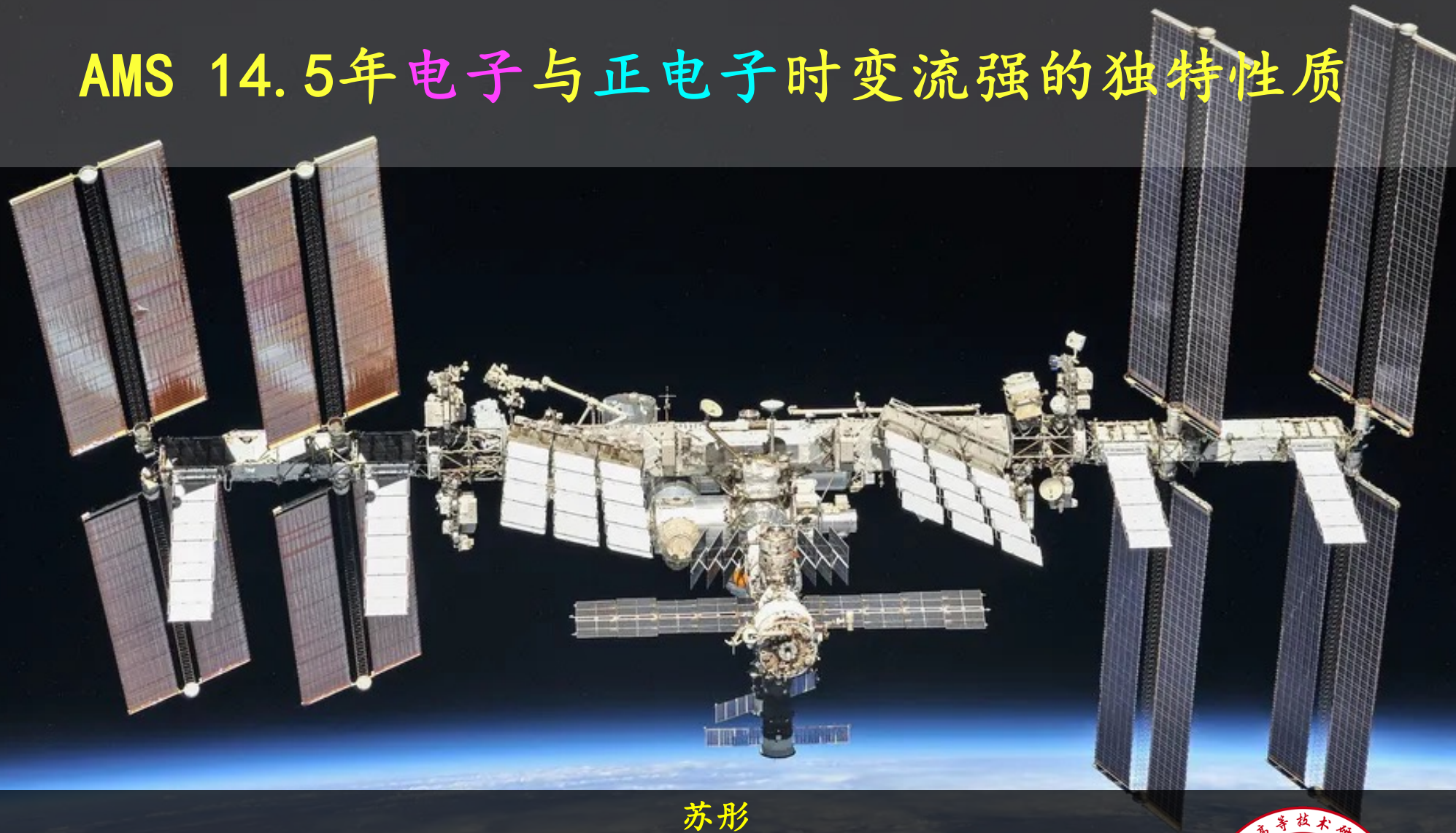


AMS 14.5年电子与正电子时变流强的独特性质



苏彤

山东高等技术研究院

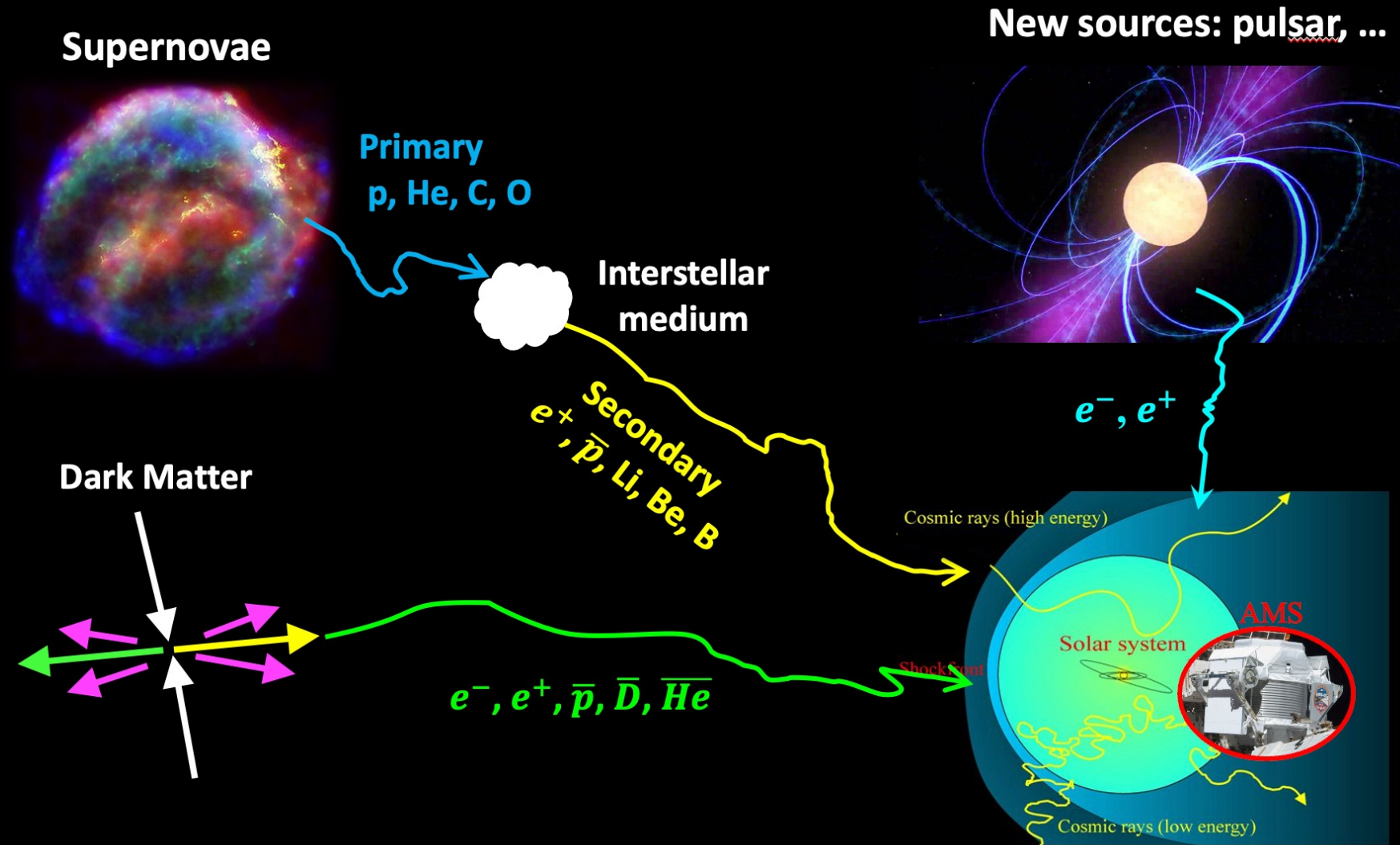
2026.07.16

