

A photograph of a snowy mountain peak under a starry night sky with a vibrant green aurora borealis. The aurora is a bright, glowing band of light that curves across the sky, illuminating the scene. The mountain is dark and rugged, with patches of snow. The sky is filled with numerous stars, creating a deep blue and green background.

# Temporal Variation of the Charged Cosmic Rays Flux

Francesco Faldi  
13-12-2021



# Personal Background and Studies

- Born in Perugia on 14th May 1996

- High School diploma at Liceo Classico “Luca Signorelli” of Cortona in 2015

- Bachelor degree in Physics at University of Perugia in 2019

Title: Study of the feasibility and performance of a 4D silicon tracker through a numerical simulation

- Master degree in Astrophysics and Astroparticles at University of Perugia in 2021

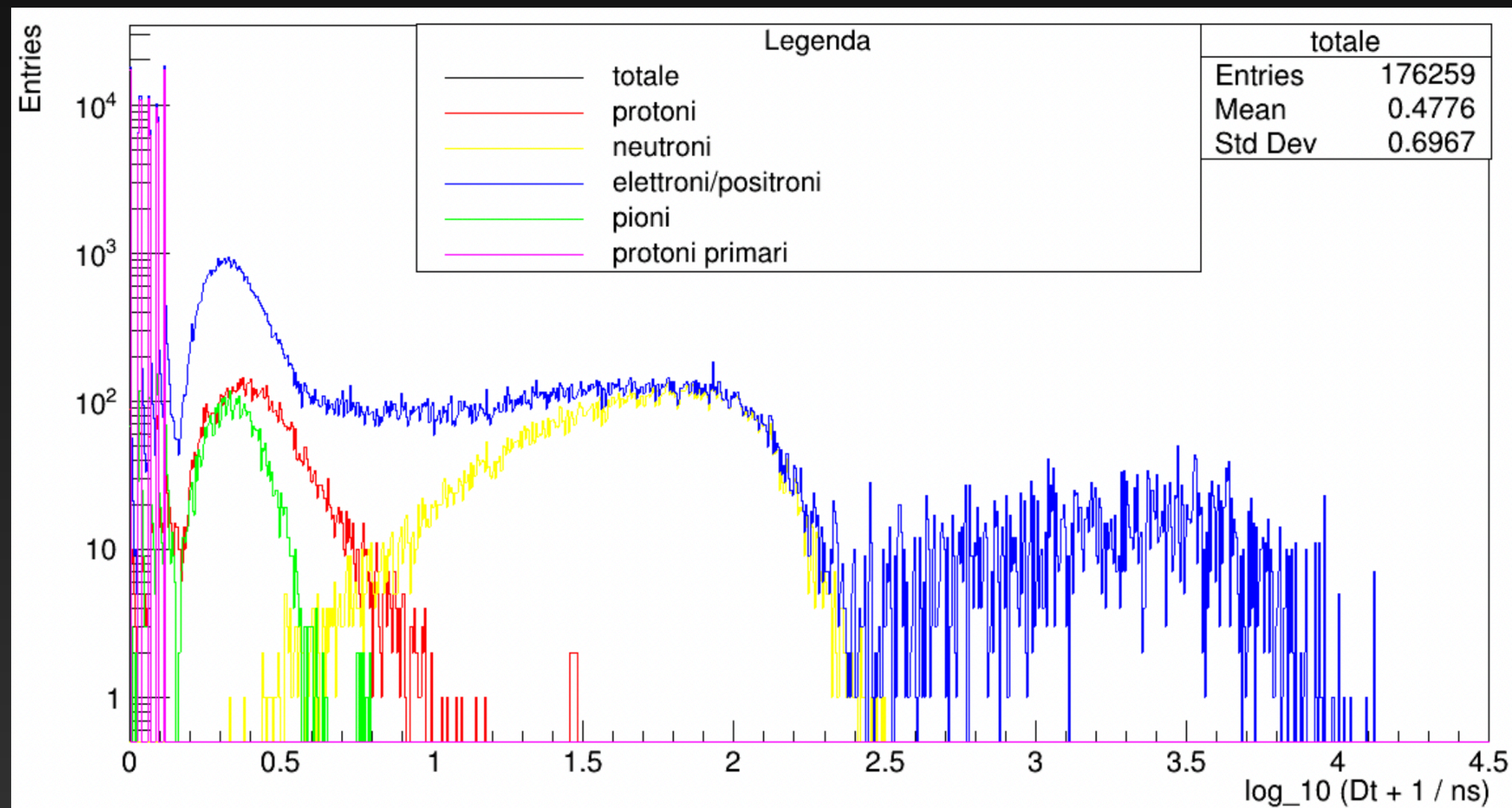
Title: Real time monitoring of the radiation environment on the International Space Station with the AMS-02 detector

