Proyecto trasgo Project

Cosmic Ray Physics with Trasgos

Juan A. Garzón (LabCAF, Univ. Santiago de Compostela)

on behalf of

LIP - Coimbra

LabCAF/IGFAE - Univ. Santiago de Compostela

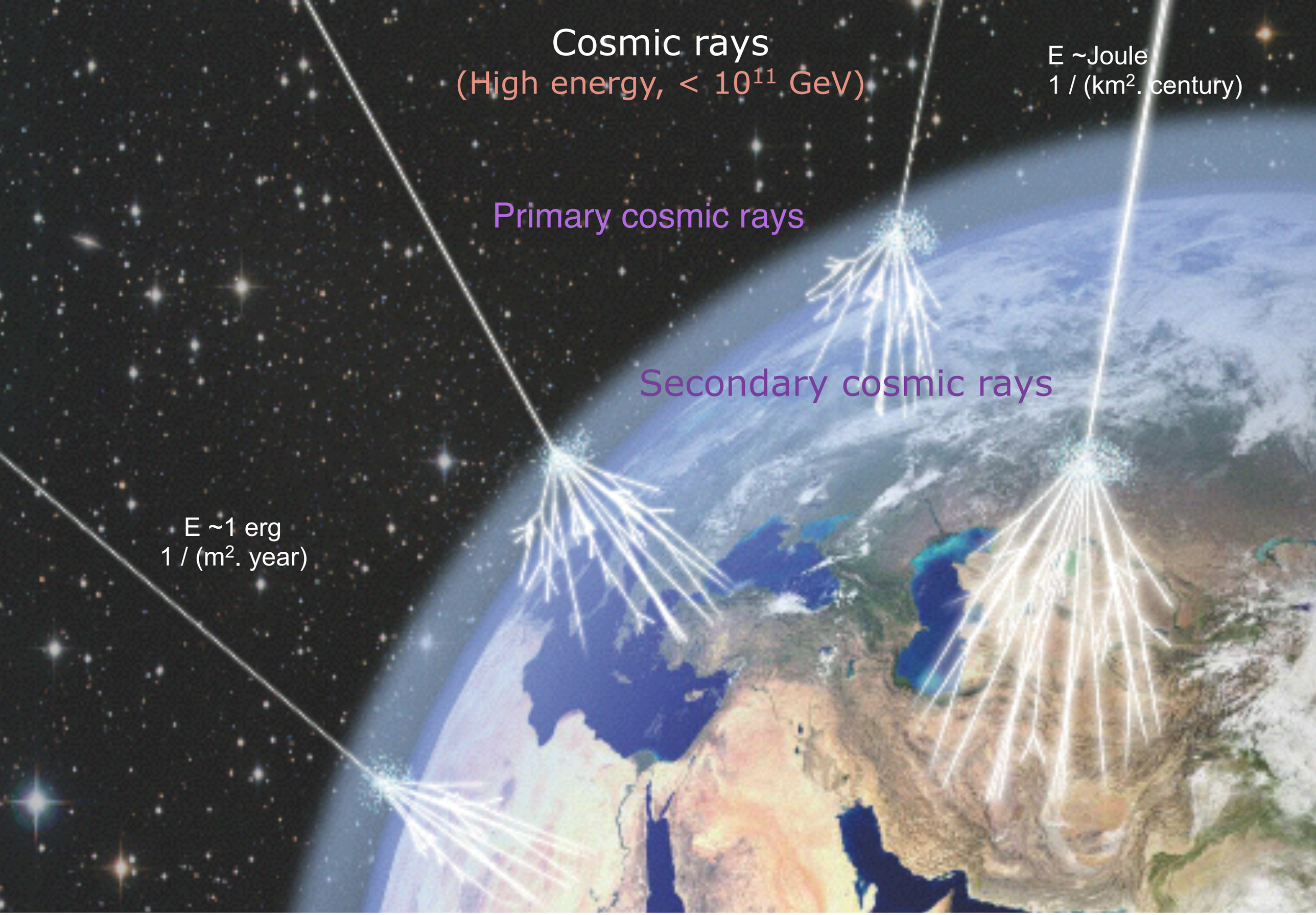
Hidronav - Vigo

and

TRAGALDABAS Collaboration

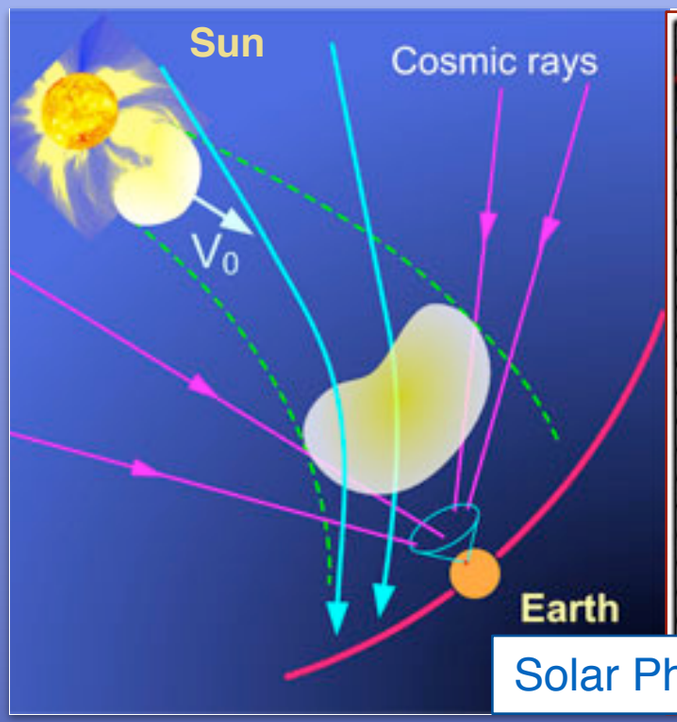
Outlook

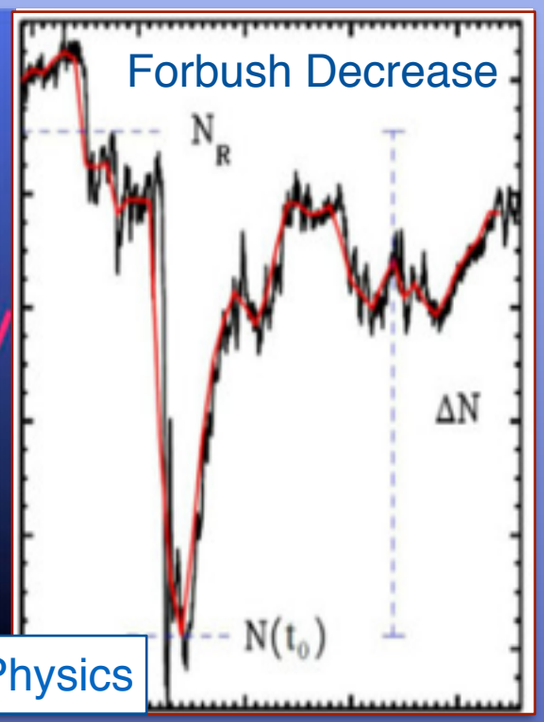
1. Cosmic rays
2. The Trasgo project
3. Microscope
4. Other Trasgos
5. Summary & Conclusions


