



Sidereal anisotropy of sub-TeV galactic cosmic ray intensity observed with a two-hemisphere network of underground muon detectors in Japan and Australia

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Abstract: This paper presents the average sidereal anisotropy (SA) of sub-TeV galactic cosmic ray intensity observed with a two-hemisphere network (THN) of underground muon detectors over 15 years. The average SA confirms the conclusions derived from the initial 5-year data by THN [1][2], while the long-term observations allow us to examine modulations over the solar activity and magnetic cycles. The THN also confirms a clear north-south anti-symmetric feature of the anti-sidereal variation which is a signature of the spurious sidereal variation due to the second order anisotropy of solar origin. This allows us to confidently correct the observed sidereal anisotropy for the spurious effect using the anti-sidereal variation, though the correction introduces only a minor change in the SA. We compare the anisotropy with that recently reported by the Tibet air shower experiment at ~10 TeV [3] and conclude that the large-scale anisotropies derived from these two experiments are consistent with each other, regardless of the difference in energy of more than an order of magnitude. We discuss these results, with special emphasis on our observations over southern hemisphere mid-latitudes which cannot be observed by the Tibet experiment.

References

- [1] Hall et al., *J. Geophys. Res.*, 103:367, 1998.
- [2] Hall et al., *J. Geophys. Res.*, 104:6733, 1999.
- [3] M. Amenomori et al., *Science*, 314:439, 2006.