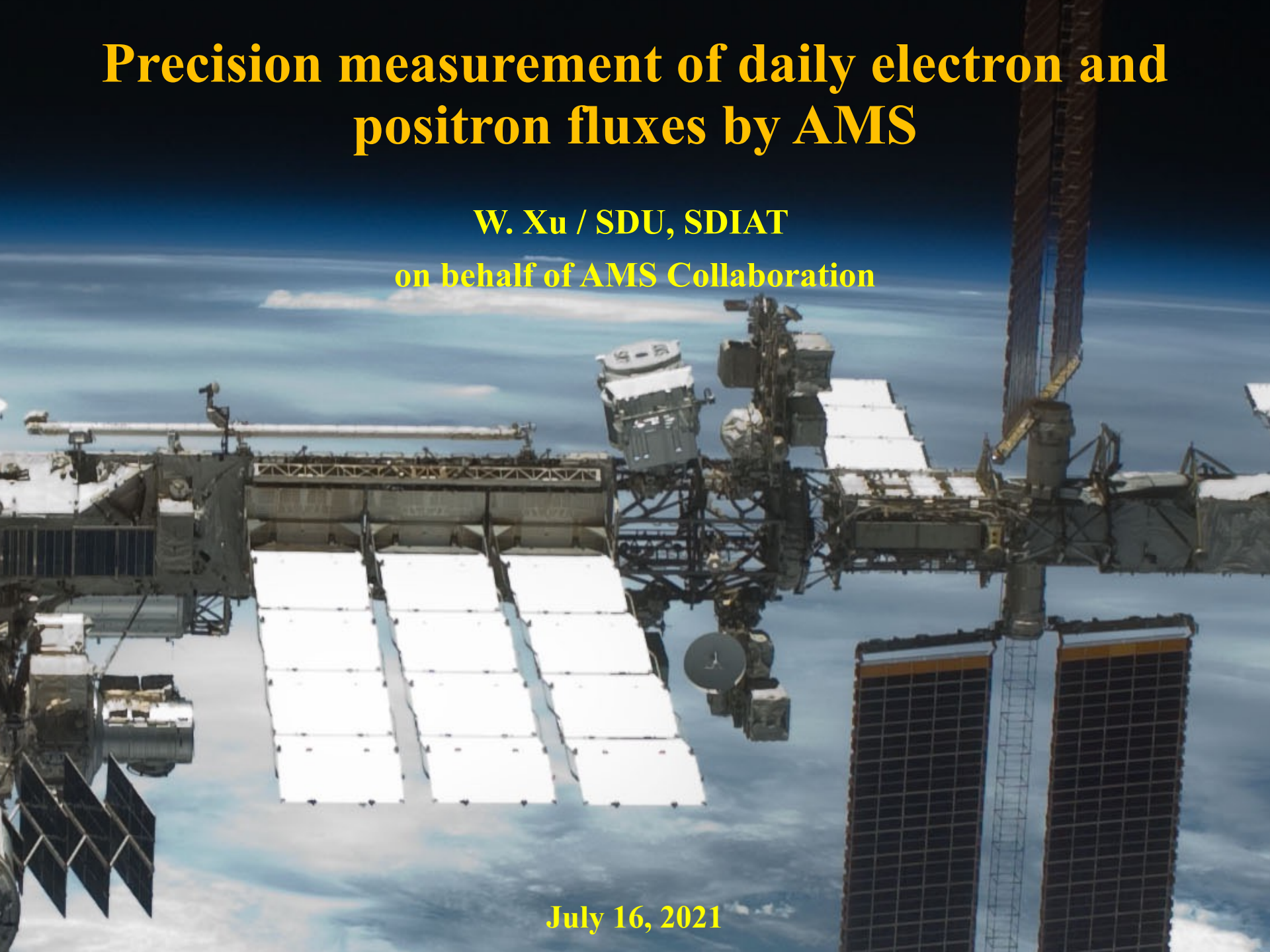


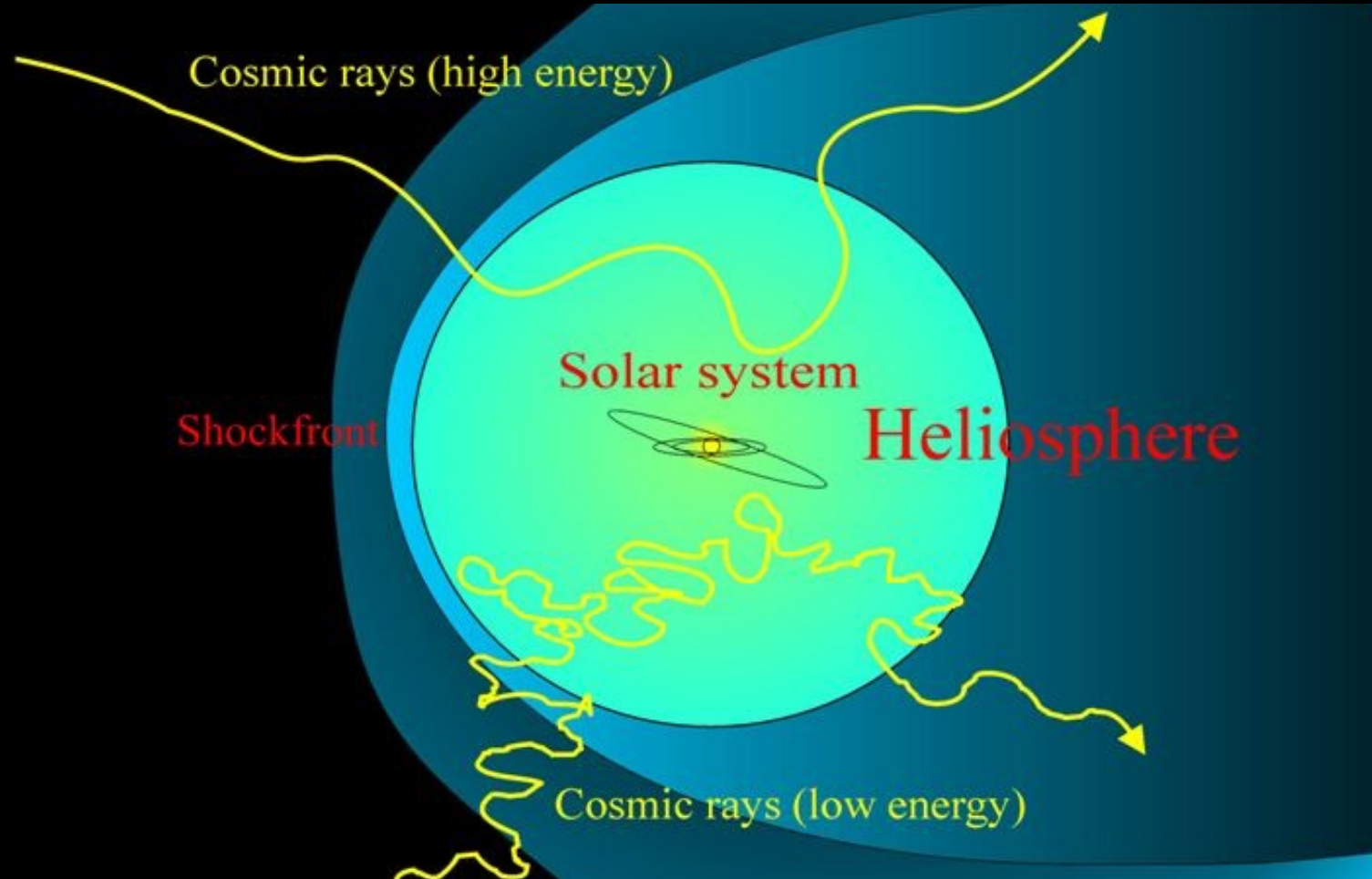
Precision measurement of daily electron and positron fluxes by AMS