广州，广东

中国物理学会高能物理分会
HIGH ENERGY PHYSICS BRANCH OF CPS

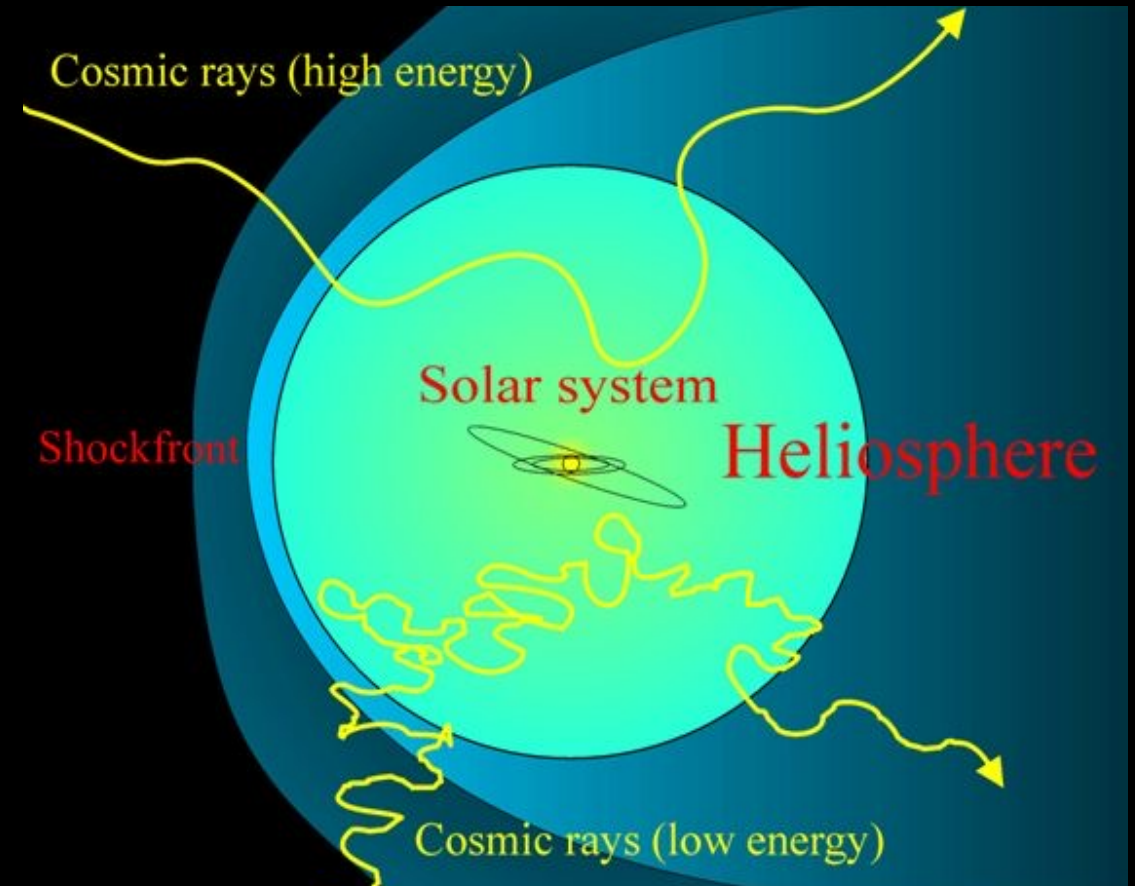
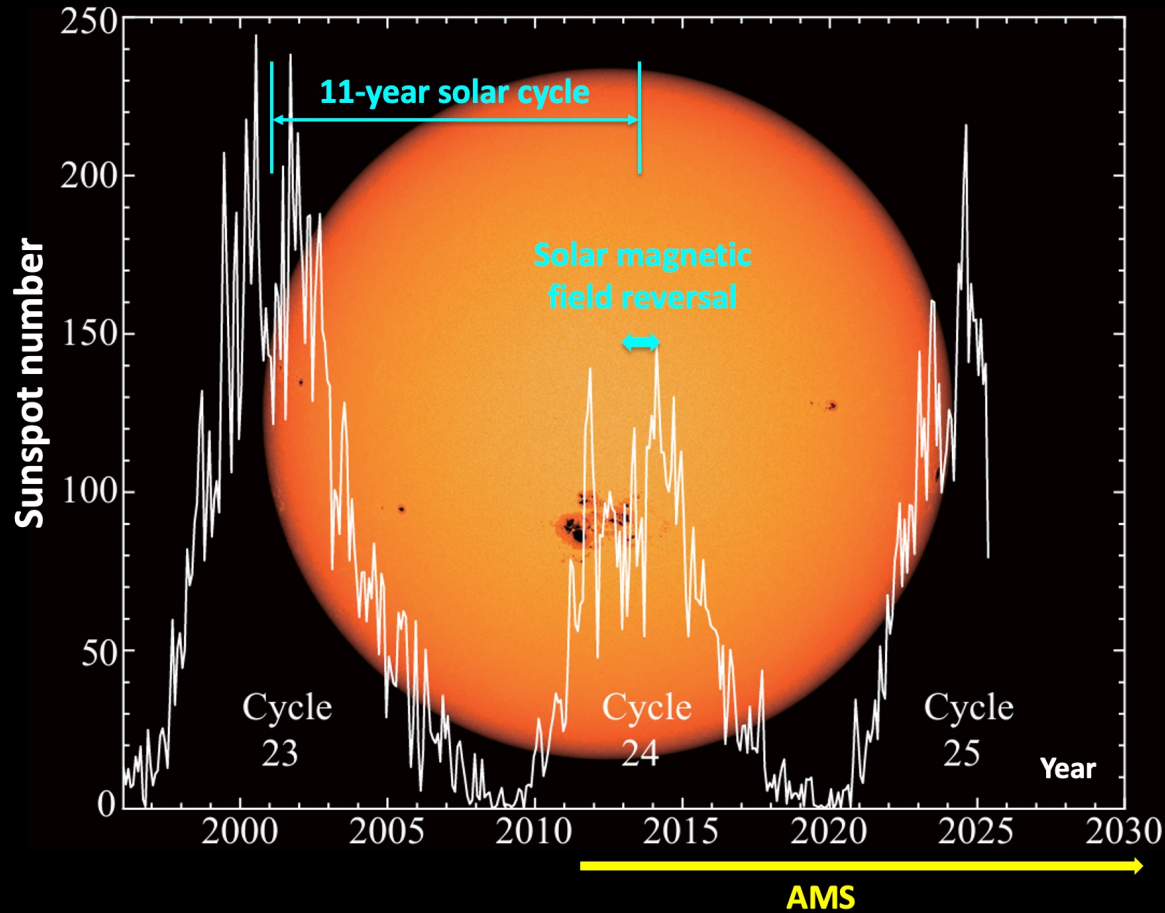


