EGU22-4215
https://doi.org/10.5194/egusphere-egu22-4215
EGU General Assembly 2022

Cosmic Ray Flux Correlation between McMurdo and Jang Bogo Neutron Monitor Stations vs. Time Lag

Ekawit Kittiya[1], **Waraporn Nuntiyakul**[1], Achara Seripienlert[2], Paul Evenson[3], Alejandro Saiz[4], David Ruffolo[4], and Sueyon Oh[5]

[1]Chiang Mai University, Faculty of Science, Physics and Materials Science, Muang, Chiang Mai, Thailand (jumboaekawit@gmail.com, waraporn.n@cmu.ac.th)

[2]National Astronomical Research Institute of Thailand (NARIT), Chiang Mai 50180, Thailand (achara@narit.or.th)

[3]Department of Physics and Astronomy, University of Delaware, Newark, DE 19716, USA (evenson@udel.edu)

[4]Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand (asaizrivera@gmail.com, ruffolo.physics@gmail.com)

[5]Department of Earth Science Education, Chonnam National University, Gwangju 61186, South Korea (suyeonoh@chonnam.ac.kr)

A neutron monitor is a large ground-based detector responding to the flux of cosmic ray particles in space by measuring atmospheric secondary neutrons. Any ground-based detector is sensitive to cosmic rays from a specific range of directions in space. In particular, a particle arriving from a specific sky direction with a specific rigidity (momentum per unit charge) was necessarily moving from a certain direction in space, called the asymptotic direction. McMurdo and Jang Bogo neutron monitor stations are Antarctic stations with similar geomagnetic latitudes but slightly different longitudes. From December 17, 2015 to January 9, 2017, six of the eighteen neutron counters from McMurdo had been transferred to Jang Bogo (with full transfer to Jang Bogo completed in December 2017). We present an analysis of the correlation of the cosmic ray flux between the McMurdo and Jang Bogo stations, during the time when both were operating, with ten-second time resolution. Although highly correlated, there are significant differences, including a systematic time lag of approximately 16 minutes between the data from the two stations. Although McMurdo observes with similar asymptotic directions to Jang Bogo, the response-weighted average directions still have a substantial difference of 21.9 degrees in geographic longitude, so with Earth's rotation, time-independent anisotropy effects should induce a lag of 88 minutes. Because the observed lag of 16 minutes is intermediate between 0 and 88 minutes, the joint observations reveal structure in the interplanetary cosmic-ray density that is consistent with a combination of simultaneous temporal variations and non-simultaneous variations with direction (i.e., anisotropy). The research is supported in part by a TA/RA scholarship (active recruitment) of Chiang Mai University and Thailand Science Research and Innovation via Research Team Promotion Grant RTA6280002.