## Scientific Interests:

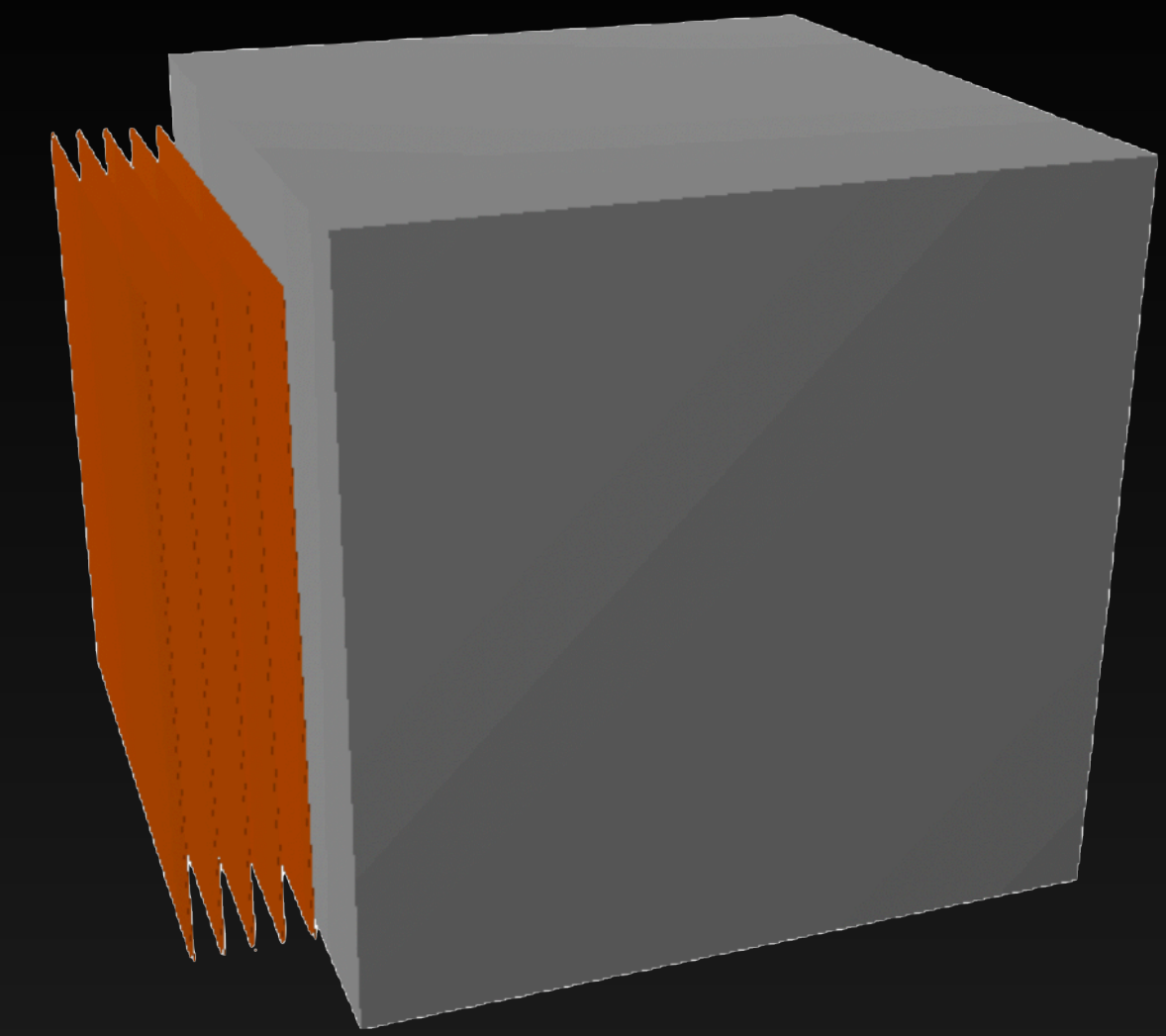
Phenomenology in the context of cosmic ray physics, solar physics and high energy astrophysics.