W. Xu / SDU, SDIAT
on behalf of AMS Collaboration



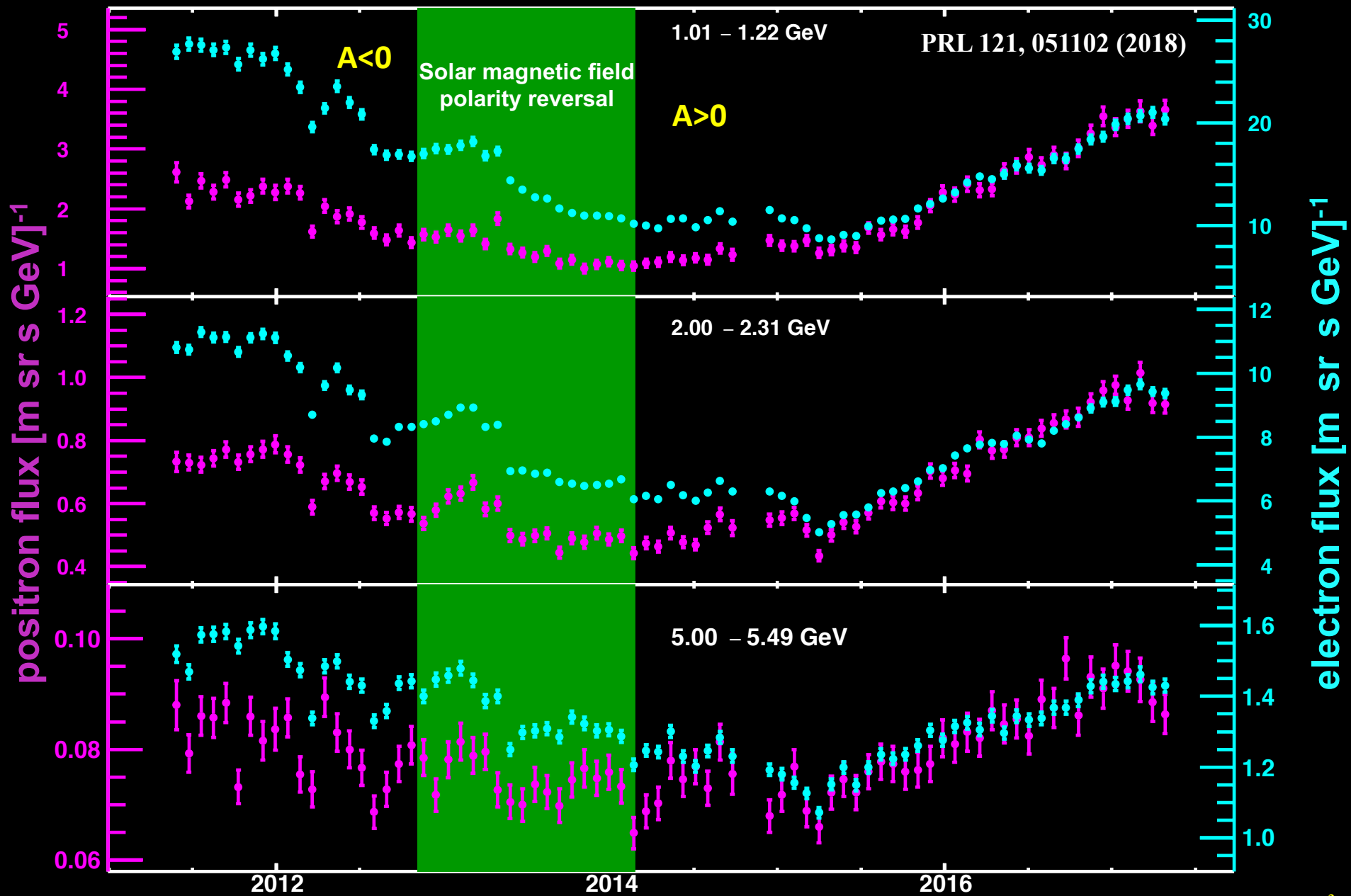
July 16, 2021

The propagation of cosmic rays in the heliosphere depends on their mass and charge.

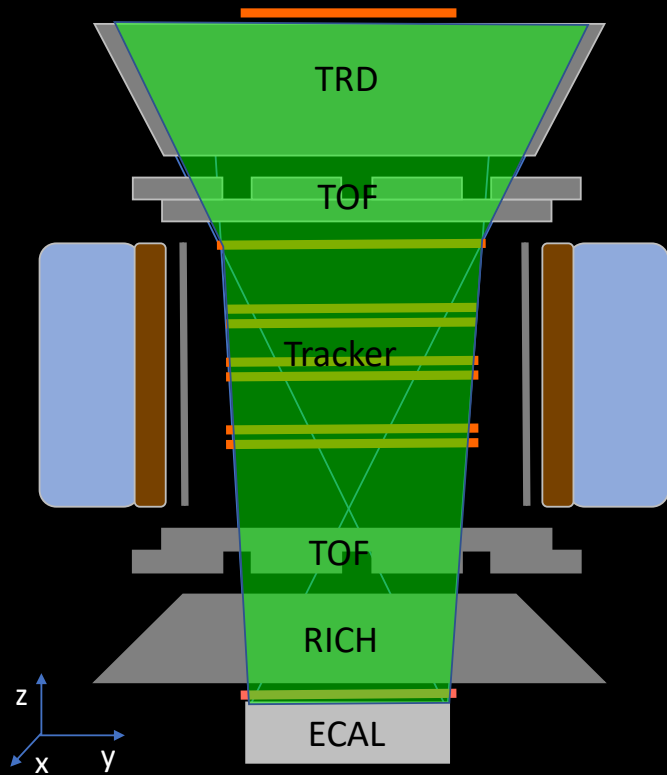


Electrons are the most abundant negative cosmic rays,
positrons are the lightest positive cosmic rays.
They provide unique information of the heliosphere.

AMS Results on the monthly electron and positron fluxes

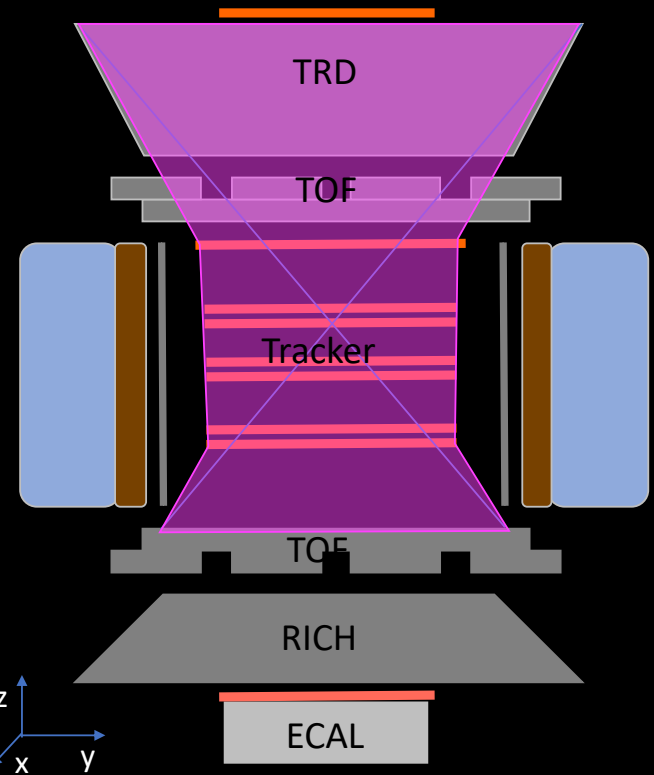


Measuring electrons and positrons in AMS



Traditional ECAL based analysis:

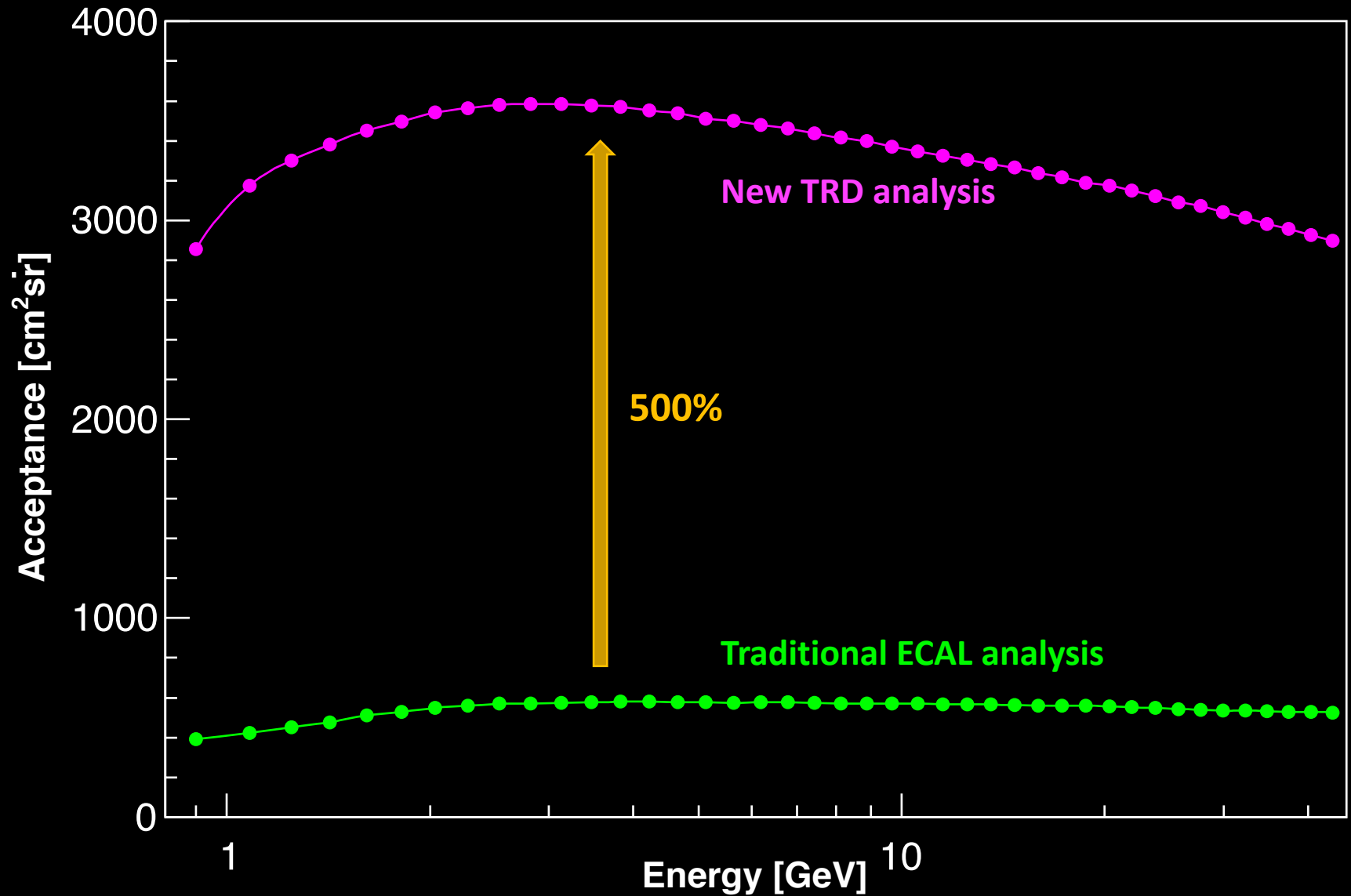
- Identification electron and positron with ECAL, tracker (and TRD)
- ✓ High positron sample purity
- ✓ Good for positron measurement



