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Cosmic Ray Flux Correlation between McMurdo and Jang Bogo Stations

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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 certain 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 in a certain direction in space, called the asymptotic direction outside the geomagnetic field. McMurdo and Jang Bogo neutron monitor stations are Antarctic stations with similar geomagnetic latitude but slightly different geomagnetic longitude. From December 2015 to October 2016, we had transferred six of the eighteen neutron counters from McMurdo 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 systematic time lags, in the data from the two stations. Since McMurdo observes a similar asymptotic direction to Jang Bogo with a time delay of approximately 13 minutes, the joint observations reveal structure in the interplanetary cosmic ray density at a unique distance and angular scales. The research is supported in part by TA/RA scholarship (active recruitment) of Chiang Mai University and Thailand Science Research and Innovation via Research Team Promotion Grant RTA6280002.

Primary author: KITTIYA, Ekawit (Department of Physics and Material Science, Faculty of Science, Chiang Mai University)

Co-authors: NUNTIYAKUL, Waraporn (Chiang Mai University); EVENSON, Paul (University of Delaware); SÁIZ, Alejandro (Mahidol University); RUFFOLO, David (Mahidol University); Prof. OH, Suyeon (Department of Earth Science Education, Chonnam National University, Gwangju 61186, South Korea); SERIPIENLERT, Achara (National Astronomical Research Institute of Thailand (NARIT), Chiang Mai 50180, Thailand)

Presenter: KITTIYA, Ekawit (Department of Physics and Material Science, Faculty of Science, Chiang Mai University)

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