# Bachelor Degree Thesis

**Title:** Study of the feasibility and performance of a 4D silicon tracker through a numerical simulation



Proton beam and Temporal distribution of signals in tracker



Silicon Tracker + Calorimeter

 *instruments* 

Article

## Advantages and Requirements in Time Resolving Tracking for Astroparticle Experiments in Space

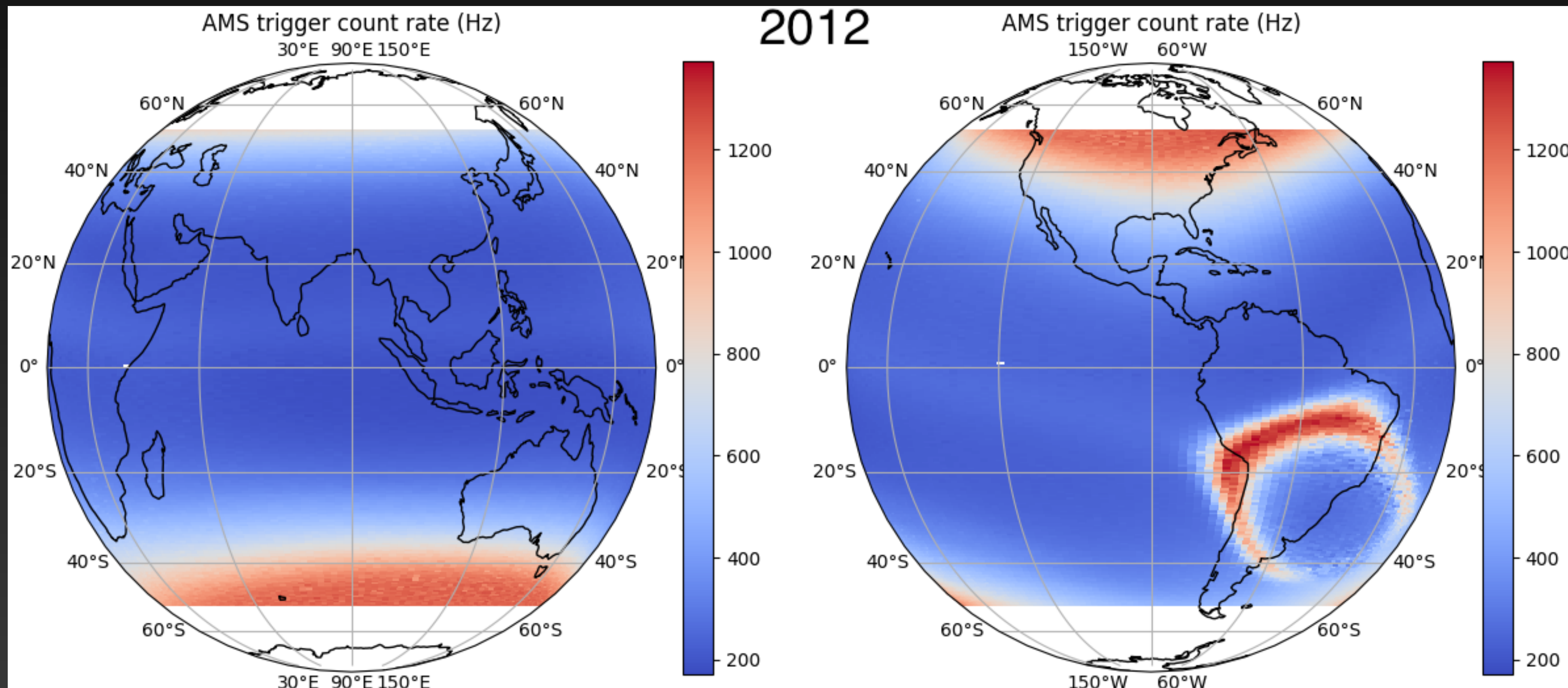
Matteo Duranti <sup>1,\*</sup>, Valerio Vagelli <sup>1,2\*</sup>, Giovanni Ambrosi <sup>1</sup>, Mattia Barbanera <sup>1,3</sup>, Bruna Bertucci <sup>1,4</sup>, Enrico Catanzani <sup>1,4</sup>, Federico Donnini <sup>1</sup>, Francesco Faldi <sup>4</sup>, Valerio Formato <sup>5</sup>, Maura Graziani <sup>1,4</sup>, Maria Ionica <sup>1</sup>, Lucio Moriconi <sup>4</sup>, Alberto Oliva <sup>6</sup>, Andrea Serpolla <sup>4</sup>, Gianluigi Silvestre <sup>1,4</sup> and Luca Tosti <sup>1</sup>