Origin and Propagation of Cosmic Rays



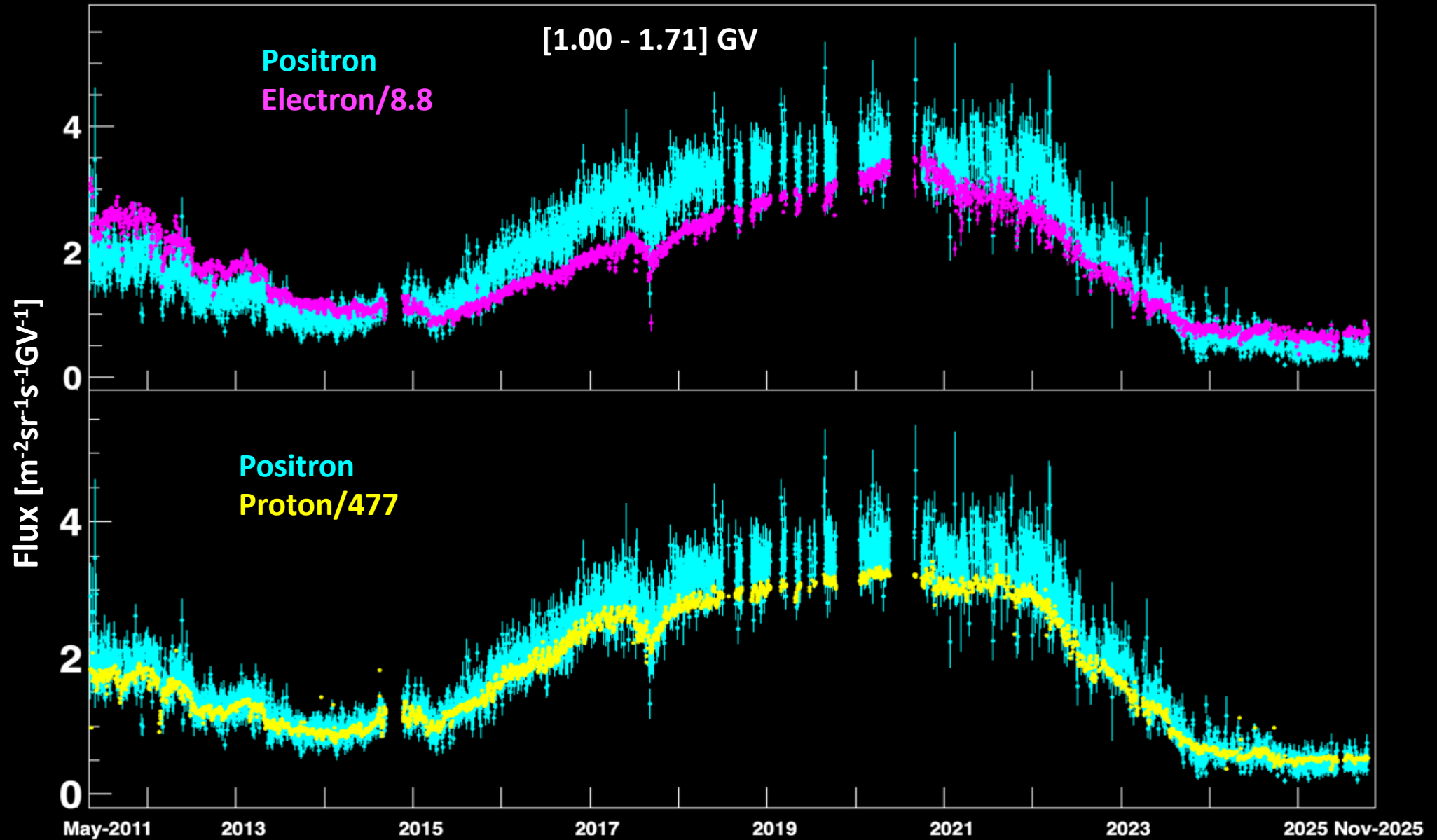
Before being detected by AMS,
All the galactic cosmic rays propagate in the solar system (heliosphere)

AMS Studies of the cosmic ray propagation in solar system

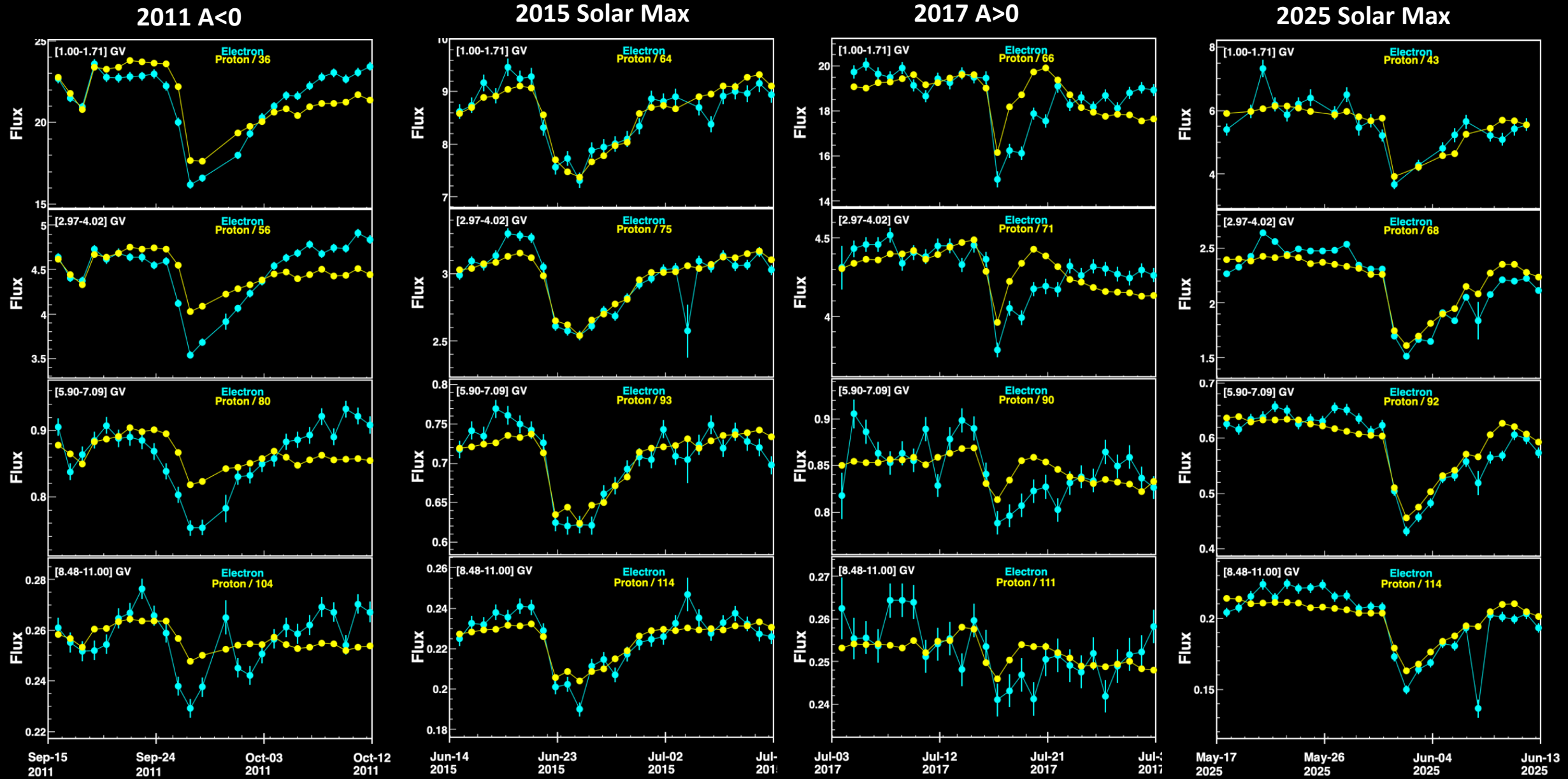


AMS continuously measures cosmic ray fluxes of different species (matter and antimatter), with high precision and time granularity.