New TRD based analysis:

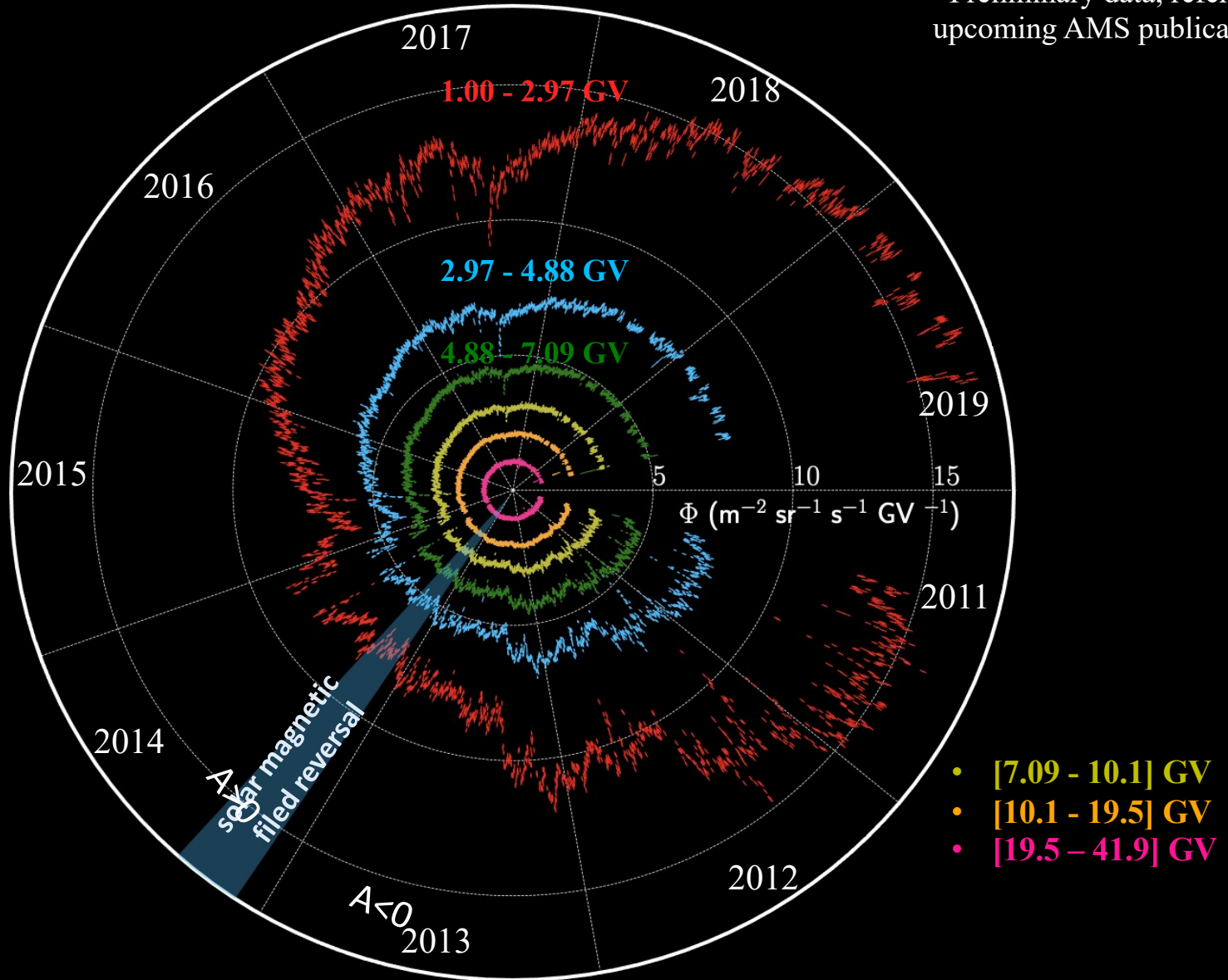
- TRD and tracker provides electron identification
- ✓ Large acceptance
- ✓ Good for low energy electron

Improvement in electron acceptance using TRD



AMS Daily Electrons Fluxes

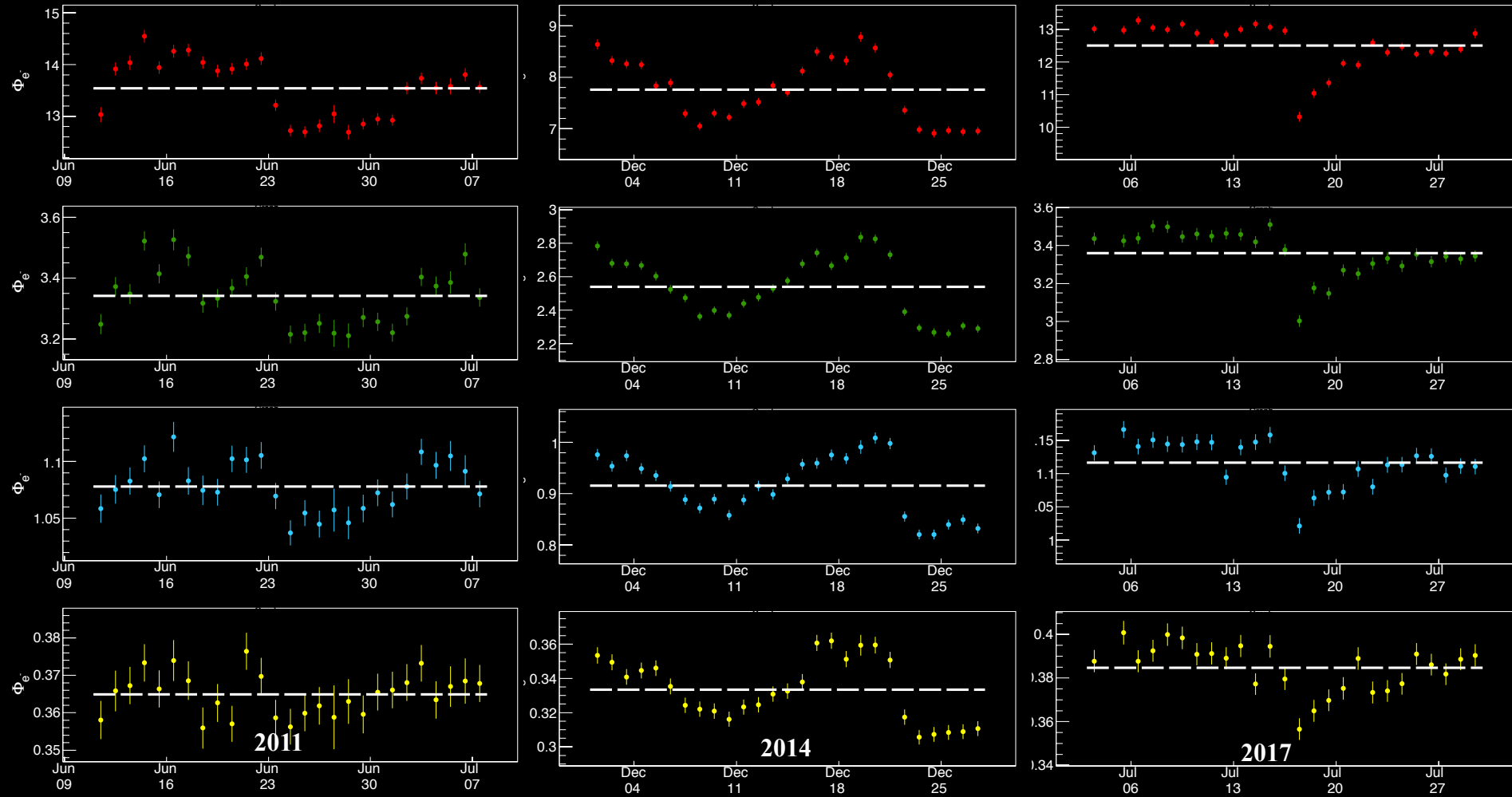
Preliminary data, refer to upcoming AMS publication



