

The gamma-ray Moon seen by the Fermi LAT over a full solar cycle

Friday 16 July 2021 19:18 (12 minutes)

The Moon is among the brightest gamma-ray sources in the sky. We have reconstructed its gamma-ray spectrum in the energy range from 30 MeV up to a few GeV using the data collected by the Fermi Large Area Telescope during its first 13 years of operation since its launch in 2008, a period covering the duration of a whole solar cycle. We have also studied the evolution of the lunar gamma-ray emission by measuring the spectra in 6 months time intervals. The data show a strong correlation with the solar activity. Gamma rays produced on the lunar surface are in fact originated in the interactions of cosmic rays (mainly proton and helium), whose fluxes are affected by solar modulation. We have also developed a model based on the FLUKA simulation code to evaluate the yields of photons produced by cosmic-ray protons and helium nuclei impinging on the Moon. We have then folded the gamma-ray yields obtained from the model with the primary proton and helium spectra measured by the AMS-02 and PAMELA experiments in different time intervals and we have compared the simulation results with the experimental data, showing that the simulation reproduces correctly the time evolution of the lunar gamma-ray flux.

Keywords

Collaboration

Fermi-LAT

other Collaboration

Subcategory

Experimental Results

Primary author: DE GAETANO, Salvatore (Università degli Studi di Bari and INFN Sezione di Bari)

Co-authors: LOPARCO, Francesco; MAZZIOTTA, Mario Nicola (INFN Bari); Prof. GIGLIETTO, Nicola (Politecnico di Bari and INFN sezione di Bari)

Presenter: DE GAETANO, Salvatore (Università degli Studi di Bari and INFN Sezione di Bari)

Session Classification: Discussion

Track Classification: Scientific Field: GAD | Gamma Ray Direct