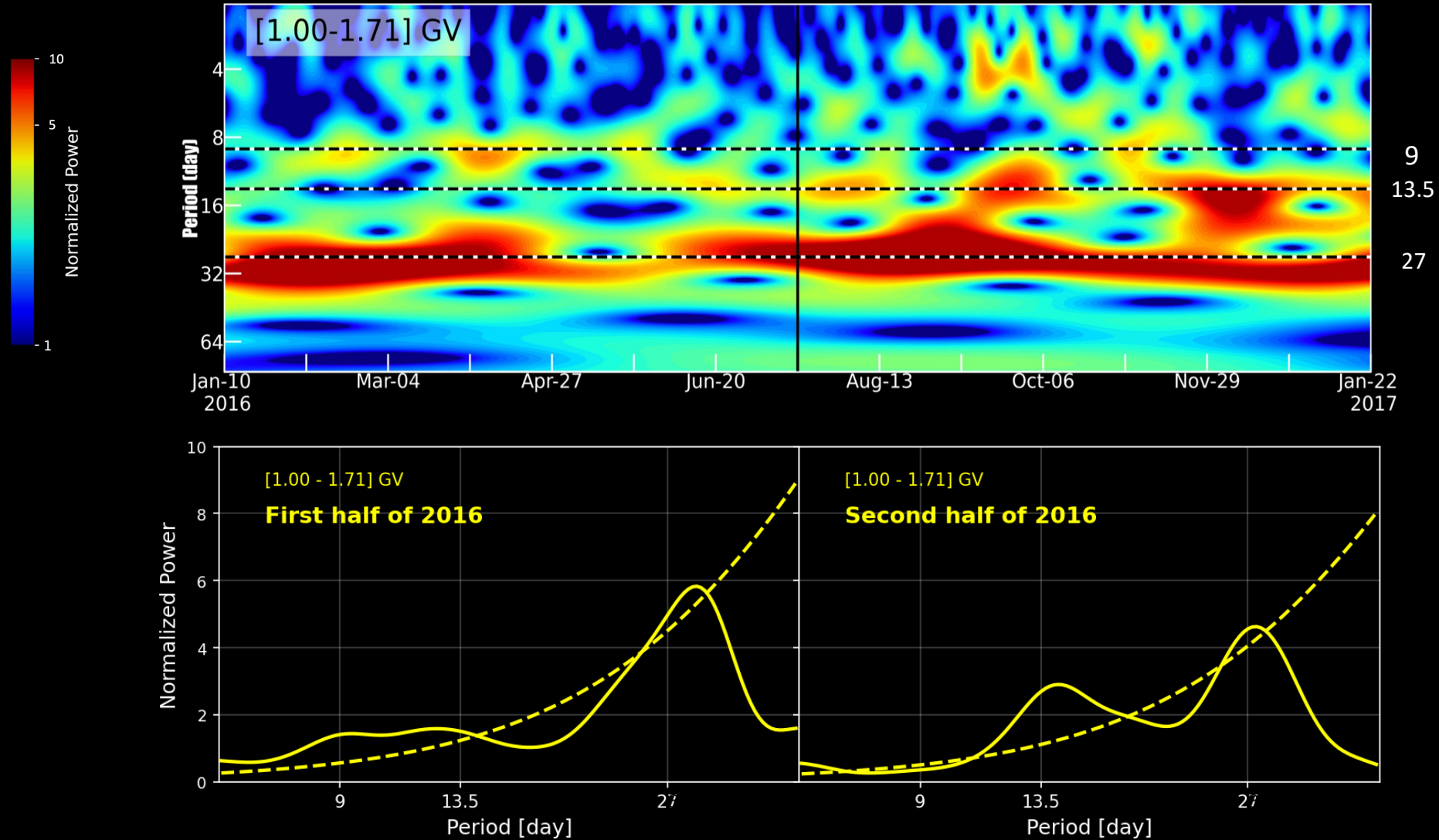
Daily electron and positron from May 2011 to November 2025



Comparison of nonrecurrent variation between Electron and Proton



The Recurrent Variation in Electron Flux: Periodicity

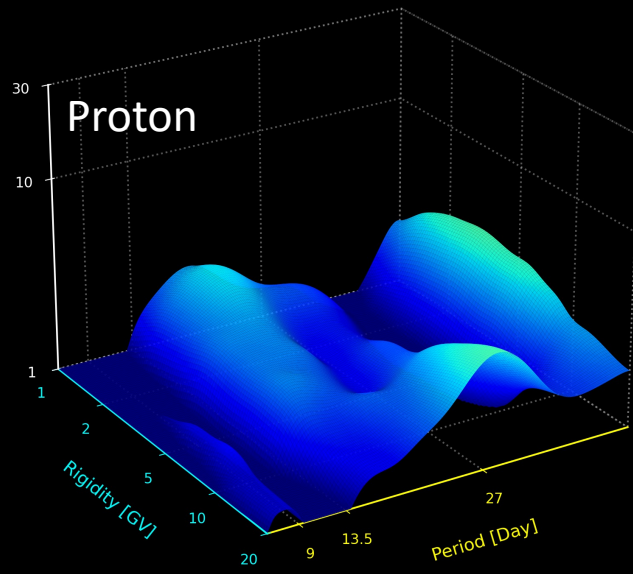
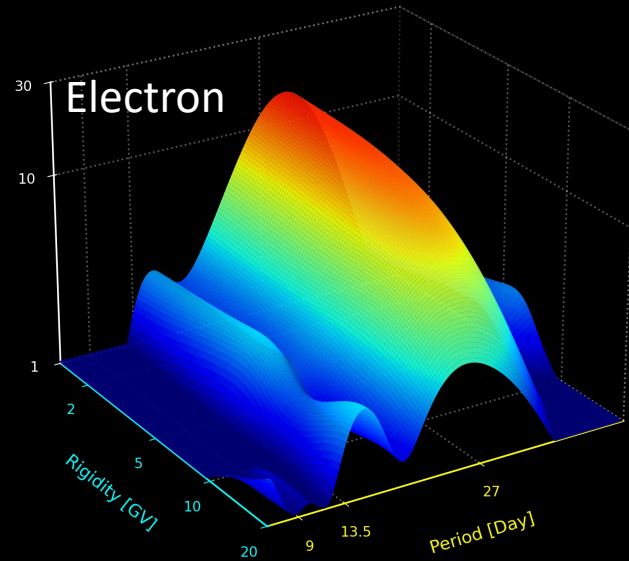


- The wavelet analysis is used to study the periodicity in electron fluxes.
- Red-noise model is used to estimate the significance of the periods.