First continuous measurement of electron fluxes on daily basis

Detailed Daily Electron Flux

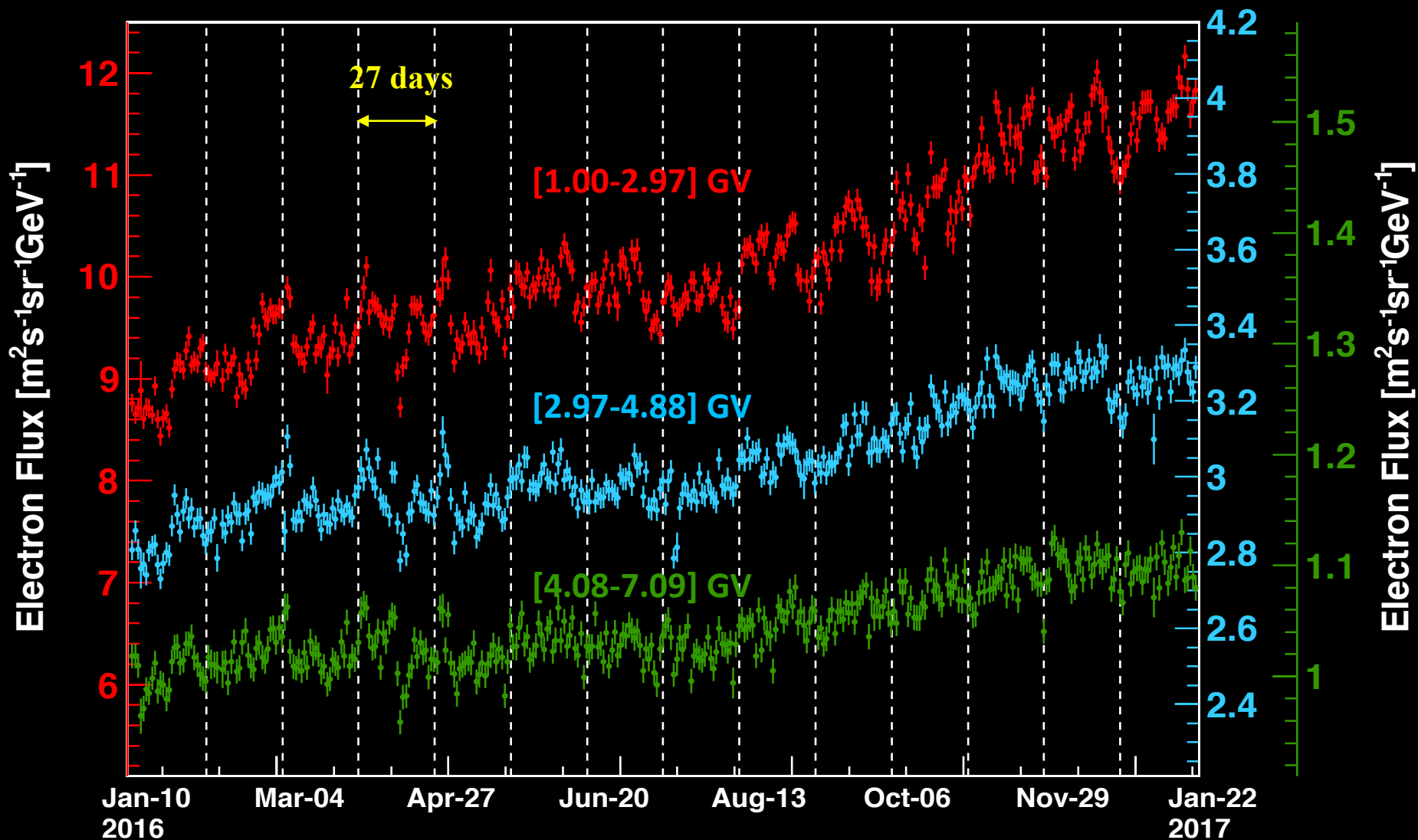
Preliminary data, refer to upcoming AMS publication



- Precision daily measurements reveal fine time structures which were not observed in monthly data (i.e. per Bartels Rotation).
- The variation in individual Bartels Rotation is different.