Cosmic rays
(High energy, < 10^{11} GeV)
E ~Joule
1 / (km^2. century)
Primary cosmic rays
Secondary cosmic rays
E ~1 erg
1 / (m^2. year)

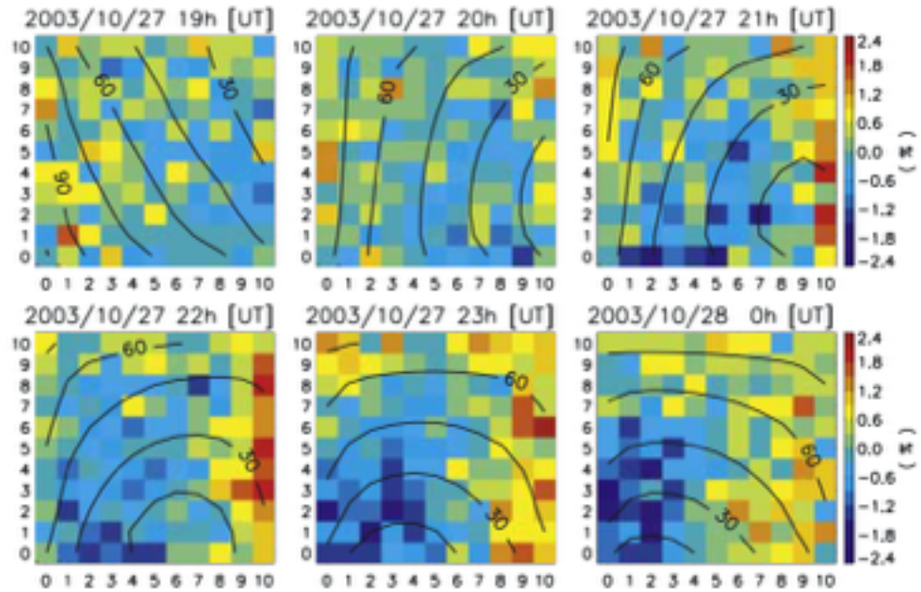
COSMIC RAYS

A few research fields





Solar Physics



Magnetic storm forecasting

Moon shadow

Interplanetary magnetic field

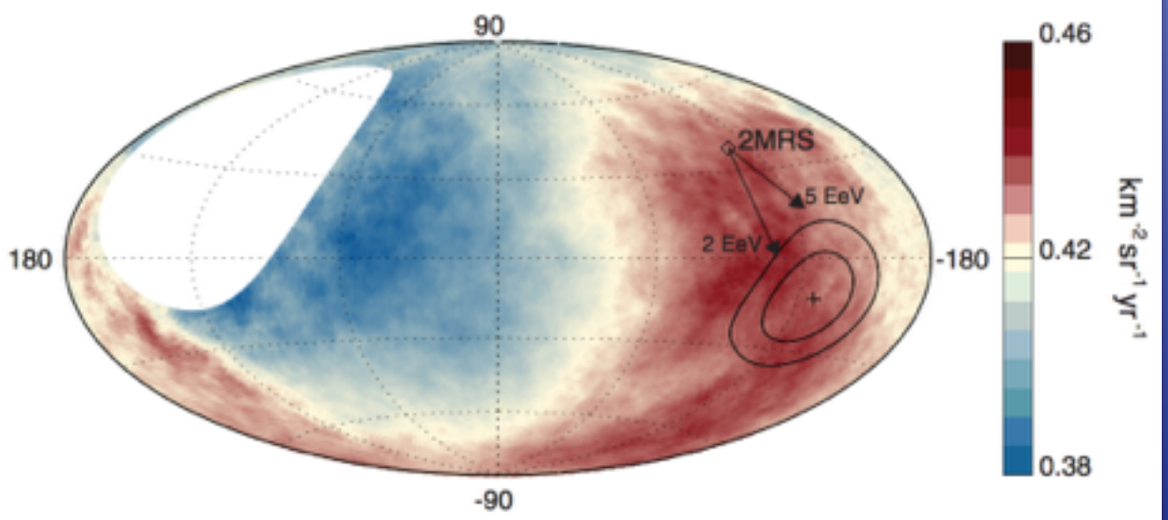
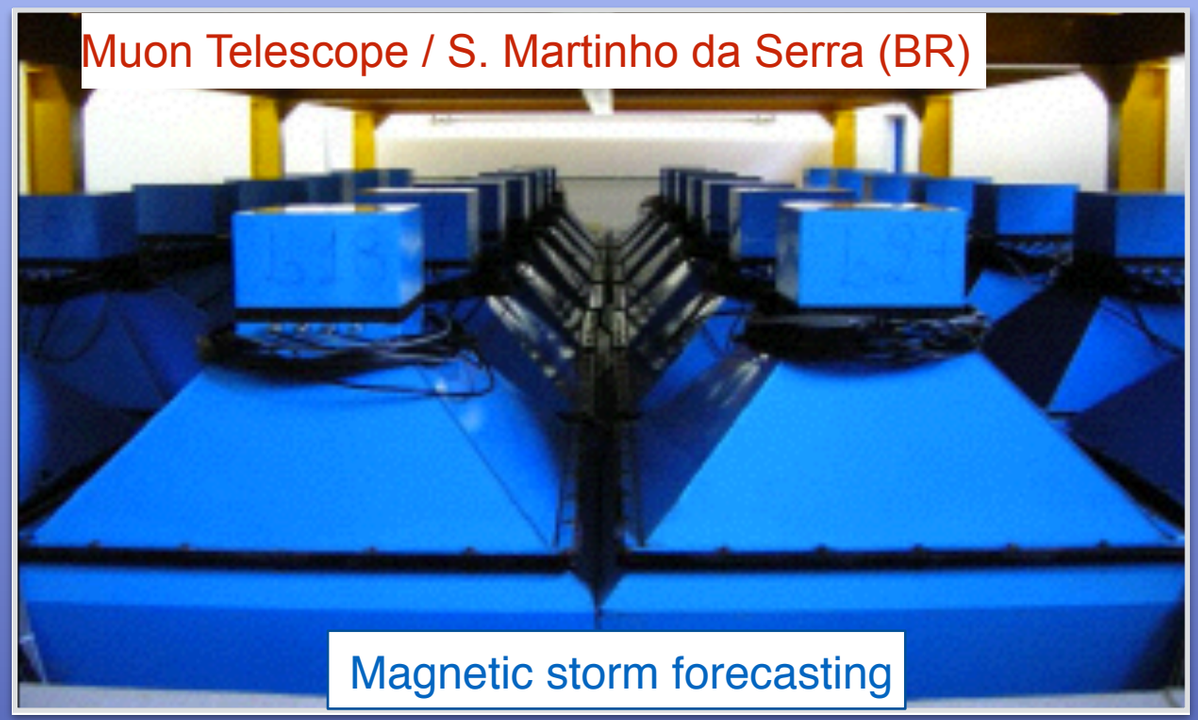