# Master Degree Thesis

**Title:** Real time monitoring of the radiation environment on the International Space Station with the AMS-02 detector.

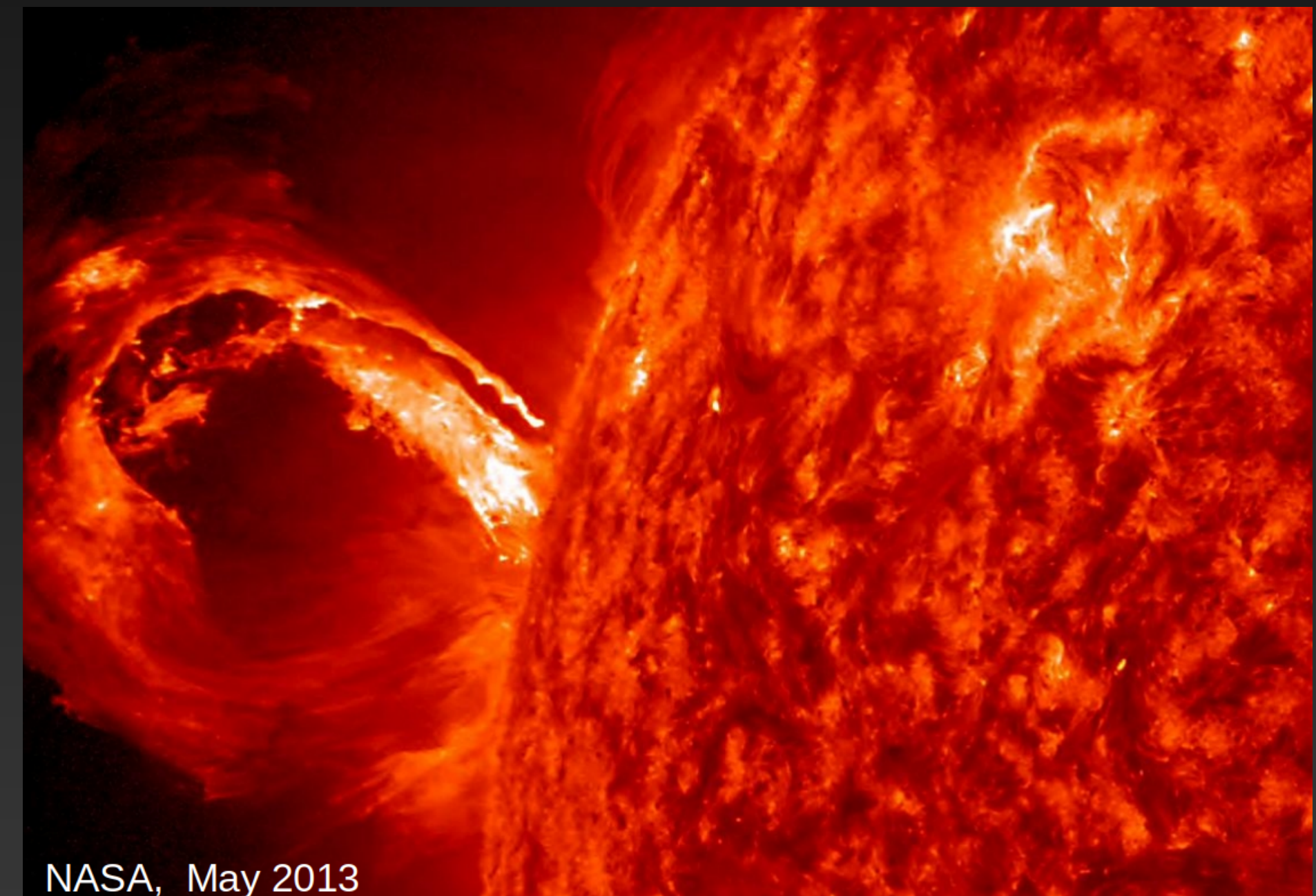
Analysis presented at SIF 13-09-2021





# Solar Activity and Space Weather

- The solar **activity cycle** has a period of 11 years, alternating between solar **minimum** and **maximum**
- On the Sun's surface **occasional** and **short duration** phenomena take place: **solar flares** and **CMEs**
- **Solar Energetic Particles (SEPs)** are emitted in these events