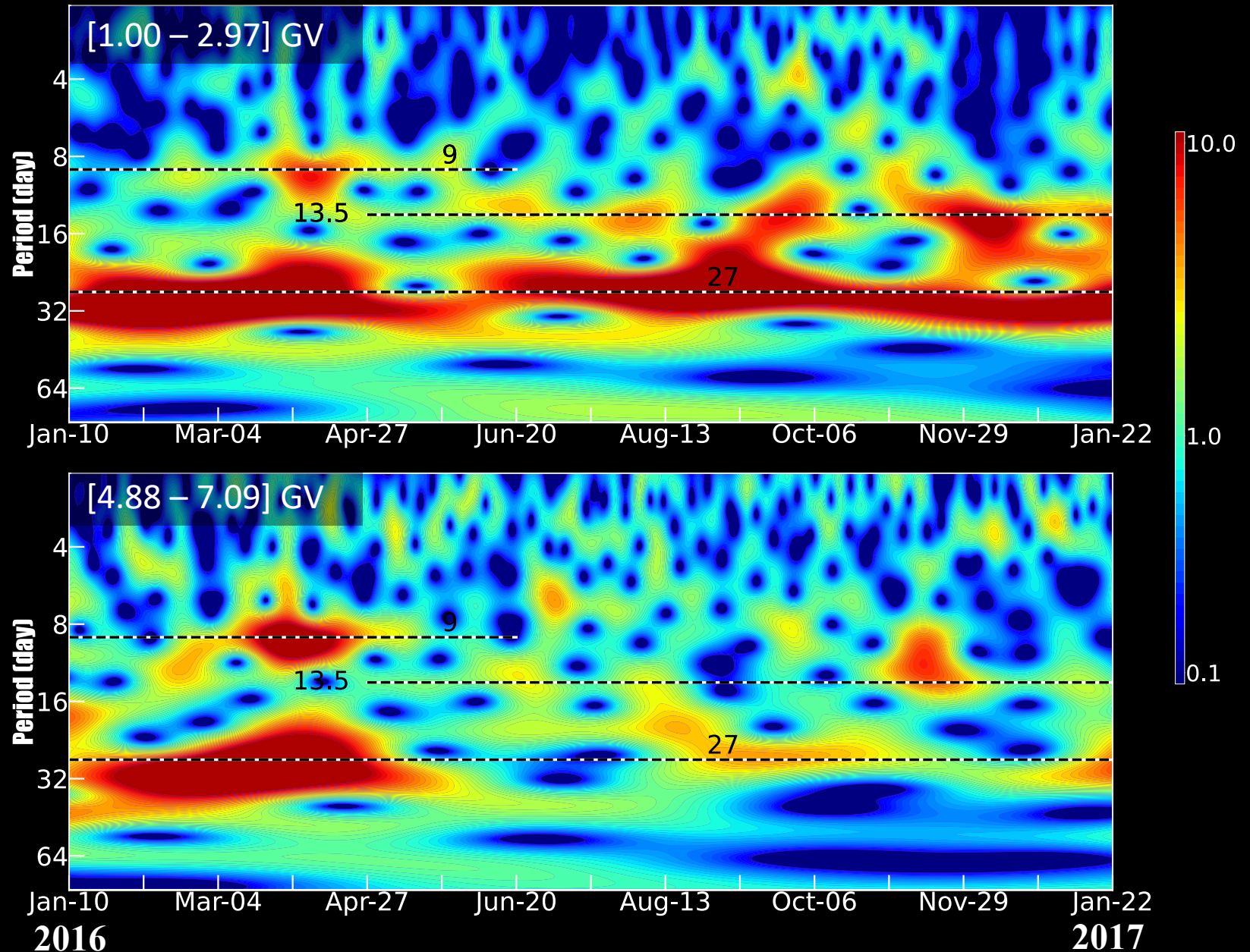
Daily Electron Flux in 2016

Preliminary data, refer to upcoming AMS publication



Periodicities of Electron Flux in 2016

Preliminary data, refer to upcoming AMS publication



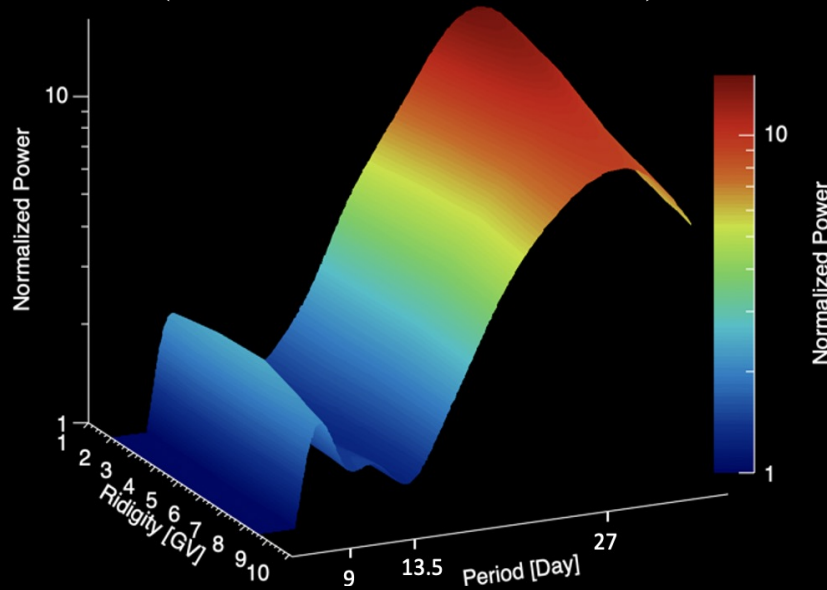
2016

2017

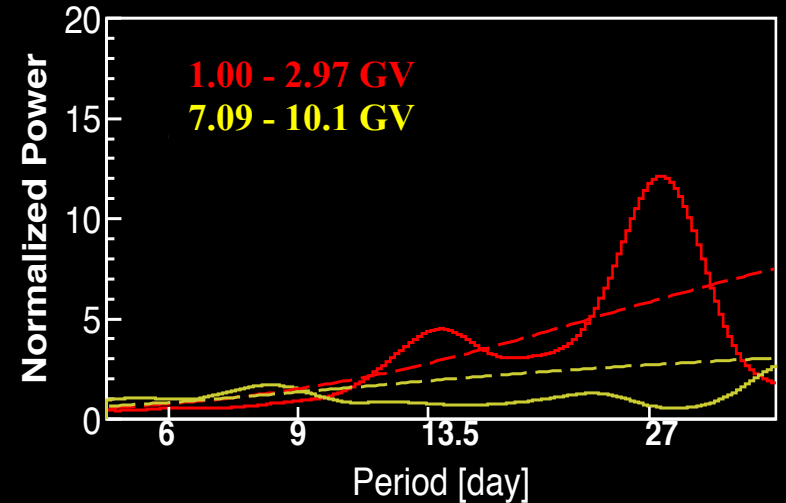
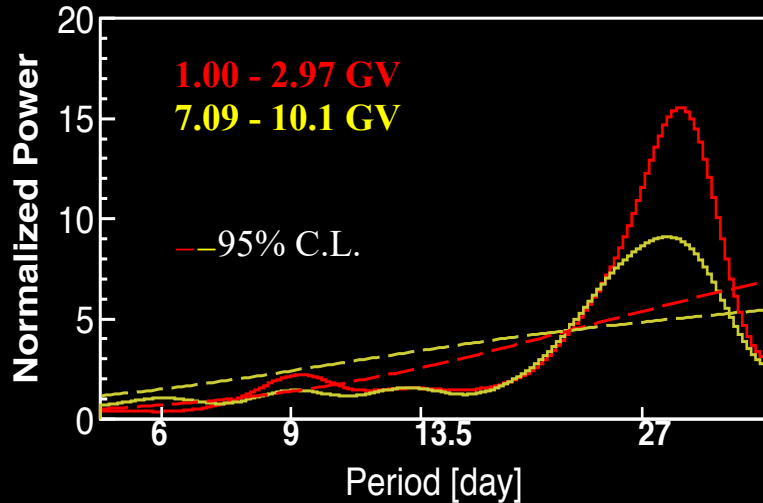
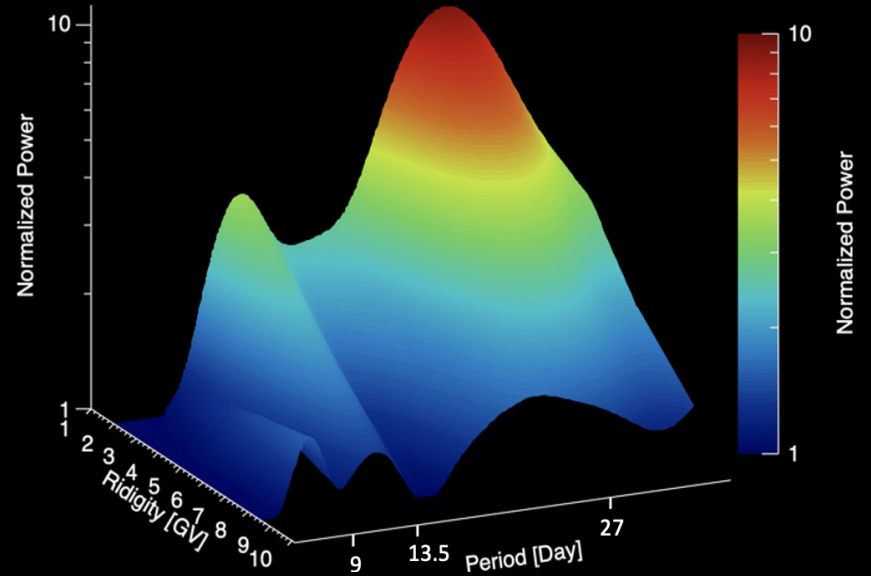
Rigidity Dependence of Electron Periodicity

Preliminary data, refer to
upcoming AMS publication

First half of 2016
(Bartels Rotation 2489-2495)

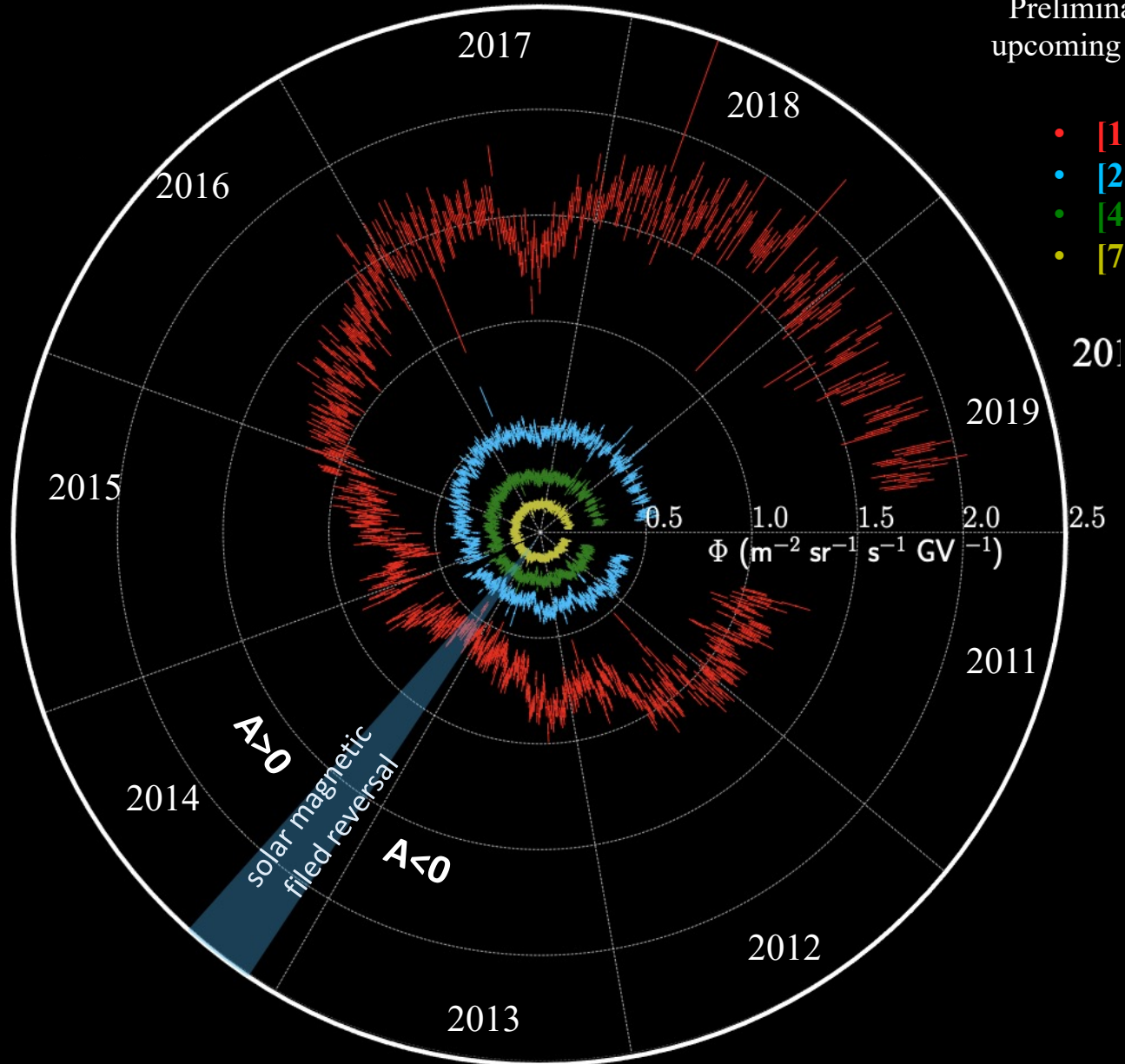


Second half of 2016
(Bartels Rotation 2496-2502)