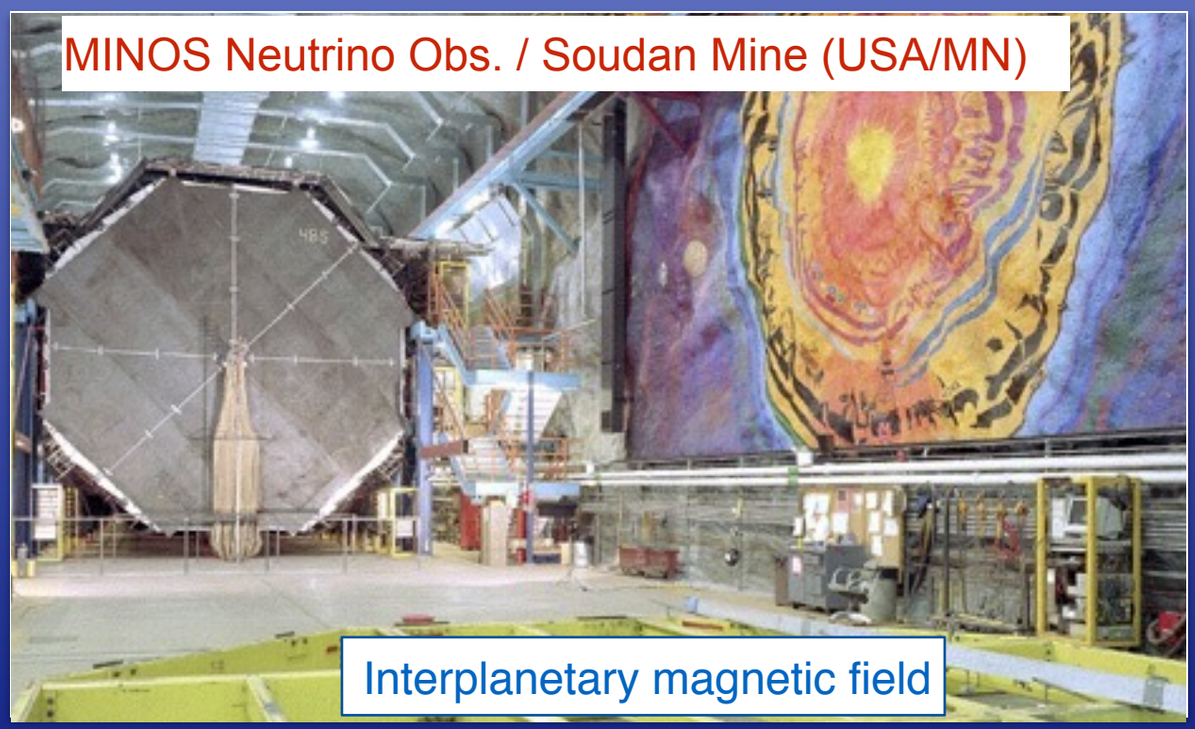
Fig. 3. Map showing the fluxes of particles in galactic coordinate: [P. Auger Observatory]