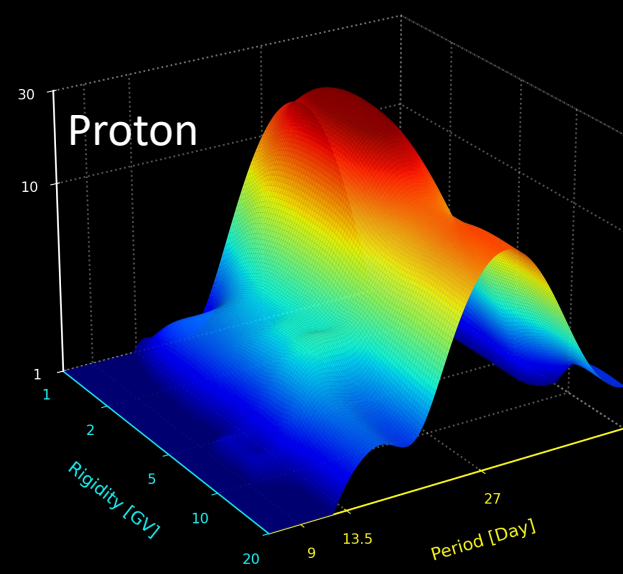
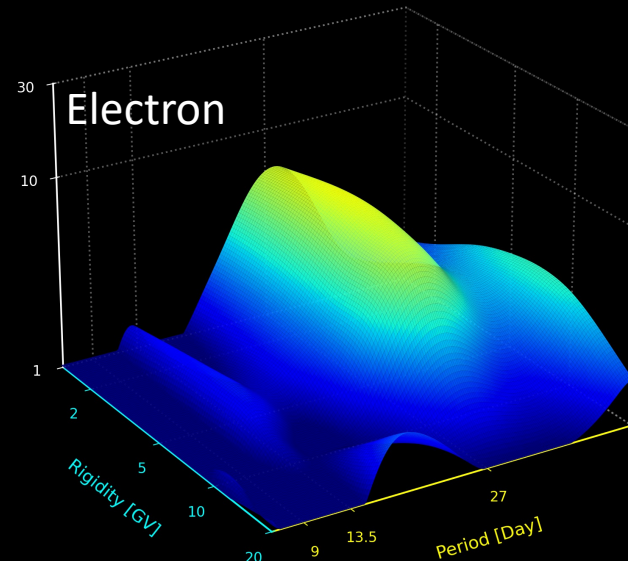
Periodicities of Daily Electron Fluxes

The rigidity dependence of the electron periodicities is different from that of protons

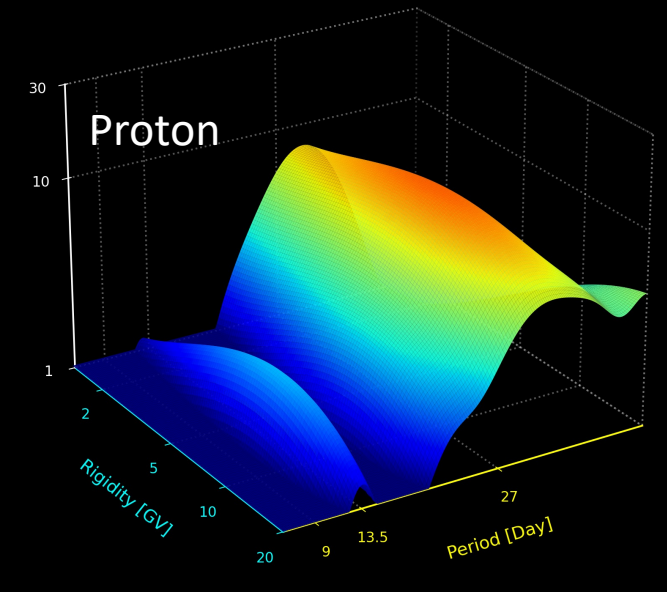
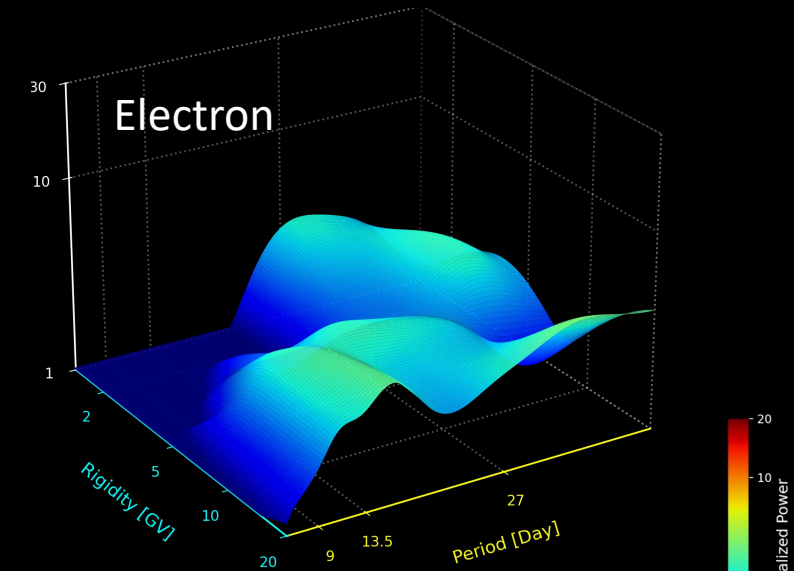
Second half of 2011 ($A < 0$)



First half of 2017 ($A > 0$)