Physics analysis - Daily Positrons

Preliminary data, refer to upcoming AMS publication

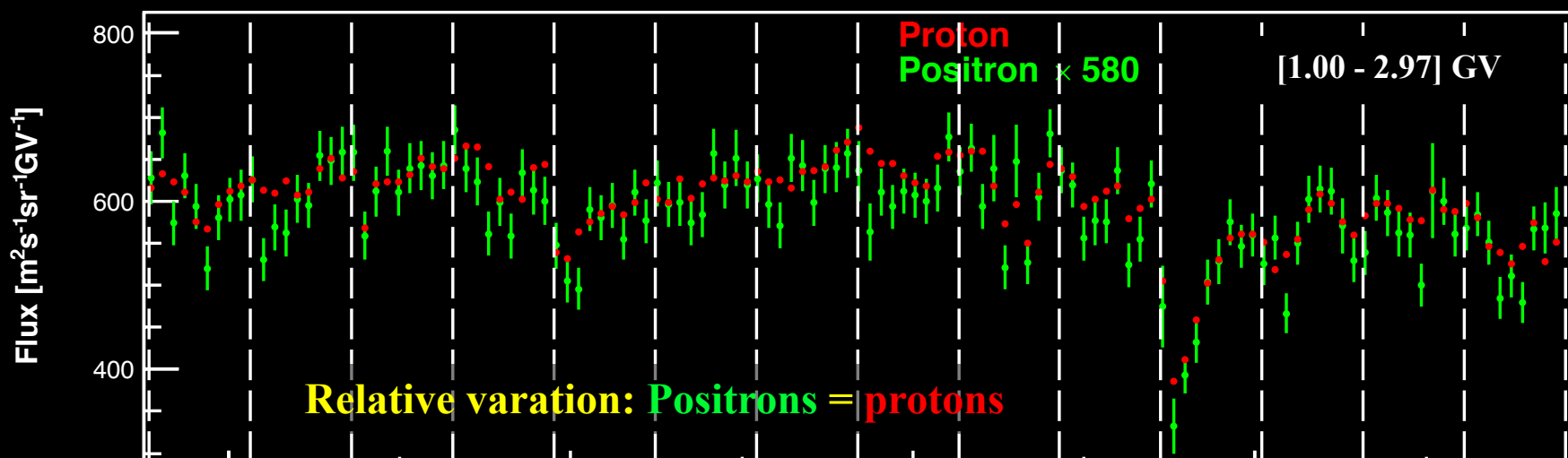
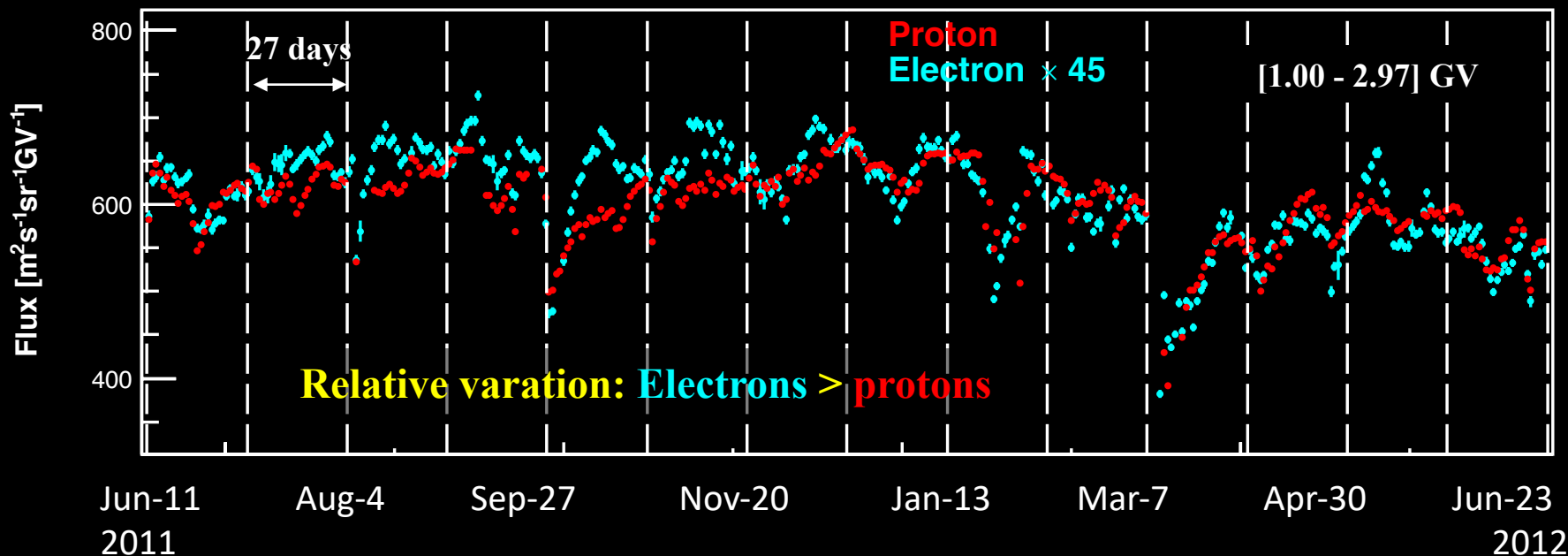