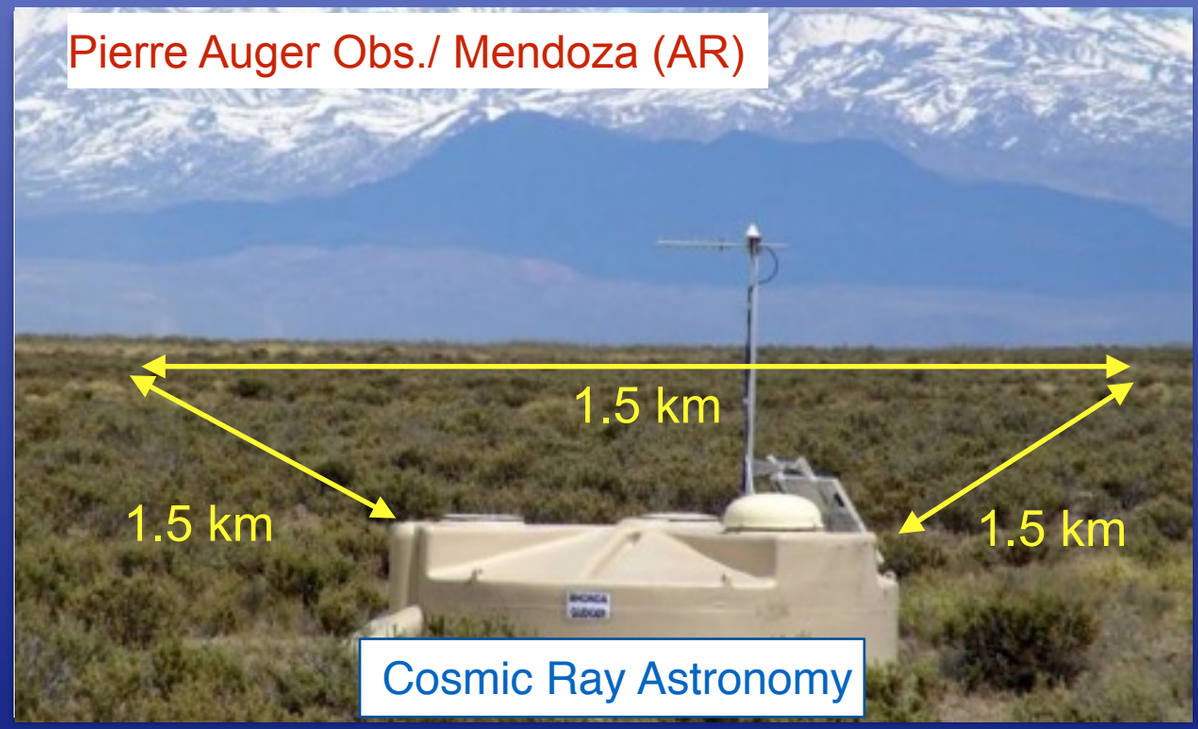
Cosmic Ray Astronomy

COSMIC RAYS

A few research fields







Proyecto

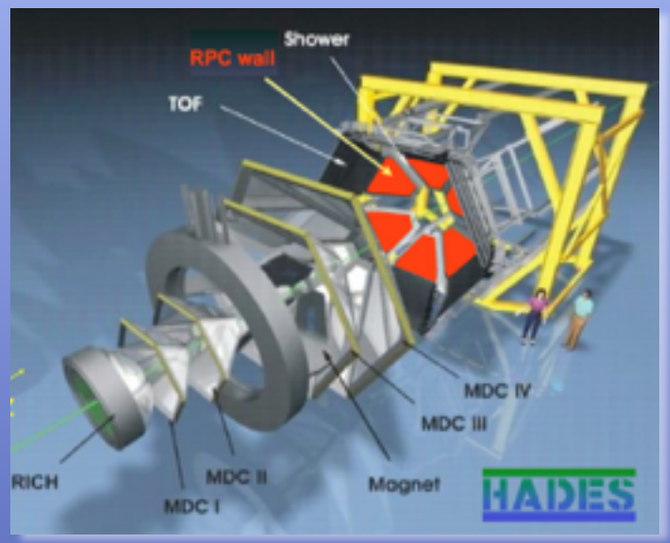
Project

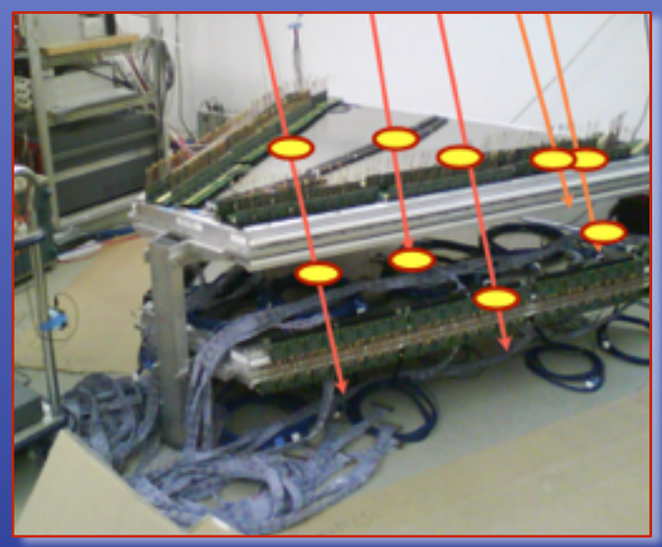
A new cosmic ray detector concept

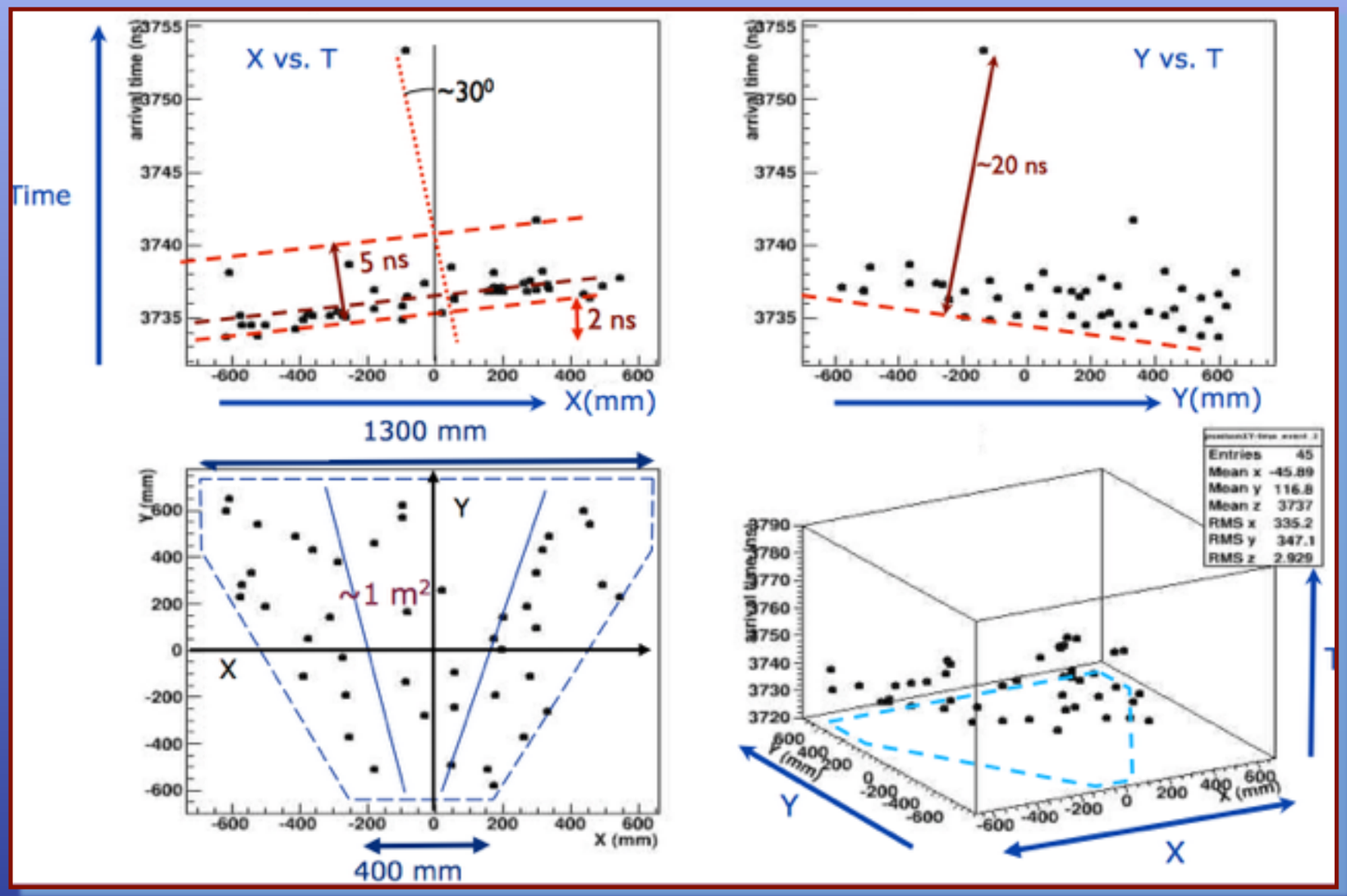
THE TRASGO PROJECT

The HADES experience

Commissioning of the tRPC ToF wall of HADES experiment at GSI (Darmstadt)