- **Space Weather** studies the effects of solar phenomena and their interactions with the environment





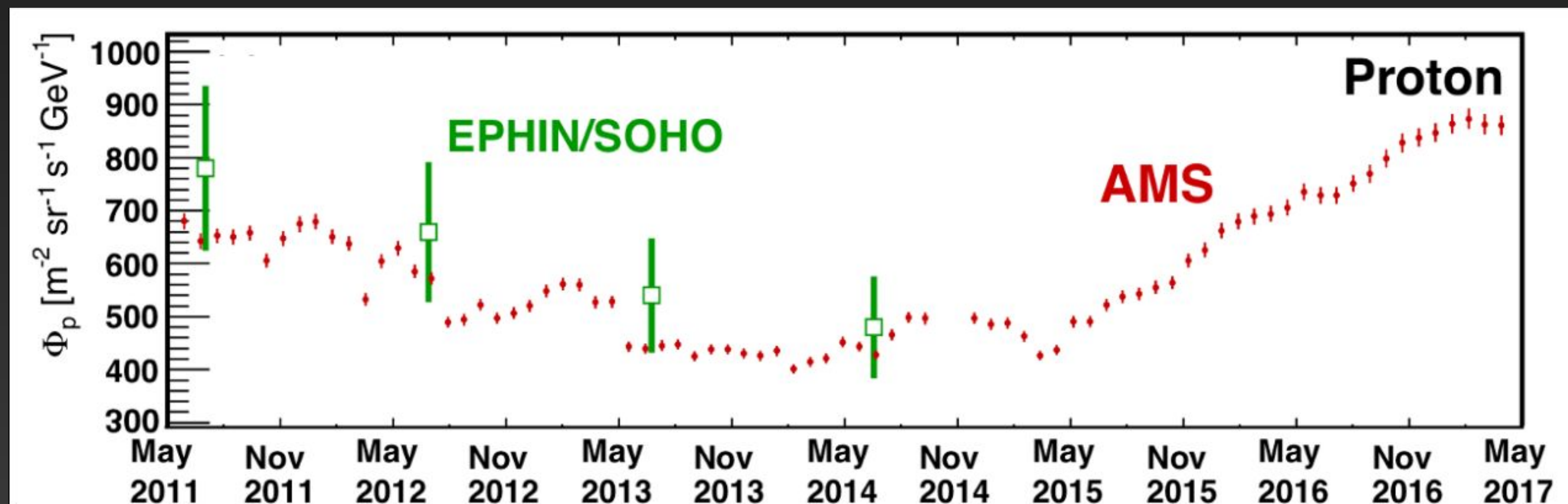
# PhD Topic: Temporal Characterization of the Solar RC Flux

## Objectives

- **Flux reconstruction** for different charged species (e, p, He) with respect to **time** and **energy** before during and after SEP events
- Characterization of the **long term flux** of GRCs ("solar quiet" flux)

## Method

Direct **measurements** of charge, mass, energy, rigidity, velocity and trajectory of RCs from **AMS data**