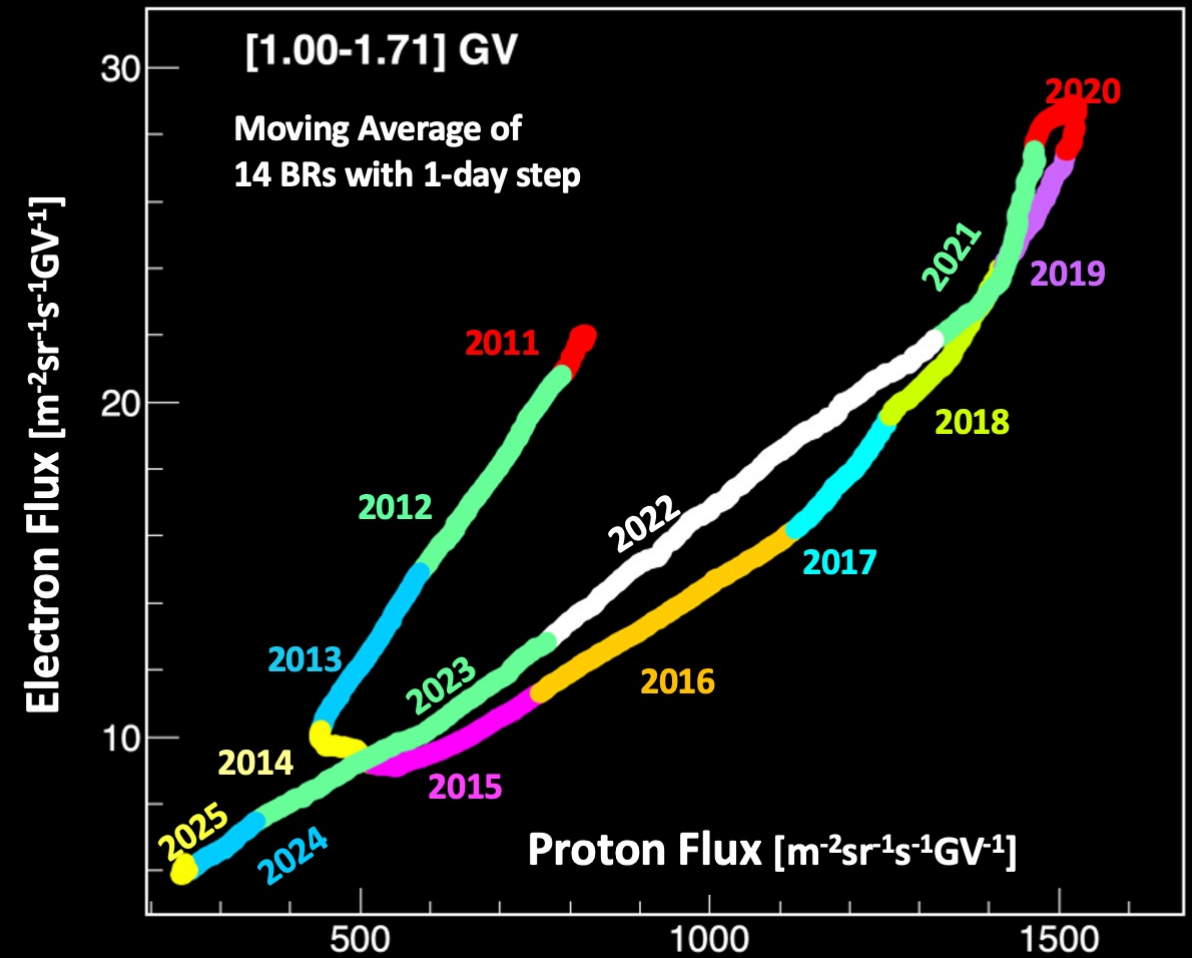
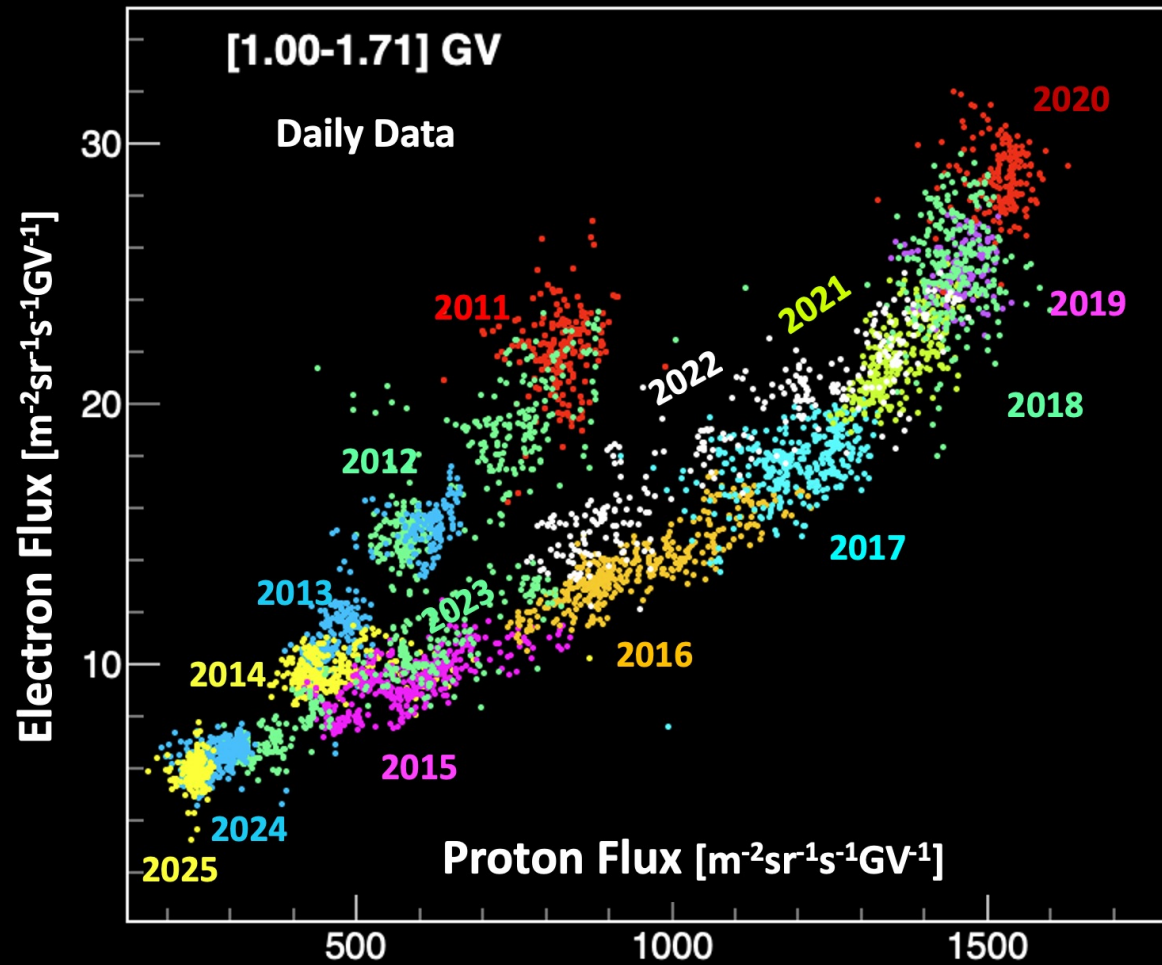


Second half of 2022 ($A > 0$)