AMS provide first measurement of positron flux in 3-day granularity

Comparison between Electrons, Positrons and Protons

Preliminary data, refer to upcoming AMS publication

Solar polarity $A < 0$

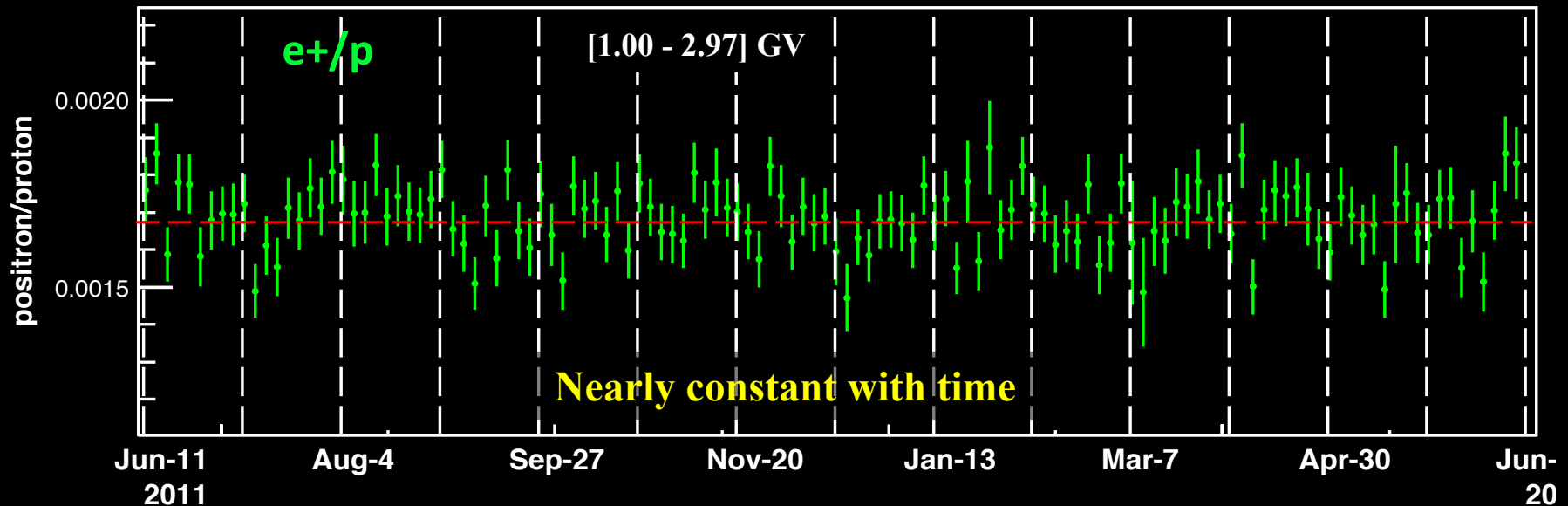
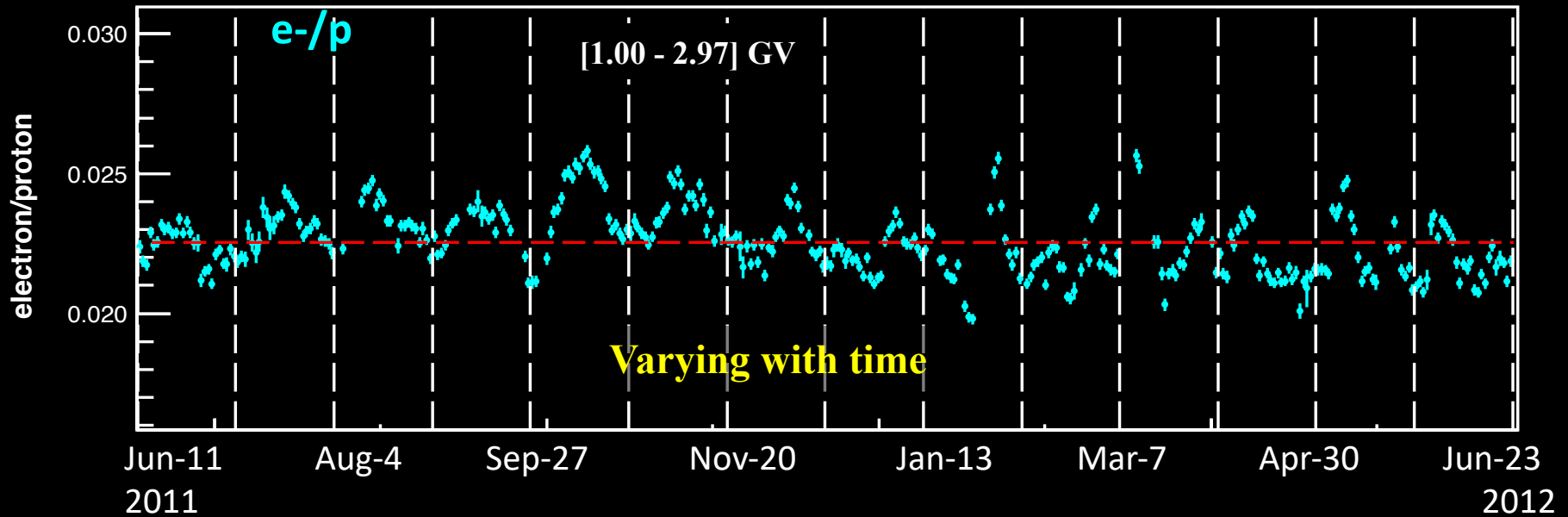


Refer to Yi Jia's talk (July14, #749) for AMS daily proton fluxes

Comparison between Electrons, Positrons and Protons

Preliminary data, refer to upcoming AMS publication

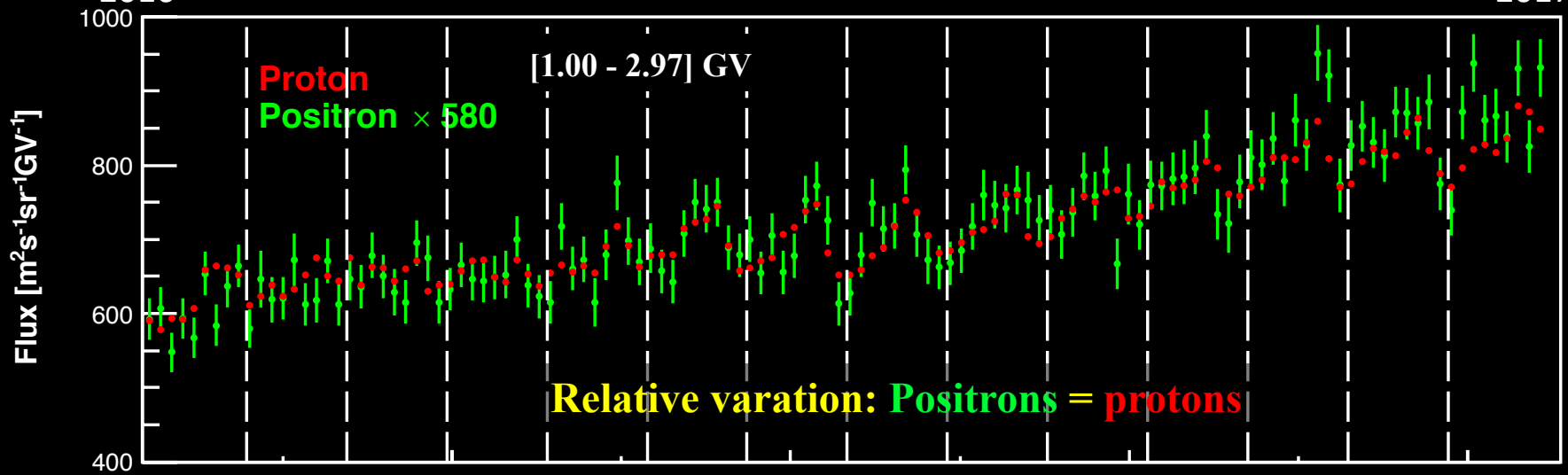
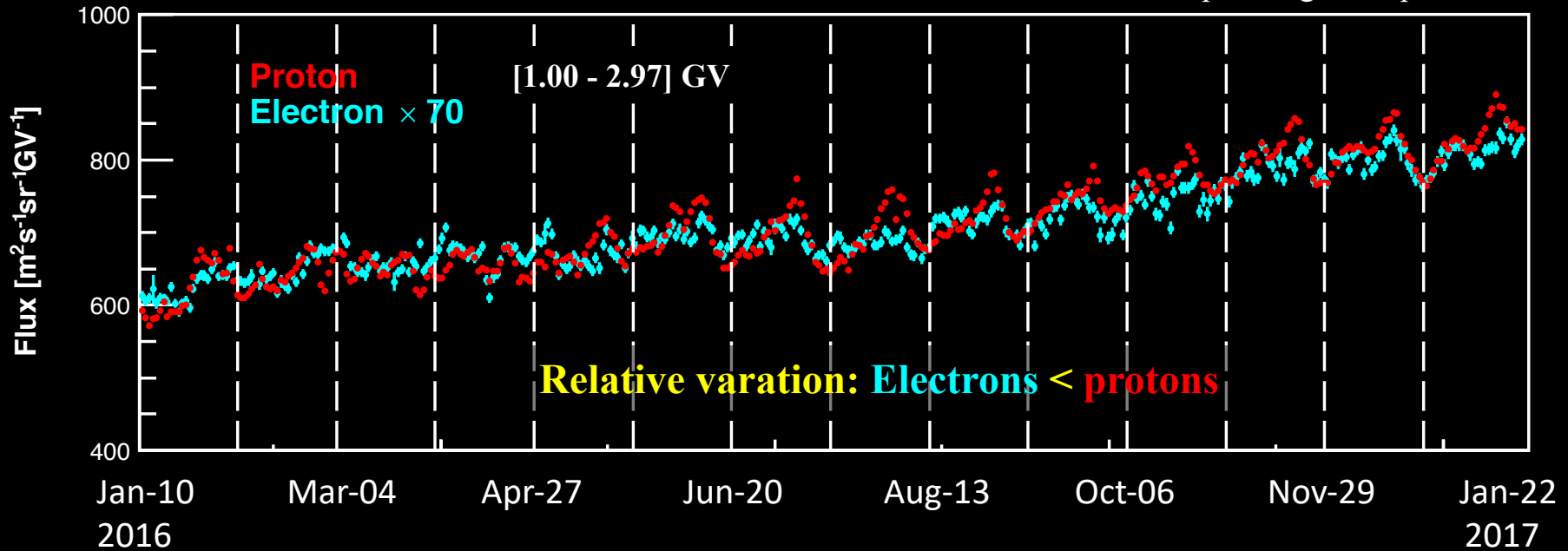
2012, Solar polarity A < 0



