution
Broken power low fit





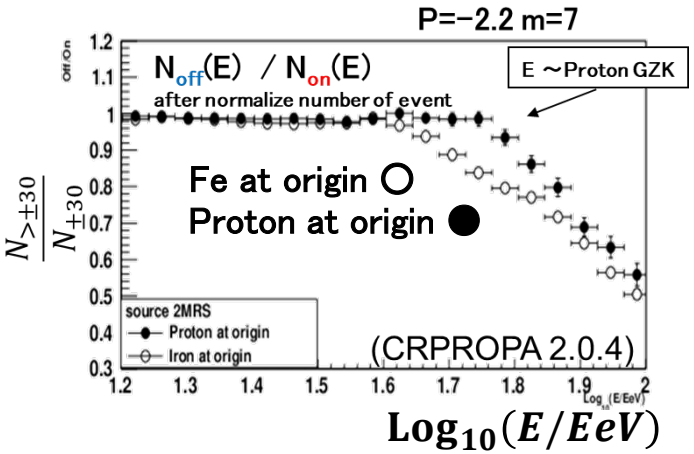
Procedure of calculation

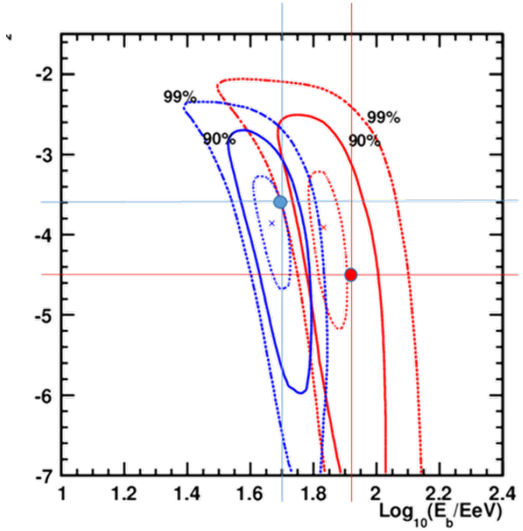
- Shuffle events to On source and Off source with binominal probability based on exposure fraction.

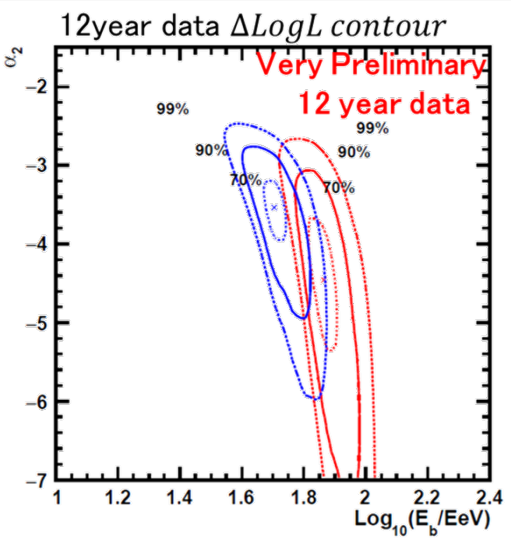


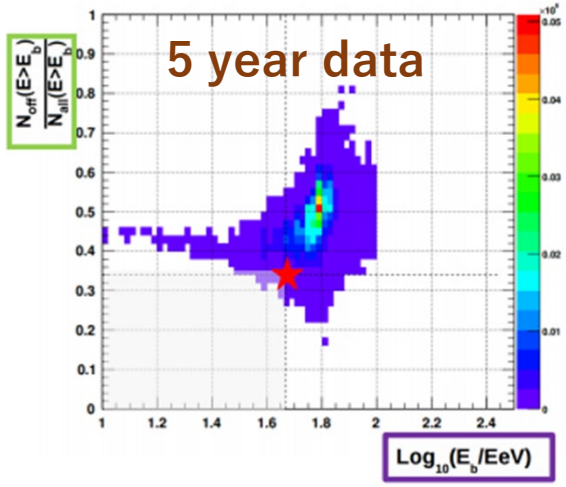
- Obtain $\mathrm{Log}_{10}(E_b/\mathrm{EeV})$ and $\frac{N_{off}(E>E_b)}{N_{all}(E>E_b)}$ with same procedure at each trial.
- Repeat and count how many times smaller $\frac{N_{off}(E>E_b)}{N_{all}(E>E_b)}$ than $\mathrm{Log}_{10}(E_b/\mathrm{EeV})$ is observed.

Propagation simulation









P=6.2x10^{-4} (3.2σ)

- ✓ Early break
- ✓ More attenuation at high energy

Summary slide (2)

- The difference in energy distribution was evaluated between two sky areas in northern hemisphere.
- One of the sky area is Super-Galactic latitude $\mathbf{within}\ \pm 30^\circ$ (On source) and the other is Super-Galactic latitude $\mathrm{o}\boldsymbol{ut\ side\ of}\ \pm 30^\circ$ (Off source).
- The simulation suggests that the cosmic ray energy distribution will differ at high energy end. The distribution from Off source area shows early breake at high energy end.

- The shape of observed cosmic ray energy distribution above 10^{19}eV was examined using Telescope array surface detectors.
- The trend of the difference in energy distribution (3.2σ with 5 year data) was analyzed with12 years of data.
- 12 years data, the maximum likelihood value is within the confidence region of the 5-year data.