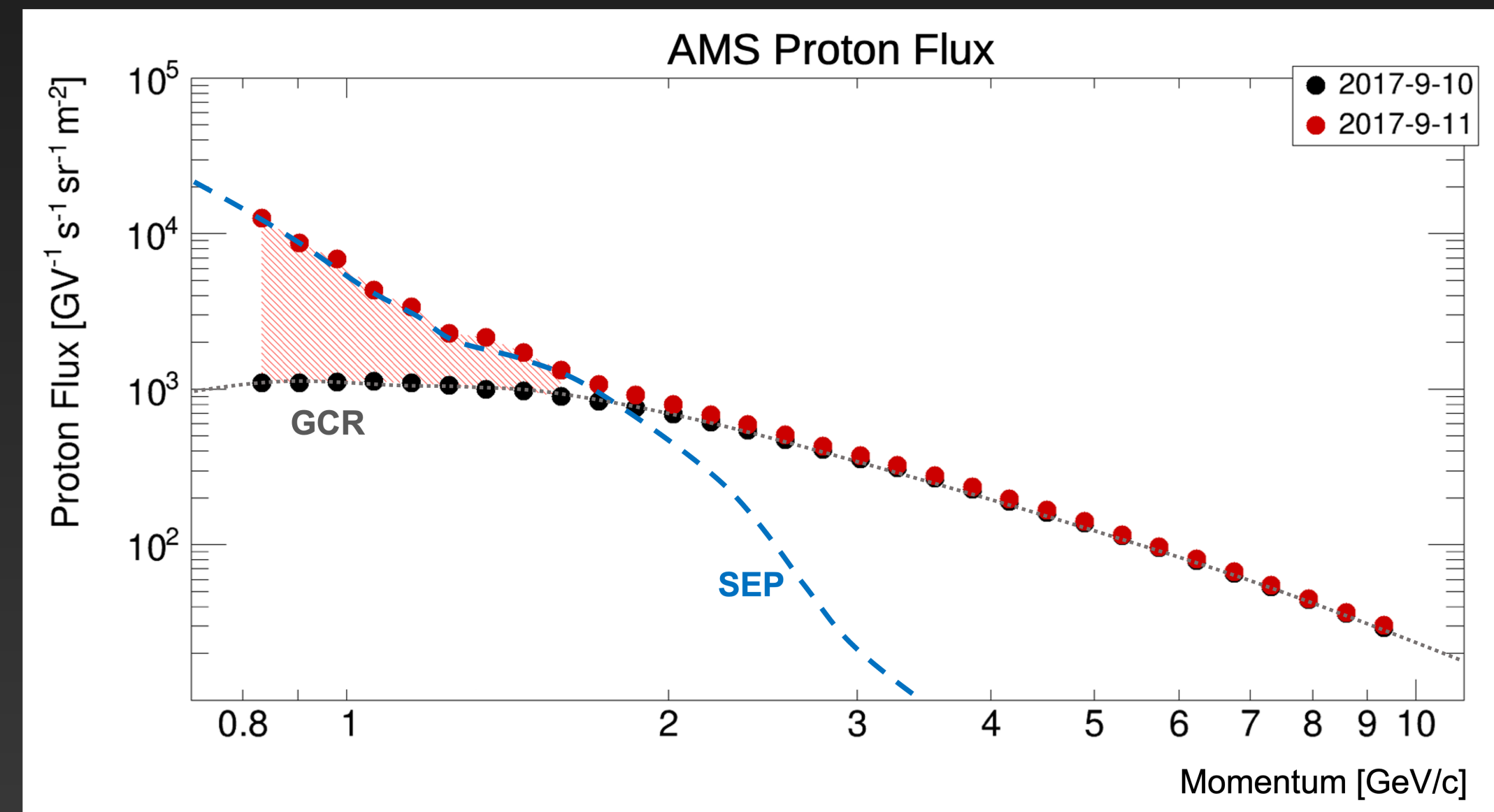
# PhD Topic: Spectrum Solar Component

## Objectives

- Determination of the **energetic spectrum** of the **solar component** in the **short term** during SEP events
- Infer **physical properties** on SEP events from resulting informations

## Method

Study of the short-term variability of the RC flux, from AMS, during SEP events. The GCR background component will be determined and subtracted using the long-term flux profile obtained in the previous phase.