$\delta T \sim 150$ ps, $\delta S \sim 5$ cm^2, $\delta\theta \sim 5^\circ$

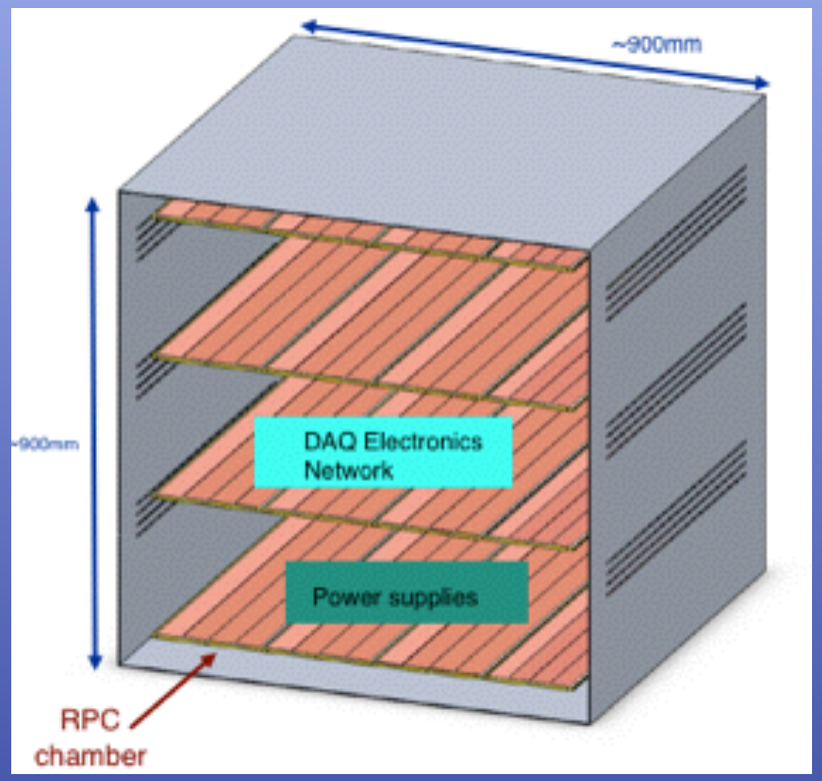
Never cosmic rays were observed at the Earth's surface with such an accuracy!

Juan A. Garzon, LabCAF / Univ. Santiago de Compostela

THE TRASGO PROJECT

The concept

TRASGO: TRAck reconStructinG bOx (Fradinho de mão furada)



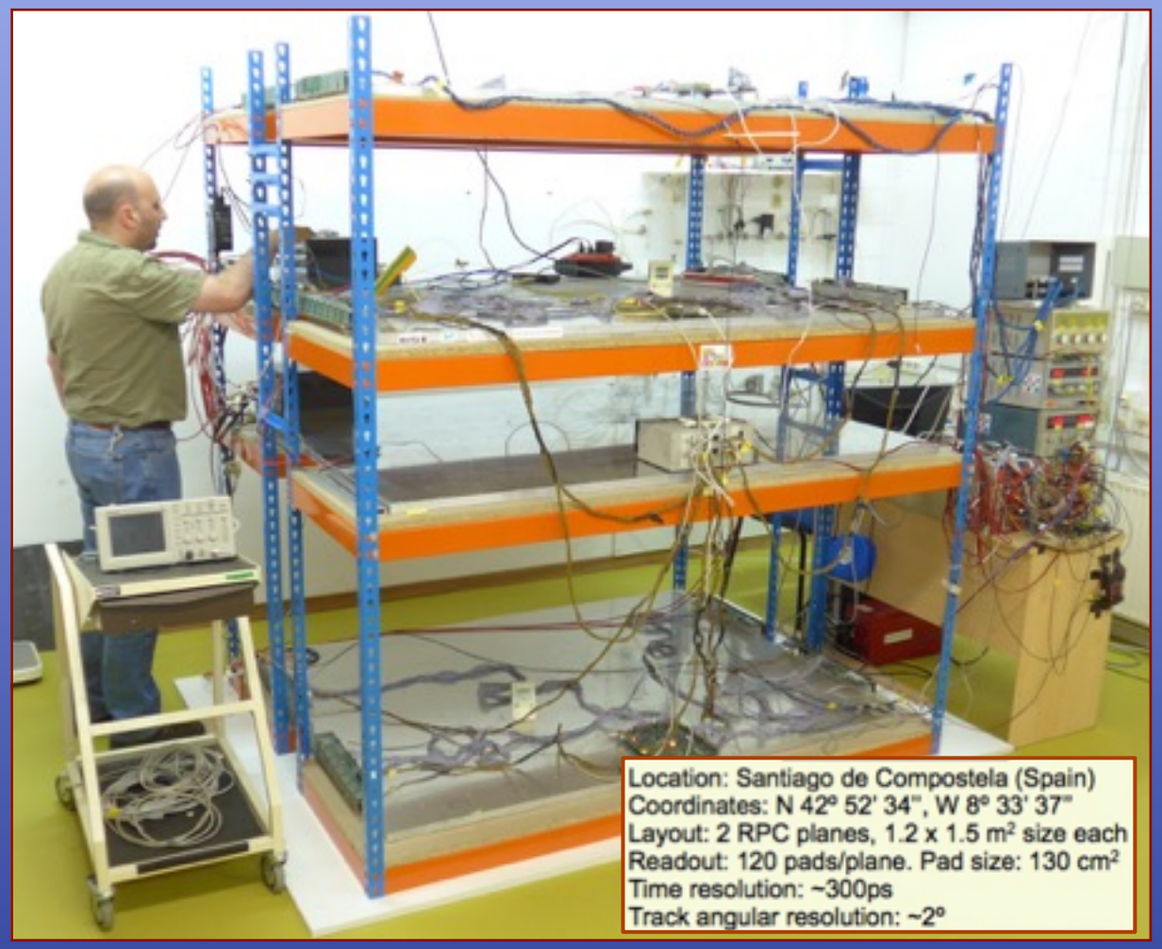
Main features:

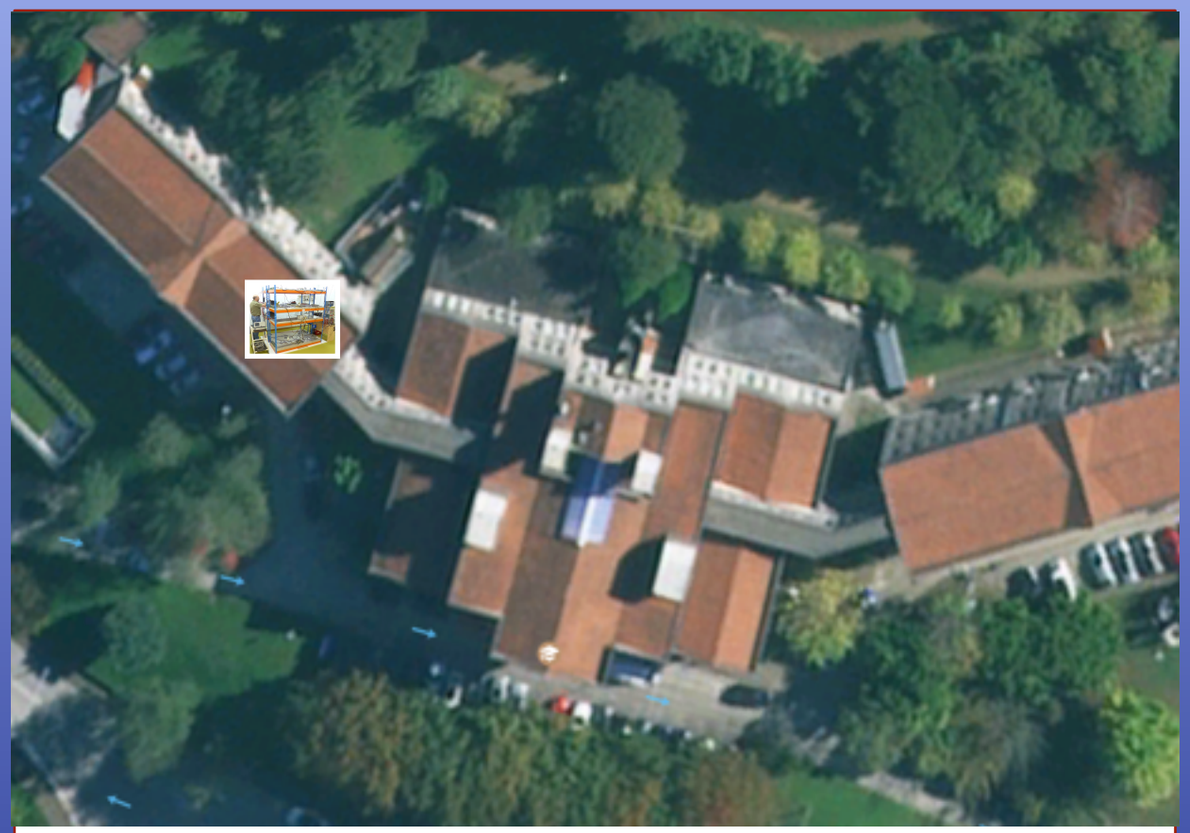
TRACKING
HIGH GRANULARITY
ELECTRON-MUON PID

THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS* (USC)

*TRAsGo for the AnaLysis of the nuclear matter Decay, the Atmosphere, the earth B-field And the Solar activity





