

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

$^3\text{He}/^4\text{He}$

Time-resolved Fluxes

Bartel Proton, Helium, Electron, Positron

Daily Proton, Helium, Electron



FERNANDO BARÃO



MIGUEL ORCINHA



JOÃO ANTUNES



LUIISA ARRUDA



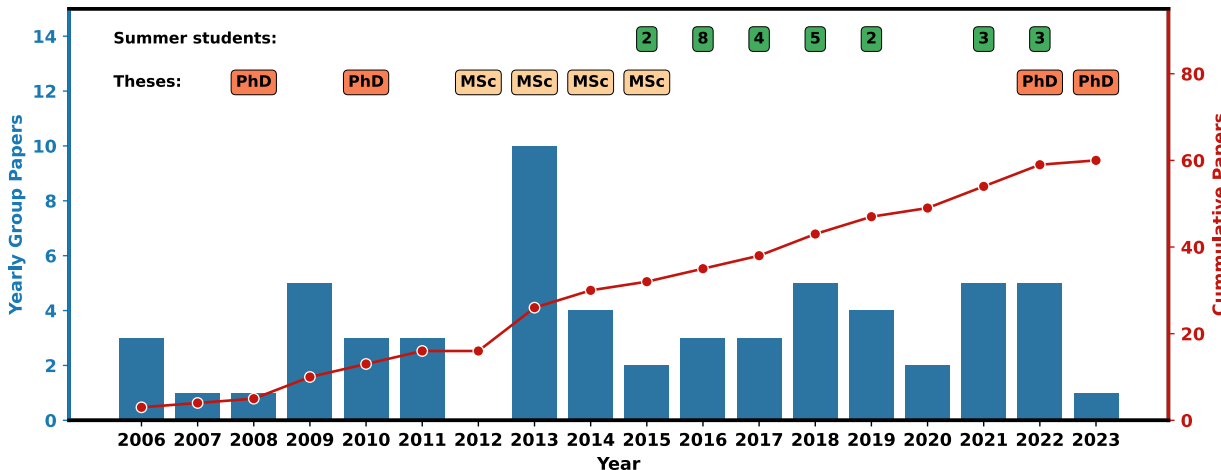
PAULA BORDALO



SÉRGIO RAMOS

AMS-LIP Physics Topics

- Time Variability of the Cosmic-ray Flux
- Isotopic Fluxes
- RICH reconstruction analysis



Total FTE: 3.45
 People: 5 Senior, 1 PhD
 Funding: FCT/CERN fund call
 CERN/FIS-PAR/0007/2021
 Dec. 2021 - Dec. 2023 (45k€)

Landmarks and Group Updates

From 2022 up to now:

- 6 AMS papers
- 2 LIP papers
- 2 PhD Theses defended
 - **E. F. Bueno**, *On the measurement and interpretation of the fluxes of galactic cosmic-ray nuclei*, 2022, University of Groningen, Netherlands
 - **M. Orcinha**, *Study of solar modulation effects on cosmic ray fluxes measured by the AMS experiment*, 2023, Instituto Superior Técnico, Universidade de Lisboa, Portugal
- 2 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

Current students:

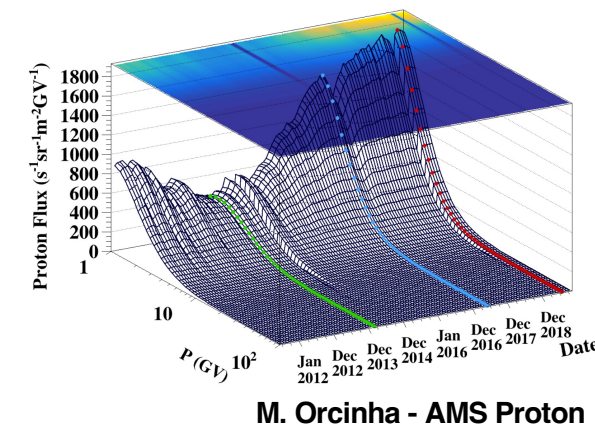
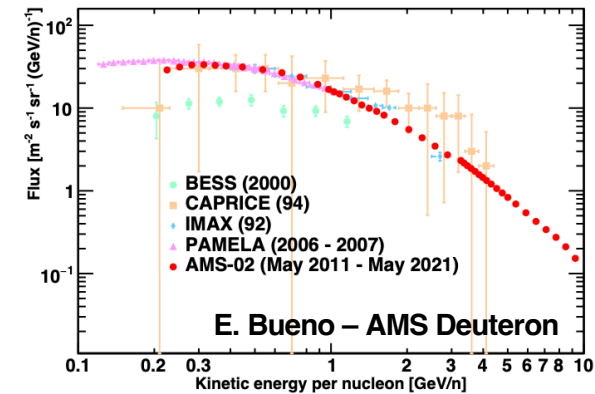
- Ongoing undergraduate project (PIC/IST) 3rd year student: **R. Parente**
- PhD thesis subject on Isotopes (Deuteron and Boron) proposed for funding (FCT ongoing call): **J. Antunes**

Ongoing research projects:

- RICH studies – F. Barão, J. Antunes, L. Arruda, M. Li (PhD Geneva)
- Time Variability of Cosmic-ray flux – M. Orcinha, F. Barão, J. Antunes
- Isotopic fluxes – F. Barão, J. Antunes, S. Ramos, P. Bordalo

Main international research collaborations:

- **INFN, Perugia** – Solar Modulation: phenomenology and simulation
- **Geneva University** – Isotopic fluxes and RICH studies
- **Groningen University** – Isotopic fluxes

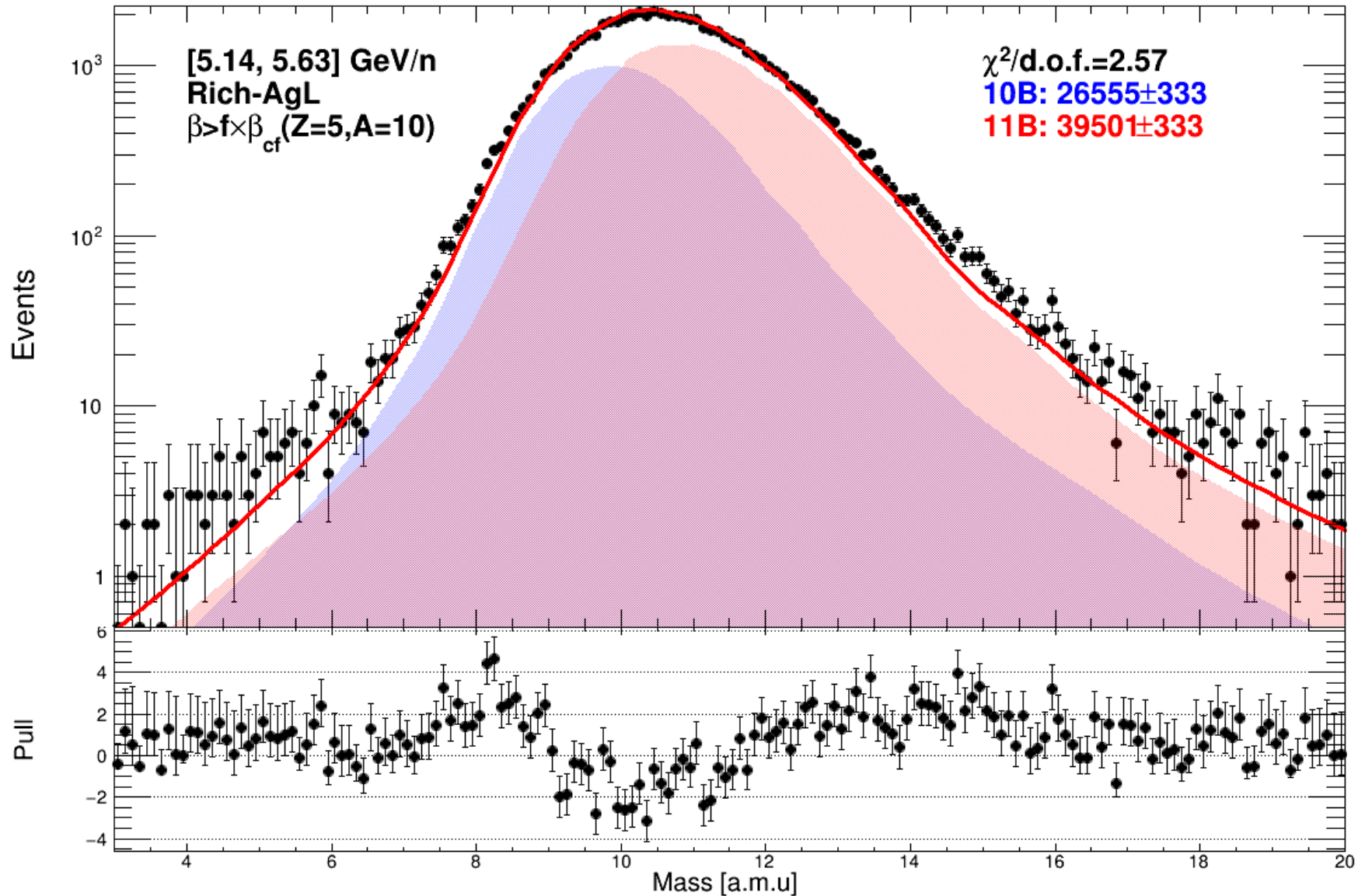


LIP group publications:

E.F. Bueno, F. Barão, M. Vecchi,
Iterative-Bayesian unfolding of cosmic-ray isotope fluxes measured by AMS-02,
NIMA 1046 (2023) 167695

E.F. Bueno, F. Barão, M. Vecchi,
A parametric approach for the identification of single-charged isotopes with AMS-02,
NIMA 1031 (2022) 166564

Boron isotopes: reaching AMS limit?



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

- 2 PhD thesis defended
 - M. Orcinha, Mar/2023 (IST, Lisboa)
 - E. Bueno, Dec/2022 (Uni. Groningen, Netherlands)
- Ongoing PIC/IST: Rafael Parente
- Waiting for PhD thesis funding: Joao Antunes