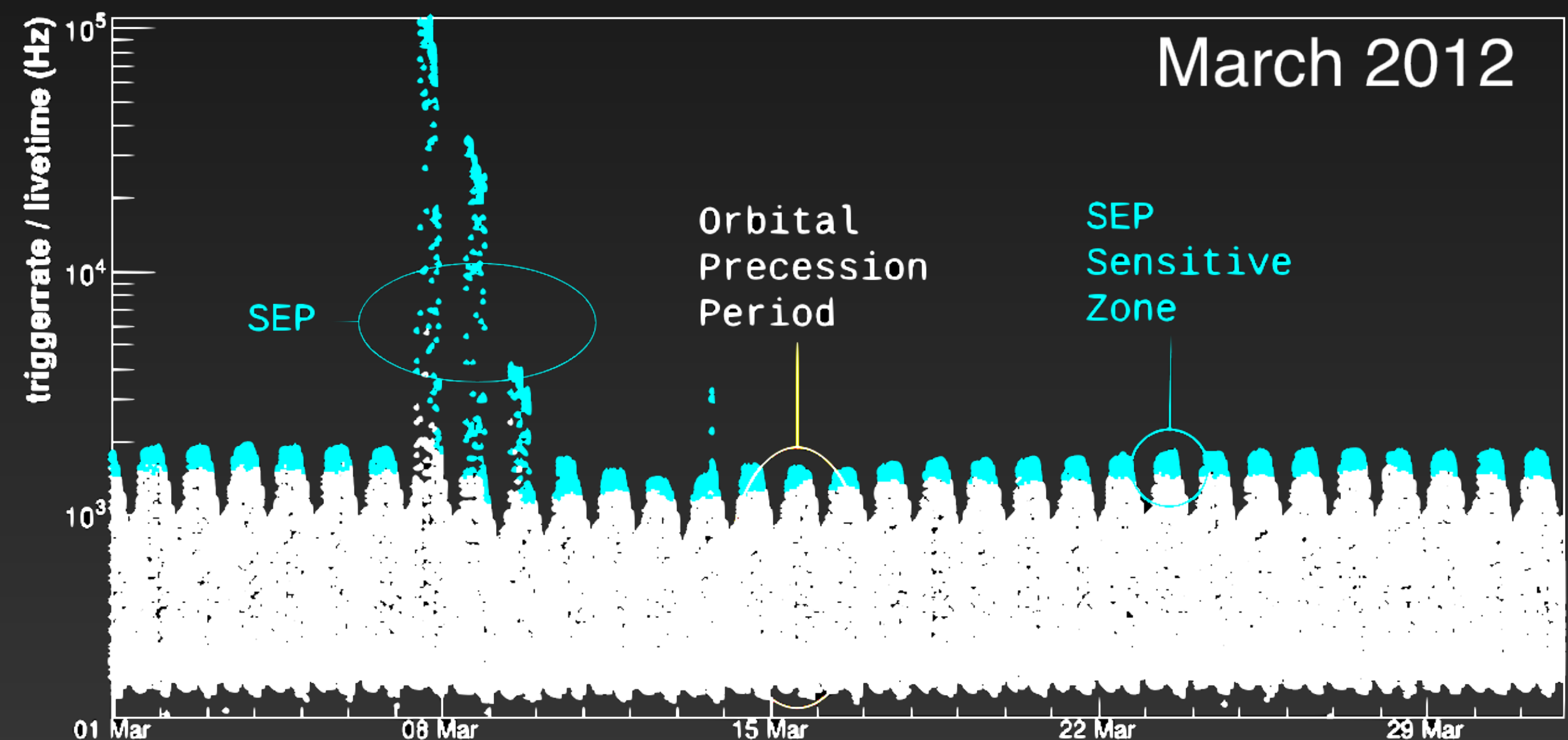




# PhD Topic: Space Weather with AMS

## Objectives

- **SEP Identification Algorithm** development based on AMS low latency **real-time data**, using the AMS analysis software, starting from the preliminary test on offline data (see plot)
- Algorithm reliability **test** and **implementation** on the ISS