Faculty of Physics / Univ. Santiago de Compostela

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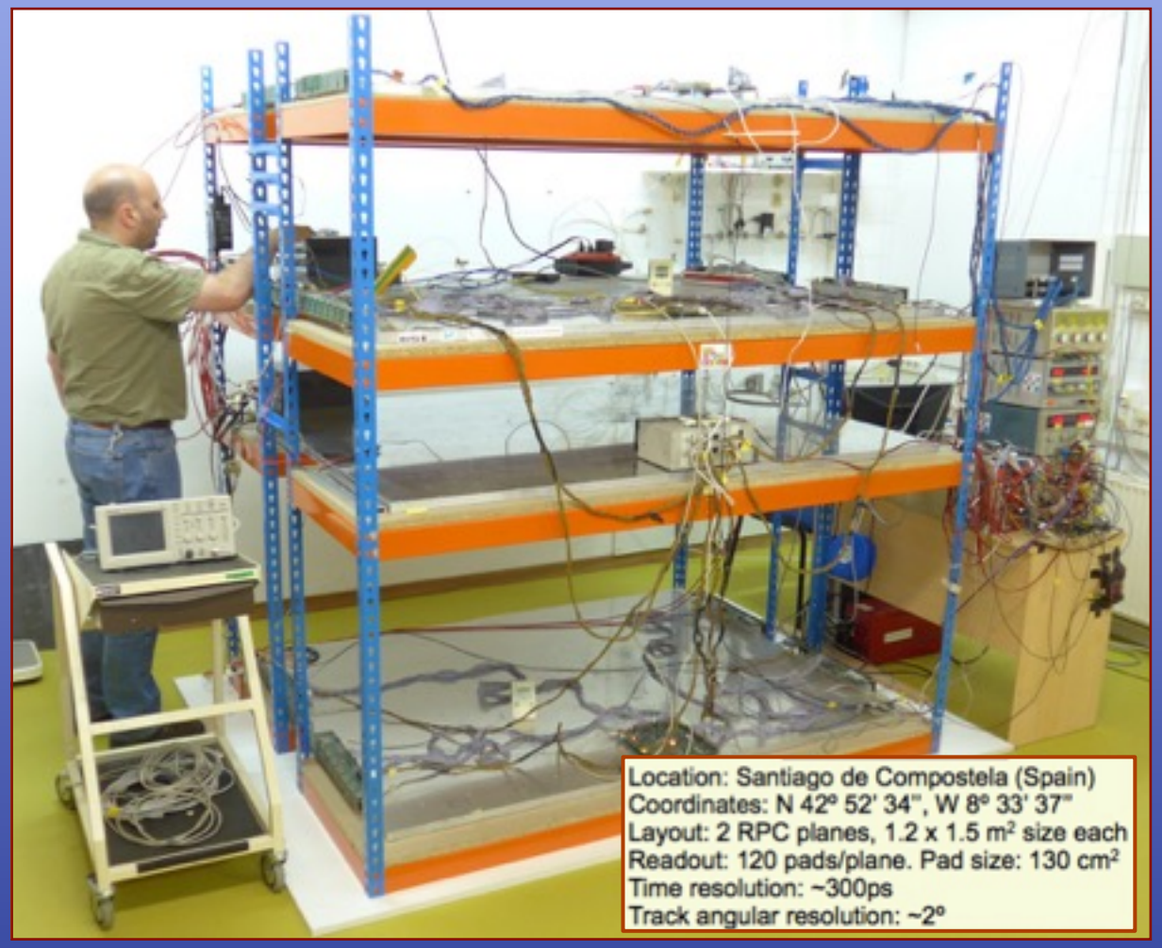
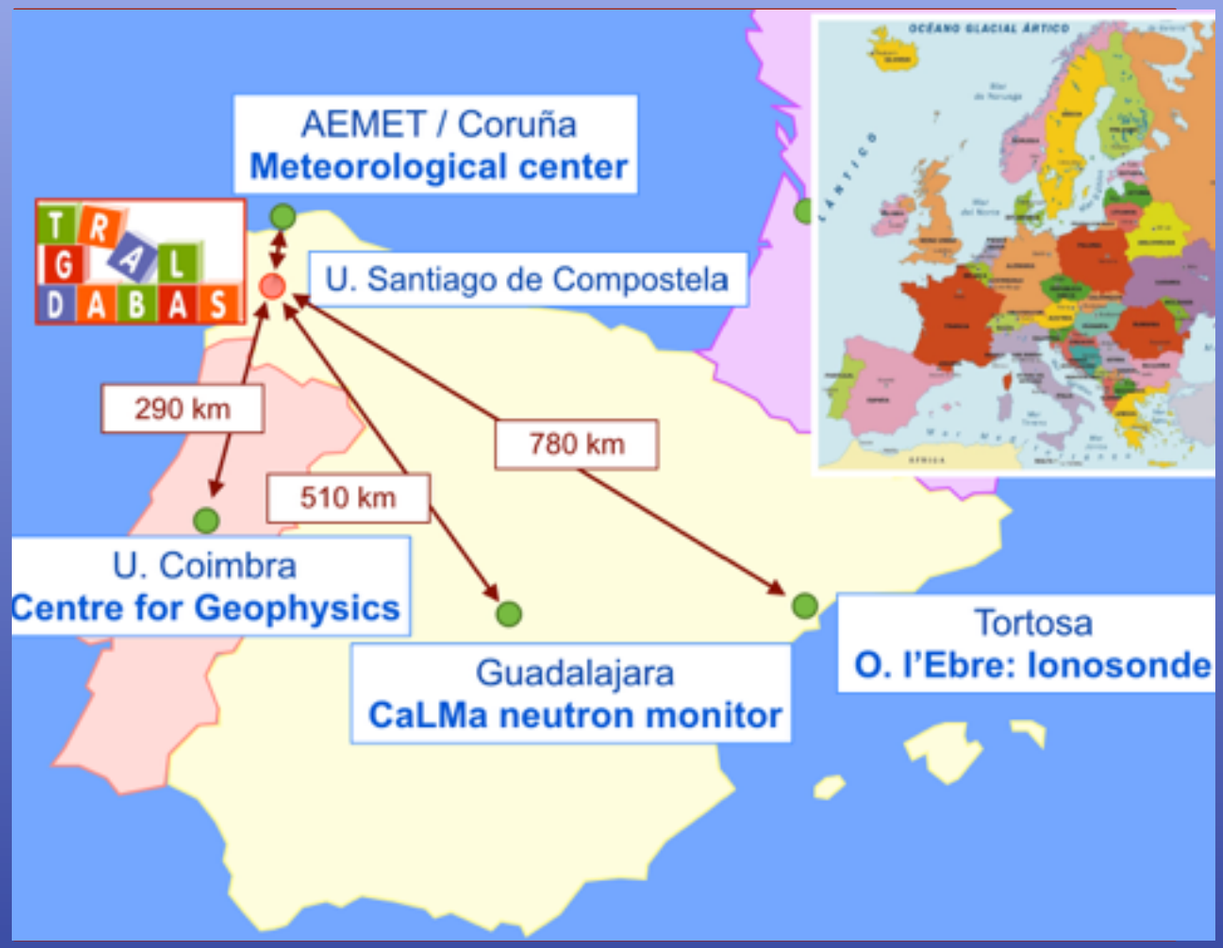
Trasgo 1: TRAGALDABAS* (USC)

