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Fermi LAT observation of the Moon

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We have reconstructed the gamma-ray flux from the Moon in the energy range from 30 MeV up to a few GeV using a 14-years dataset collected by the Fermi Large Area Telescope since its launch in 2008. Gamma rays from the Moon are originated in the interactions of cosmic-ray nuclei with the regolith of the lunar surface and their flux is sensitive to solar activity, which modulates the charged cosmic-ray fluxes in the solar system. We have studied the time evolution of the lunar gamma-ray emission over a period exceeding a solar cycle, and we have found a strong correlation with the solar activity. We have also developed a model, based on the FLUKA simulation code, to evaluate the yields of lunar gamma rays produced by cosmic-ray protons and helium nuclei. We have then folded the yields obtained from the model with the primary proton and helium spectra measured by the AMS-02 and PAMELA experiments in different epochs and we have found that the simulation correctly reproduces the time evolution of the lunar gamma-ray flux.

Track

Solar System

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