

AMS collaboration at LIP



LIP has been involved since beginning of the experiment (1998).

Since AMS' launch, 24 papers were published by the collaboration covering the following subjects:

Primary & Secondary Nuclei Fluxes

Proton, Electron, Positron, Helium, Antiproton, Boron, Carbon, Oxygen, Lithium, Beryllium, Boron, Nitrogen, Sodium, Aluminum, Fluorine, Iron, Neon, Magnesium, Silicon

Isotopic Fluxes

$^3\text{He}/^4\text{He}$, Deuteron (submitted)

Time-resolved Fluxes

Bartel Proton, Helium, Electron, Positron

Daily Proton, Helium, Electron, Positron



FERNANDO BARÃO



MIGUEL ORCINHA



JOÃO ANTUNES



LUISA ARRUDA



GUILHERME GASPAR



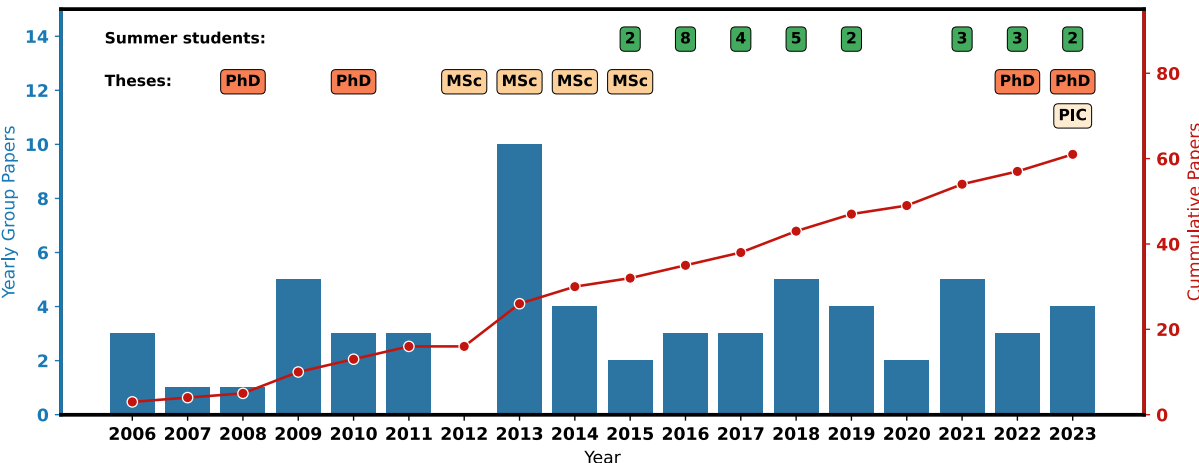
SÉRGIO RAMOS



PAULA BORDALO

AMS-LIP Physics Topics

- Time Variability of the Cosmic-ray Flux
- Isotopes (D, Li, B, C, ...)
- RICH reconstruction monitoring and analysis



Team: 5 Senior, 1PhD, 1MSc

FCT CERN CERN/FIS-PAR/0007/2021
 Dec. 2021 - Apr. 2024 (45k€)
 Total FTE: 3.45

Landmarks and Group Updates

From 2023 till now...

AMS papers: 3

Few authors papers: 2

E.F. Bueno, F. Barão, M. Vecchi, *Machine learning approach to the background reduction in singly charged cosmic-ray isotope measurements with AMS-02*, Nucl.Instrum.Meth.A 1056 (2023) 168644

M. Borchelini, F. Barão, M. Vecchi, L. Mano, *Feature selection techniques for CR isotope identification with the AMS-02 experiment in space*, Particles (MDPI), Accepted (April 2024)

Thesis and students:

Master student (started in March 2024): **Guilherme Gaspar**

PhD student (starting hopefully in September 2024): **J. Antunes**

Internships

R. Parente, *Unravelling time variability in solar activity*, 2022.

D. Lemos, *Application of a Data Driven Method to Isotopes Identification in the AMS experiment*, 2022

Ongoing research projects:

RICH studies – F. Barão, G. Gaspar, J. Antunes, L. Arruda

Time Variability of Cosmic-ray flux – M. Orcinha, F. Barão, J. Antunes

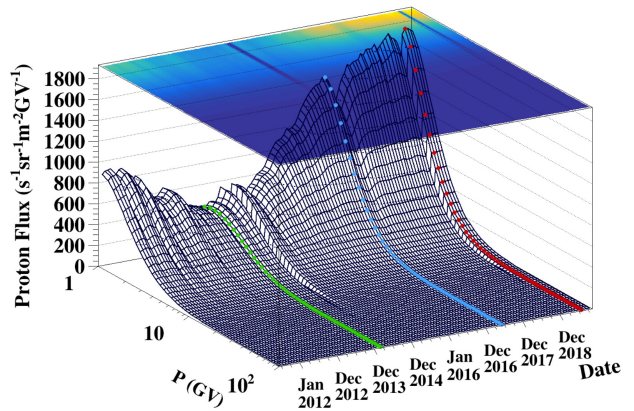
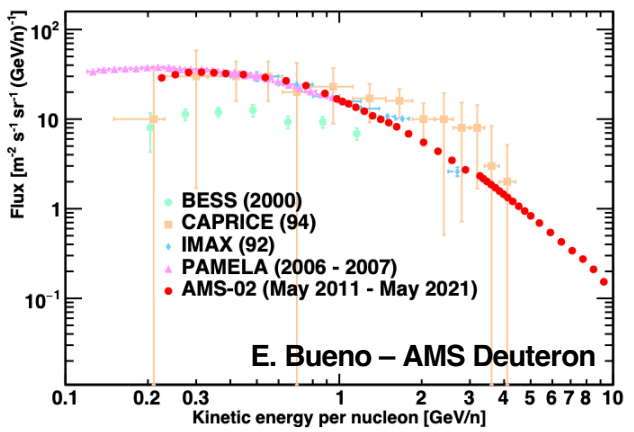
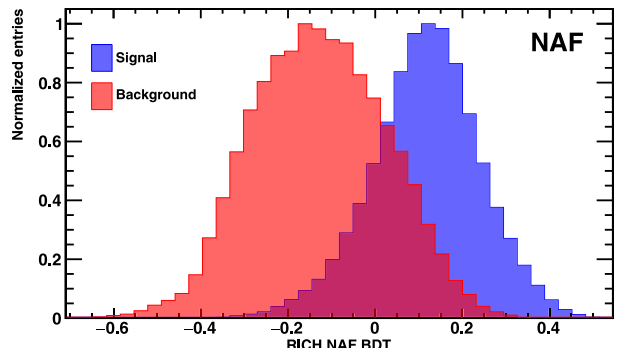
Isotopic fluxes – F. Barão, G. Gaspar, J. Antunes, S. Ramos, P. Bordalo

Main international research collaborations:

INFN, Perugia – Solar Modulation: phenomenology and modelling

Geneva University – Isotopic fluxes, RICH studies

Groningen University – Isotopic fluxes, Unfolding, Machine Learning



M. Orcinha - AMS Proton

Deuteron flux: $D/{}^4\text{He}$ & ${}^3\text{He}/{}^4\text{He}$

Aguilar, et al., Properties of Cosmic Deuterons and Helium Isotopes Measured by the Alpha Magnetic Spectrometer, *Submitted to PRL*

STRENGTHS

- Experienced team in experimental, astroparticle and computational physics, with extensive computational and data science skills
- Long history of international relationships with other research groups
- Experience in developing extensive analysis frameworks

OPPORTUNITIES

- AMS remains a unique observatory in space
- Increased interest by the scientific community in Dark Matter origin and cosmic antimatter
- Time-variability of CR fluxes is an emerging topic in the scientific community
- AMS' high exposure time gives access to low abundance nuclei and antimatter fluxes due to the sheer amount of data
- Involvement in isotopic analysis benefits greatly from the group's RICH expertise

WEAKNESSES

The main weaknesses and threats are the relatively small size of the group and the lack of scientific overlap between the topics being researched by this group and other LIP research groups.
Lack of funding for the new PhD candidate in the group.

THREATS

GROUP UPDATES

- Master thesis (ongoing)
Guilherme Gaspar
- PhD thesis (waiting for funding)
João Antunes