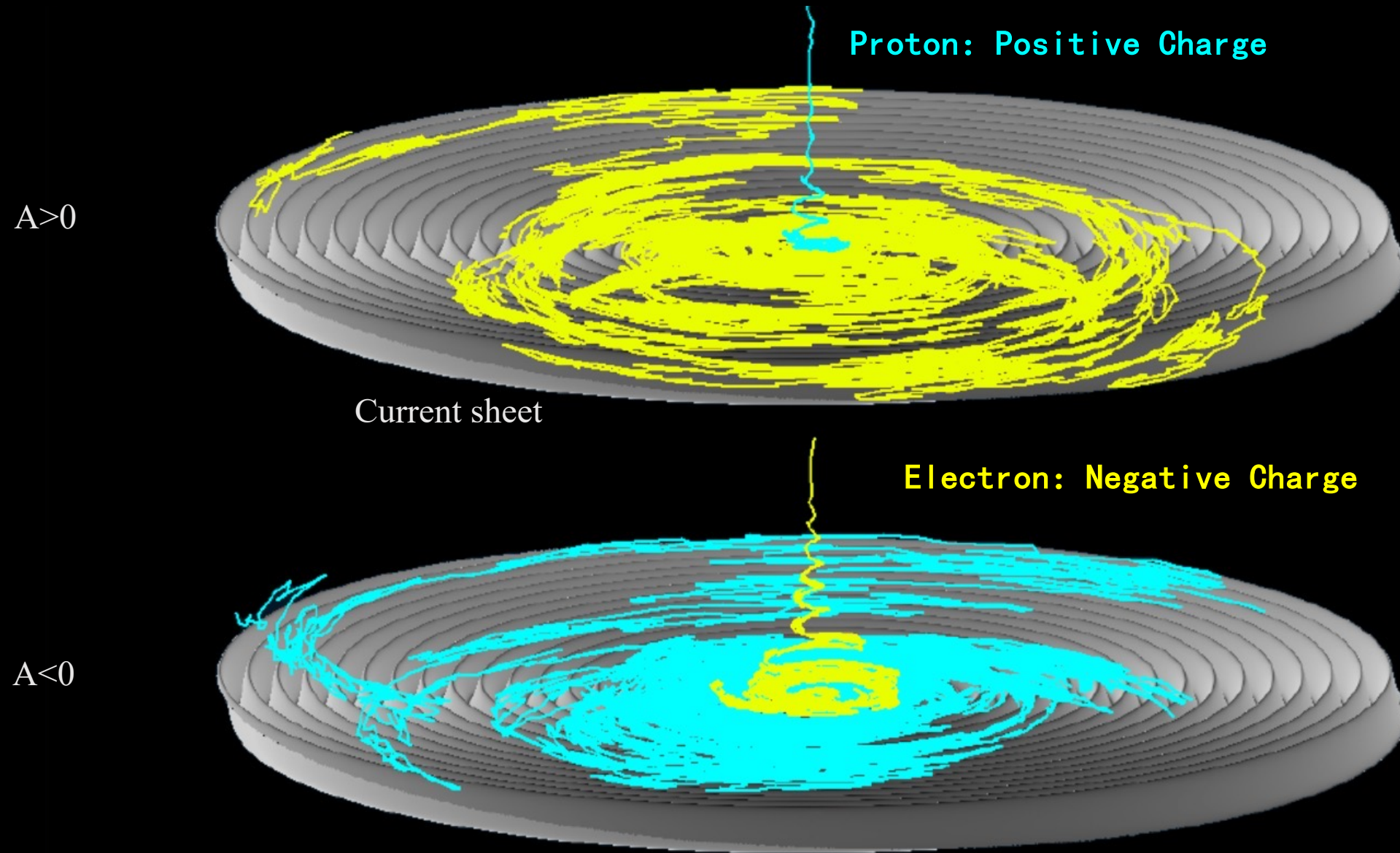


Normalized Power

Hysteresis between electron and proton

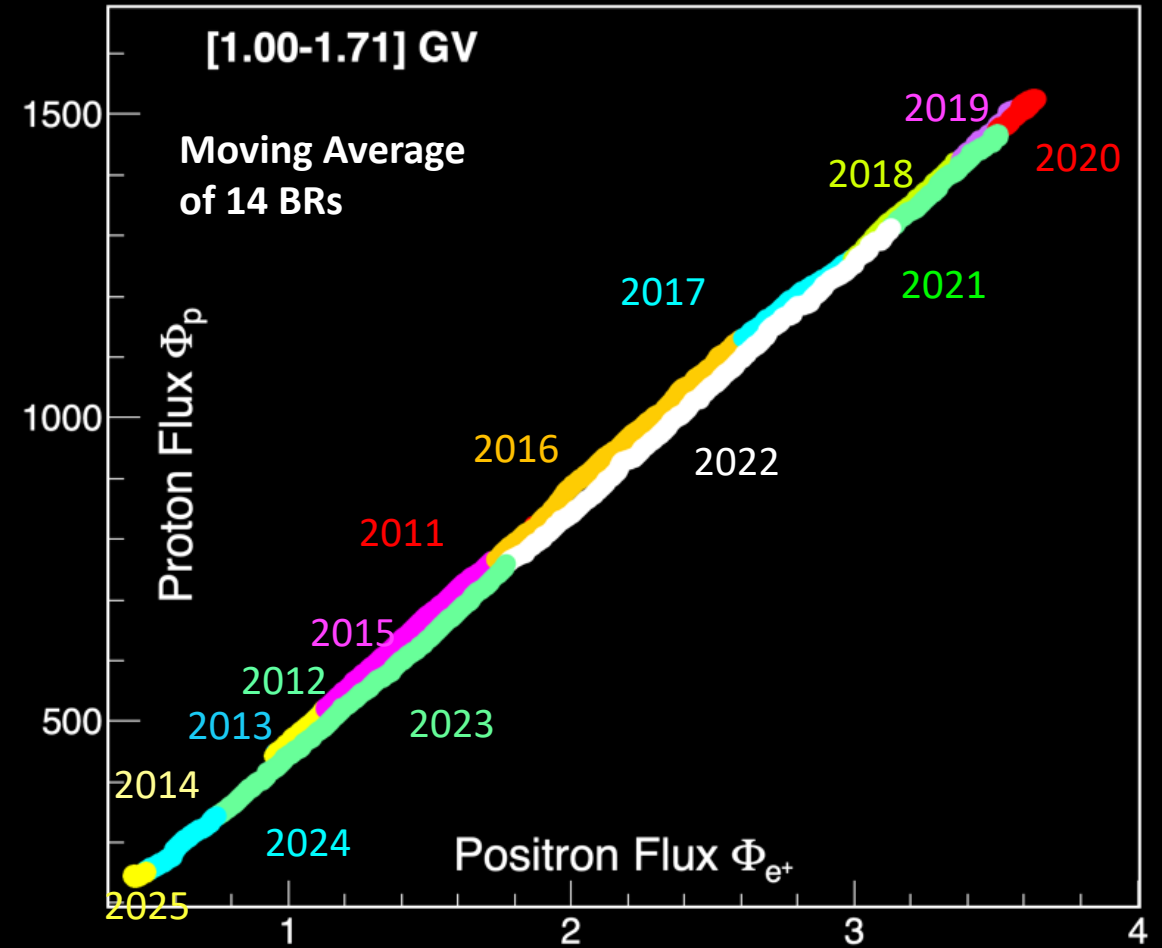
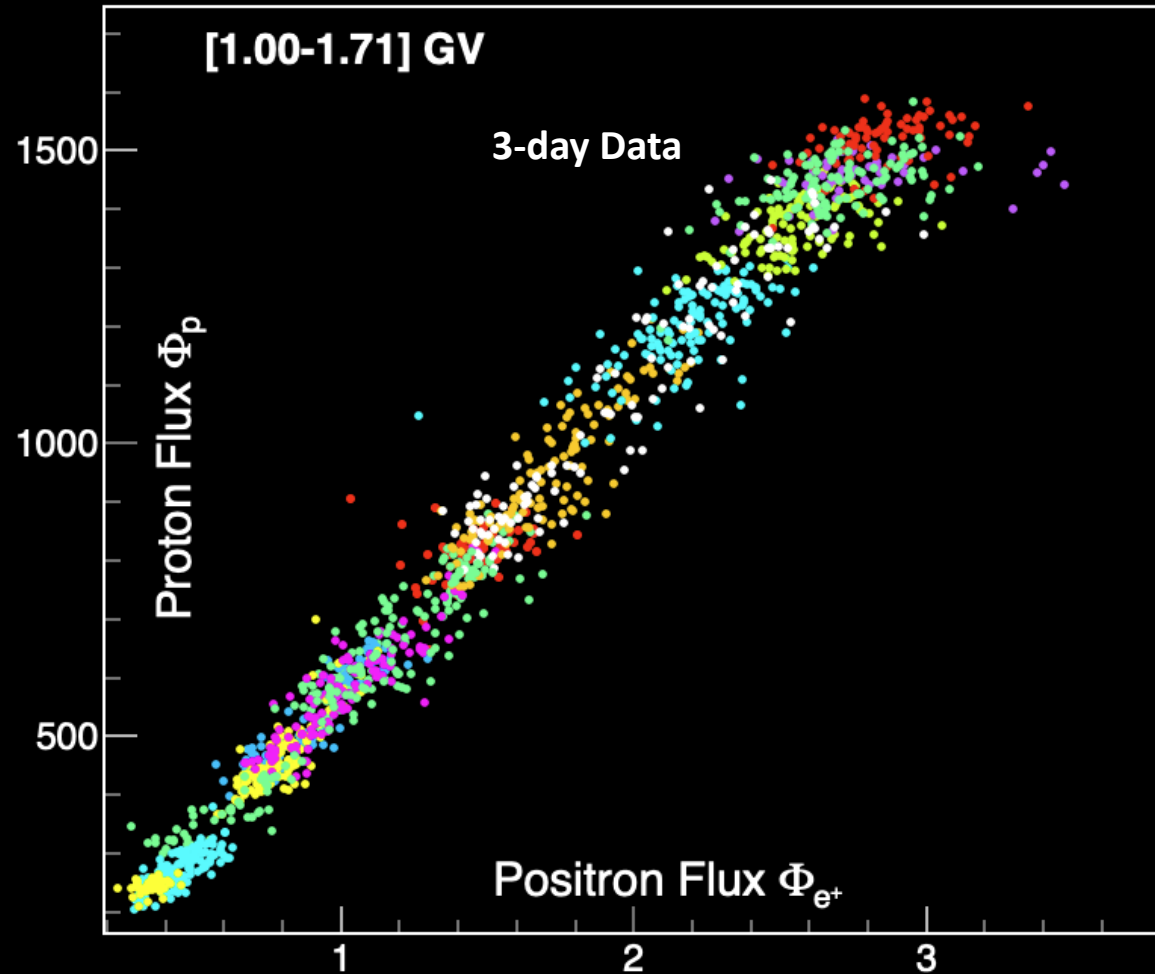