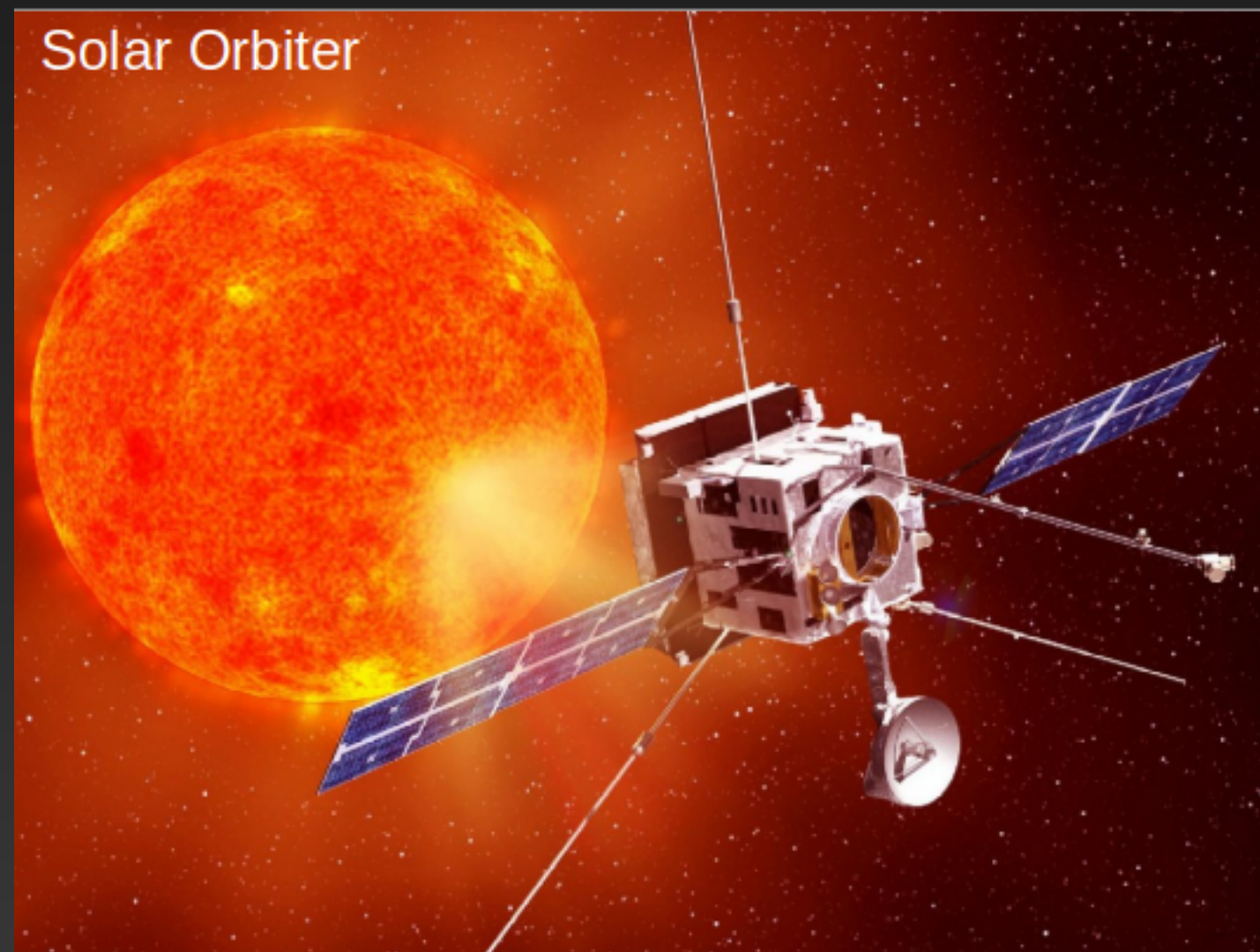
# PhD Topic: Multi-channel Data Analysis

## Objectives

Comparison between **charged particles** observables and other **solar activity**, **interplanetary medium** and **geomagnetic disturbance** parameters.

## Method

Data **gathering** and **analysis** from space and terrestrial experiments devoted to study **solar activity**.  
Candidate observables: **sunspots**, **heliospheric plasma**, **solar magnetic field polarity** and **solar wind**.





# Conclusions

- Temporal characterization of solar energetic events
- AMS-02 data analysis for charged RC flux measurements
- Measurements comparison with complementary informations (solar activity indexes)
- Real time SEP monitoring system
- Joint work with the AMS-02 collaboration in synergy with ASI