Comparison between Electrons, Positrons and Protons

Preliminary data, refer to upcoming AMS publication

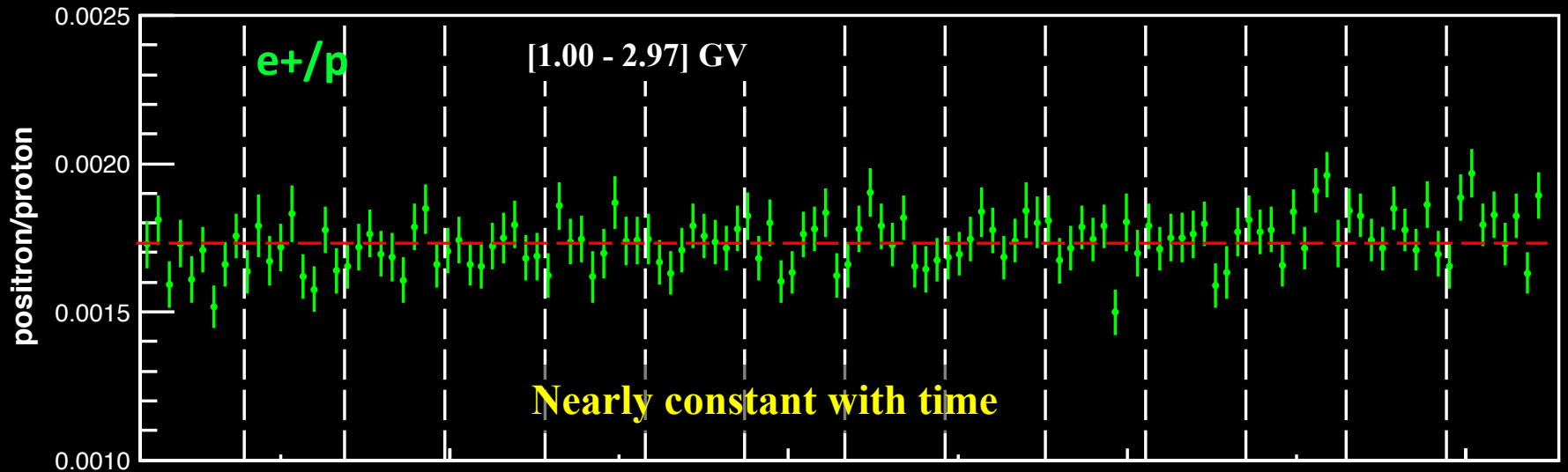
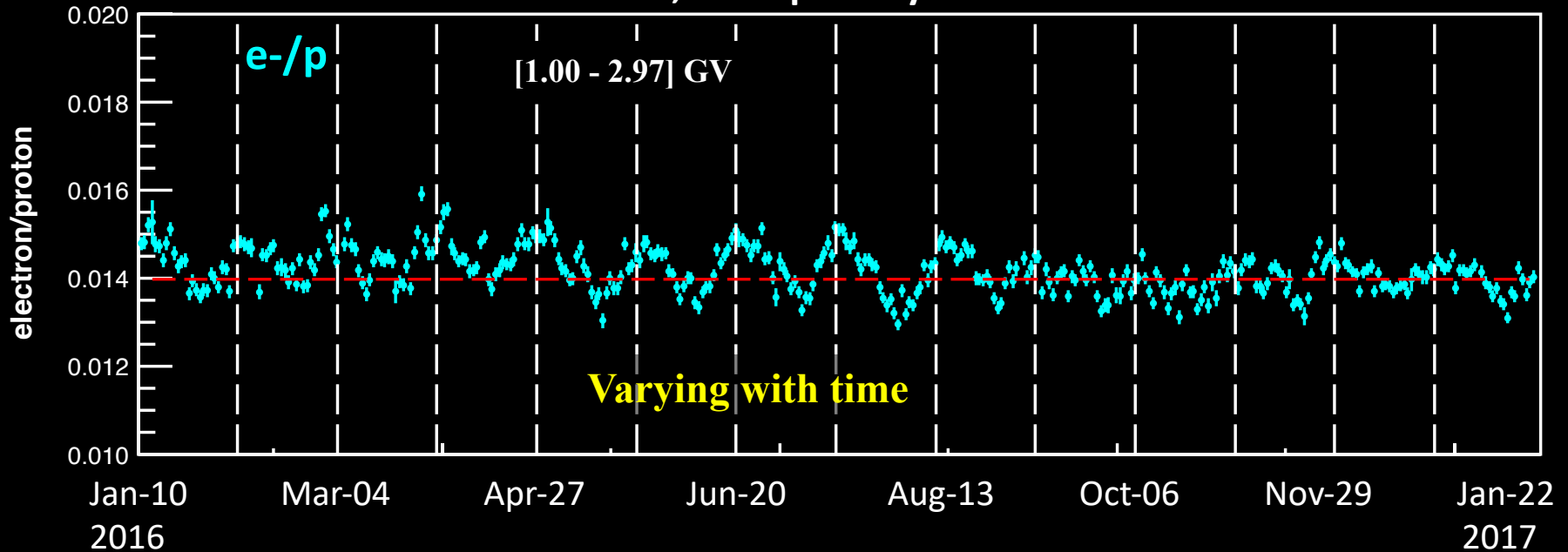
Solar polarity $A > 0$



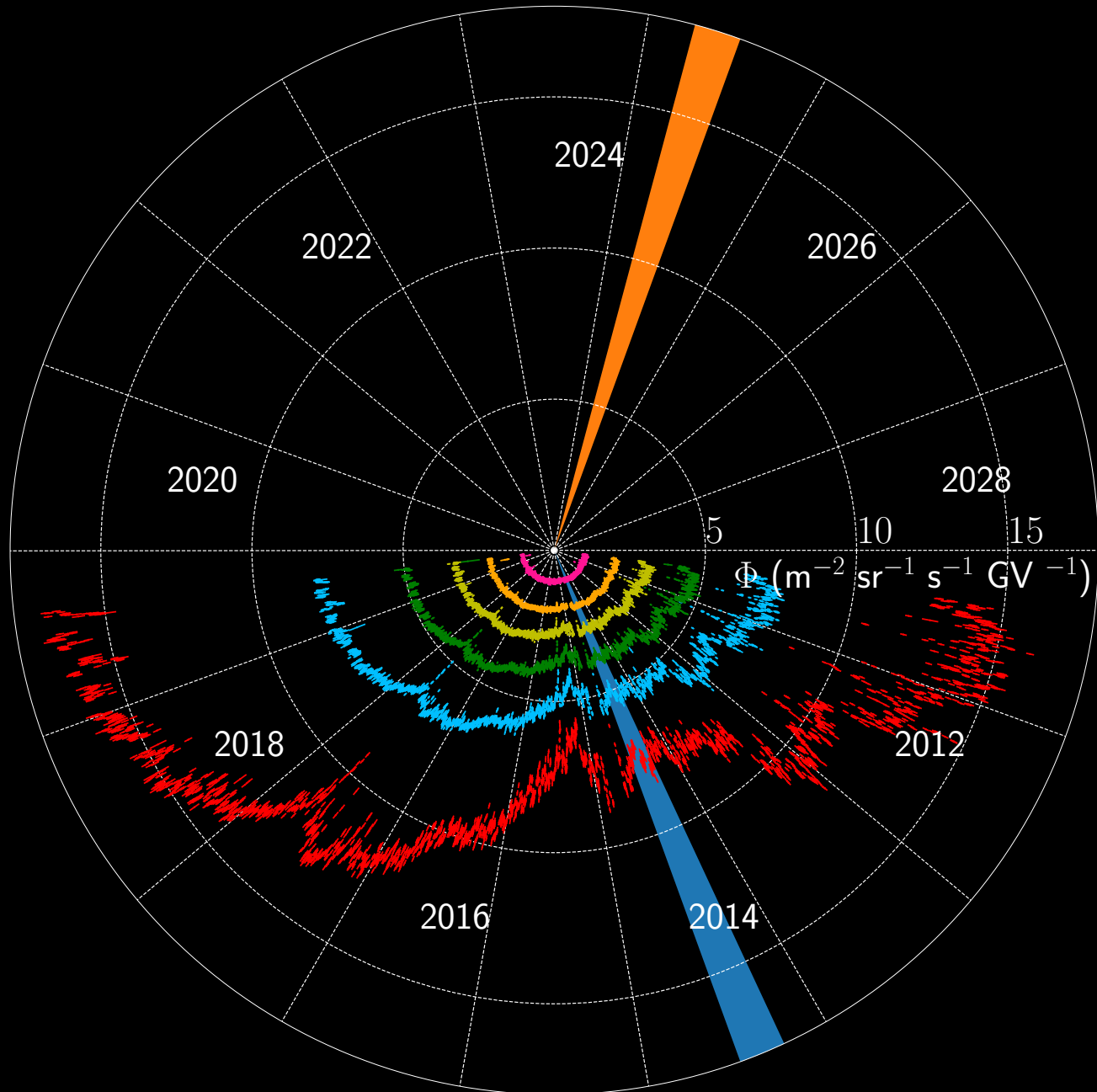
Comparison between Electrons, Positrons and Protons

Preliminary data, refer to upcoming AMS publication

2016, Solar polarity A > 0



Next solar polarity reversal



Summary

- The precision measurements by AMS of daily electron fluxes and positron fluxes from May 2011 to October 2019 are presented.
- The fluxes exhibit both long-term and short-term variations.
 - 27-days periodicity is observed in electron.
- The data from AMS allows the comparison of the different behaviour between electrons, positrons and protons.
 - Electrons and protons show **different** time variation
 - Positron and protons show **similar** time variation
- AMS will continue to collect data during the lifetime of the Space Station and provide unique opportunity to study the next solar polarity reversal.