Charge Sign Dependence of Solar Modulation



Linear relationship between positron and proton fluxes

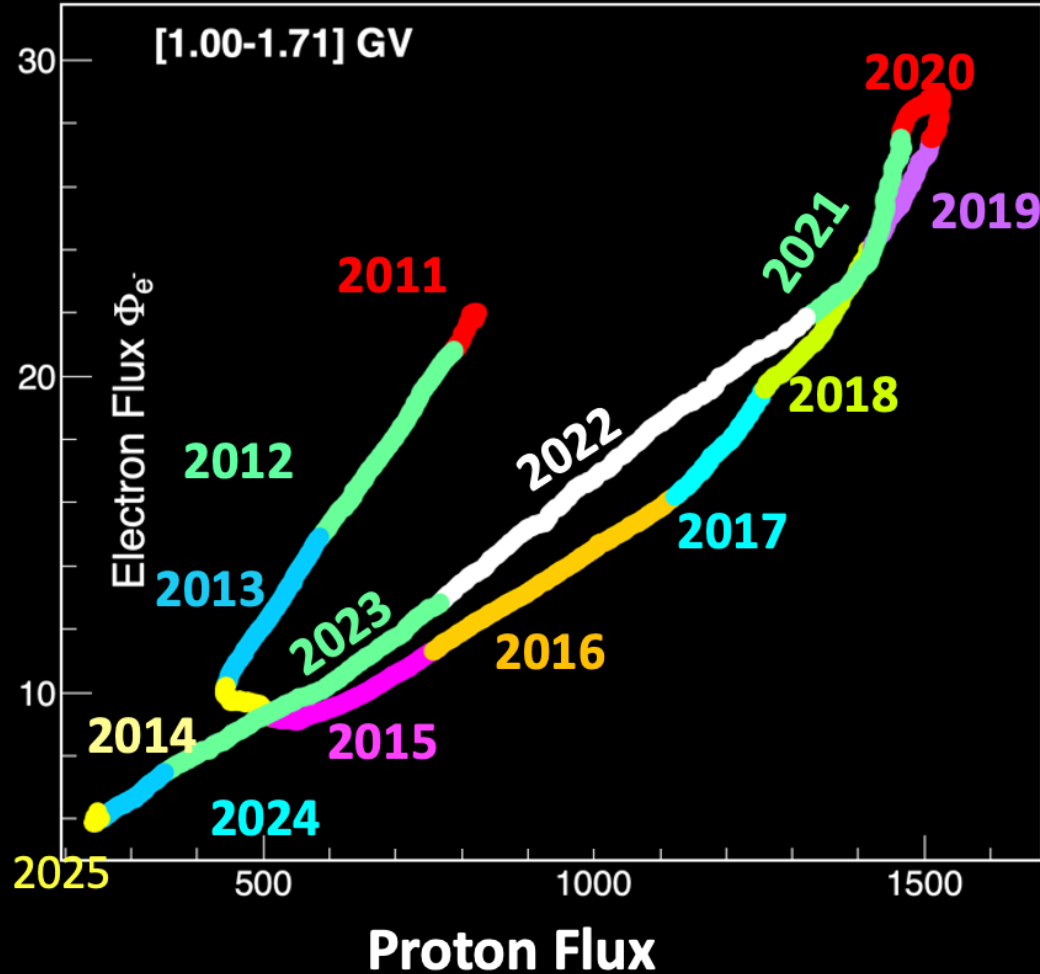
Different mass, same charge



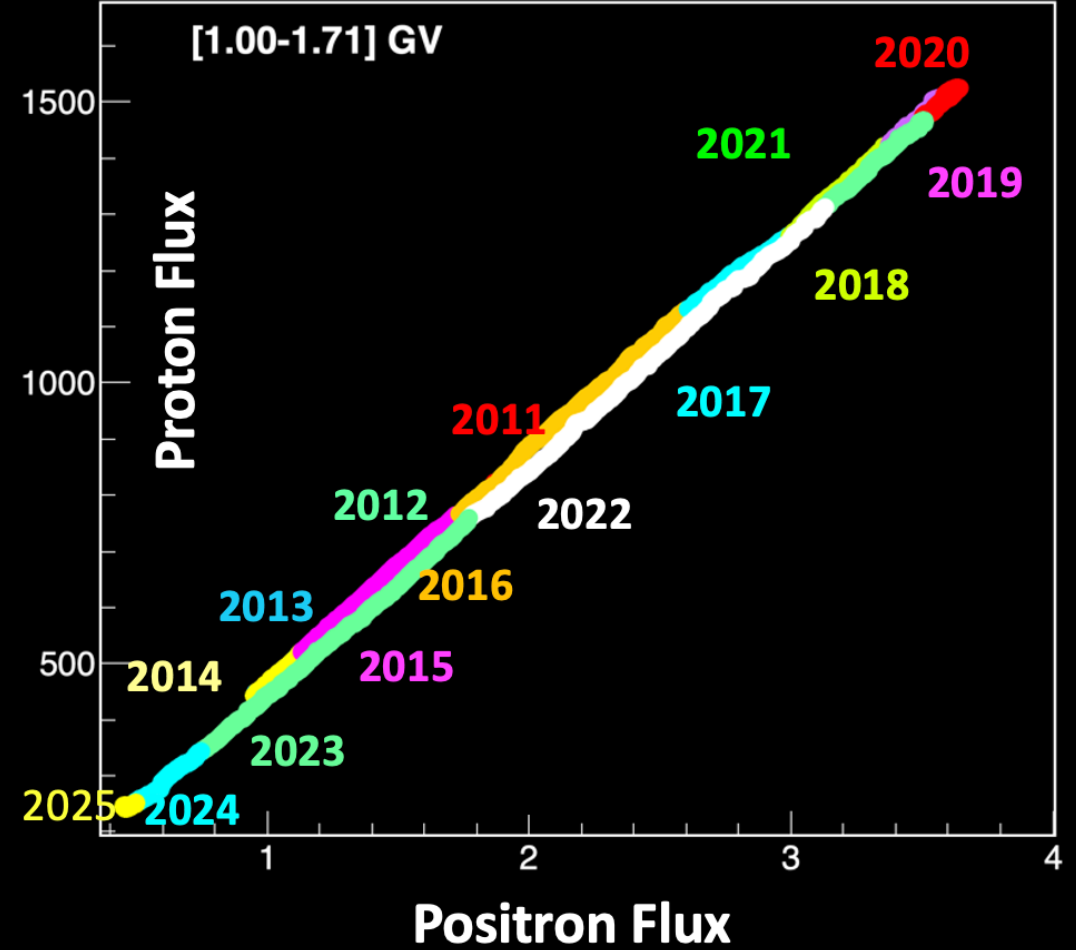
Fluxes in unit of $[m^{-2}sr^{-1}s^{-1}GV^{-1}]$

Summary of daily electron and positron fluxes

Electron vs Proton
Opposite charge
Complex Hysteresis



Positron vs Proton
Same charge
"Repeated" linearity



Fluxes in unit of $[m^{-2}sr^{-1}s^{-1}GV^{-1}]$

Daily fluxes over a 22-year solar cycle

We are experiencing
the next solar
magnetic field reversal

June 2014- July 2025

predicted by
Jha, B. K. & Upton, L. A. Predicting
the timing of the solar cycle 25
polar field reversal. Astrophys. J.
Lett. 962, L15 (2024).

By 2030, AMS will cover
nearly a complete 22-year
solar cycle

