

The cosmic-ray shadow of the Sun observed with the Tibet air shower array, as a probe of the solar magnetic field

Wednesday, 27 July 2022 15:00 (15 minutes)

The Tibet air shower array is located at 4,300m above sea level, Tibet, China. It is an international joint project between China and Japan. The Tibet air shower array which observes high-energy cosmic rays above 3 TeV. The Sun casts a shadow in high-energy cosmic-ray intensity observed at the Earth and the depth and location of the shadow vary according to variations of the solar magnetic field. We find a clear solar cycle variation of the deficit intensity in the Sun shadow in anti-correlation with the solar activities. Our MC simulation of the Sun shadow based on the potential field model of the coronal magnetic field reproduces the observed variation of the deficit intensity successfully above 10 TeV. However, we find small systematic difference between the MC simulation and our observation around 3 TeV. As a source of the difference, we examine the influence of the coronal mass ejections on the Sun shadow. On the other hand, the north-south displacement of the Sun shadow center is related to the away-toward interplanetary magnetic field, which we also discuss in this presentation.

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Session Classification: Parallel 2

Track Classification: SW