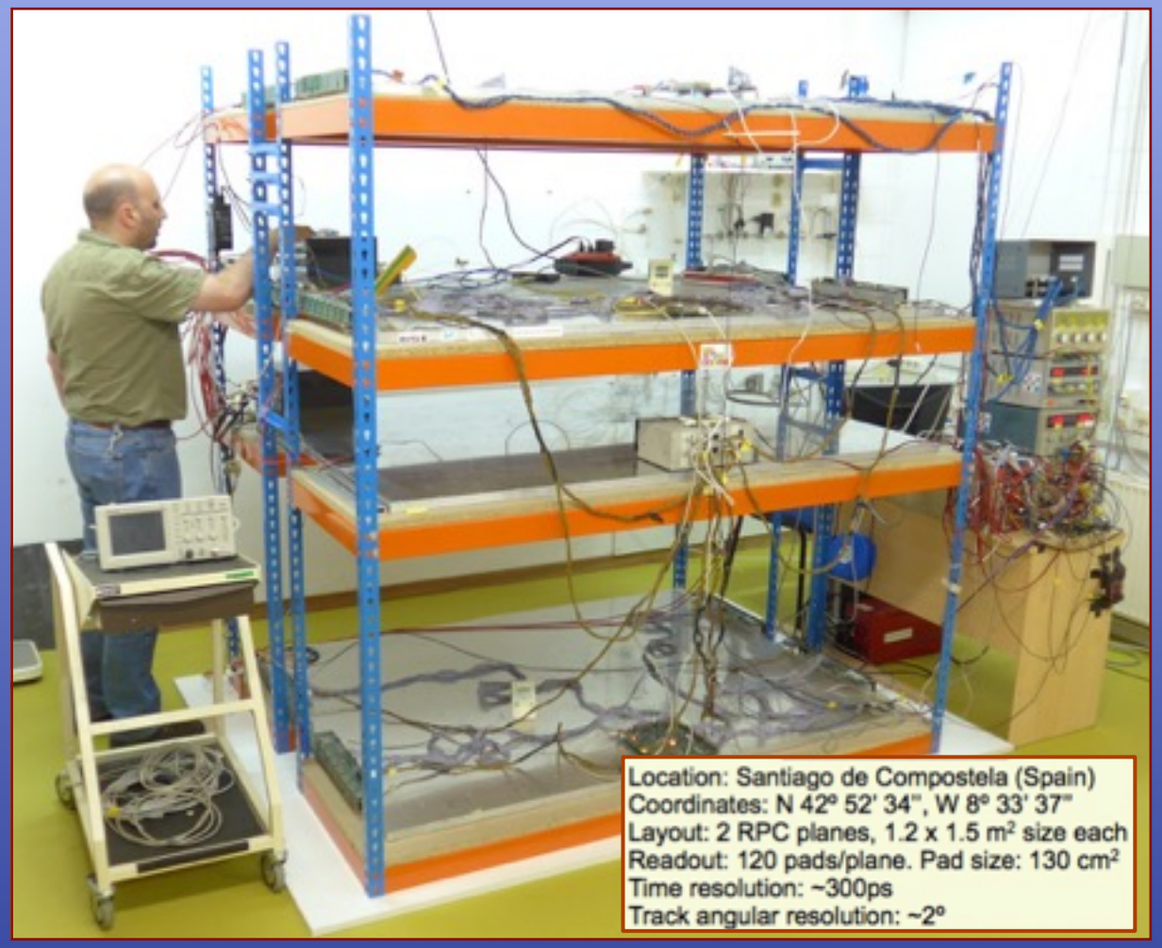


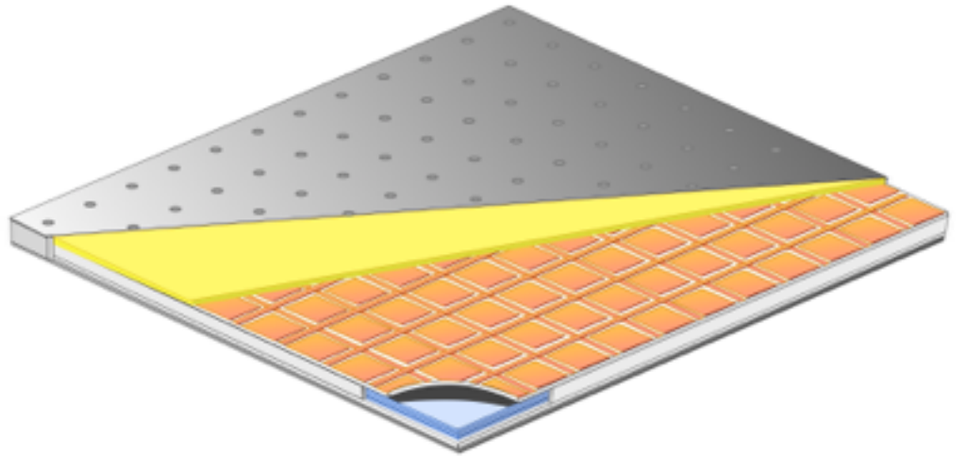


*TRAsGo for the AnaLysis of the nuclear matter Decay, the Atmosphere, the earth B-field And the Solar activity

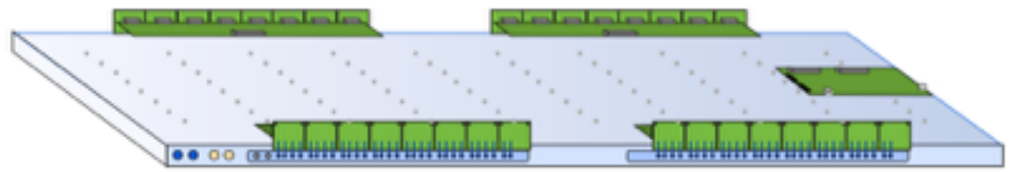
THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS* (USC)





LIP-Coimbra MARTA, P. Auger RPCs



LabCAF-GSI, HADES FEE

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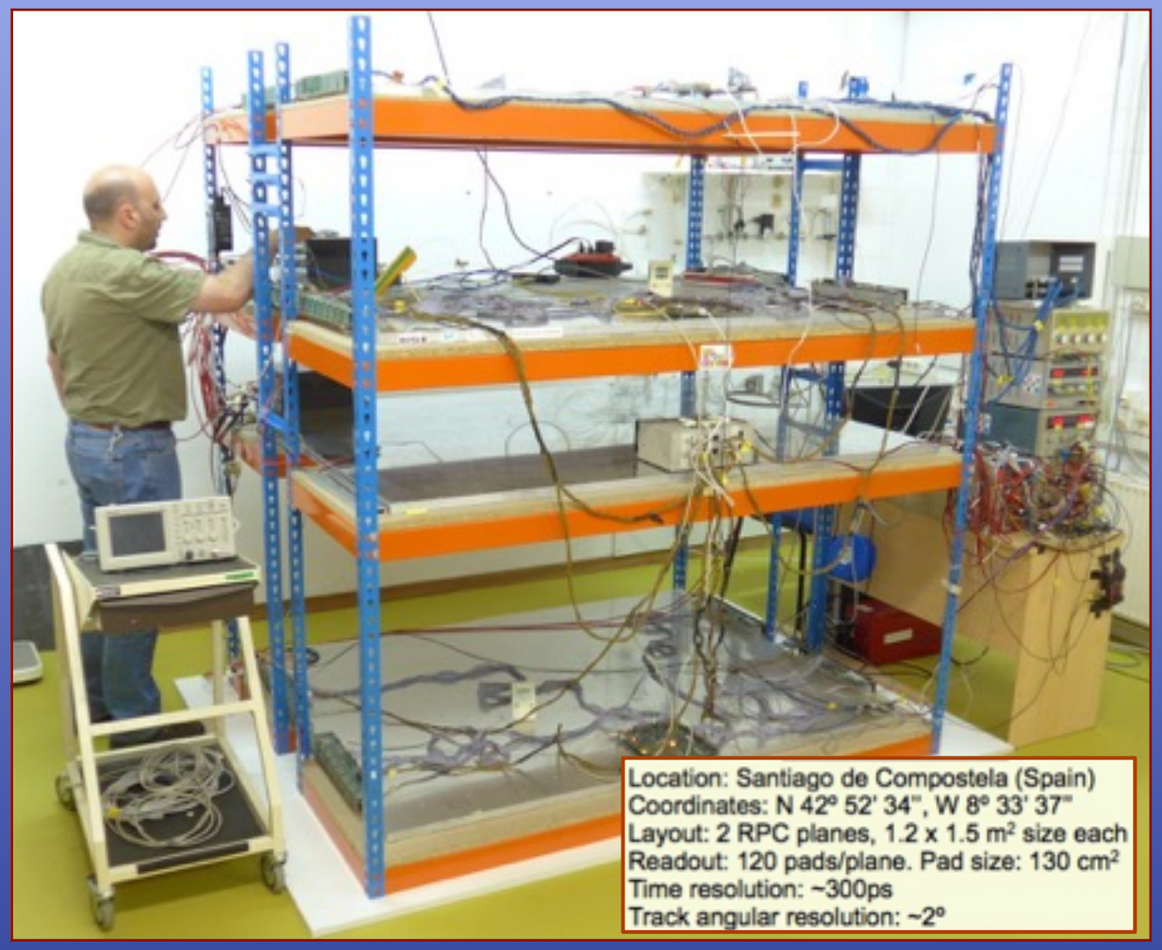
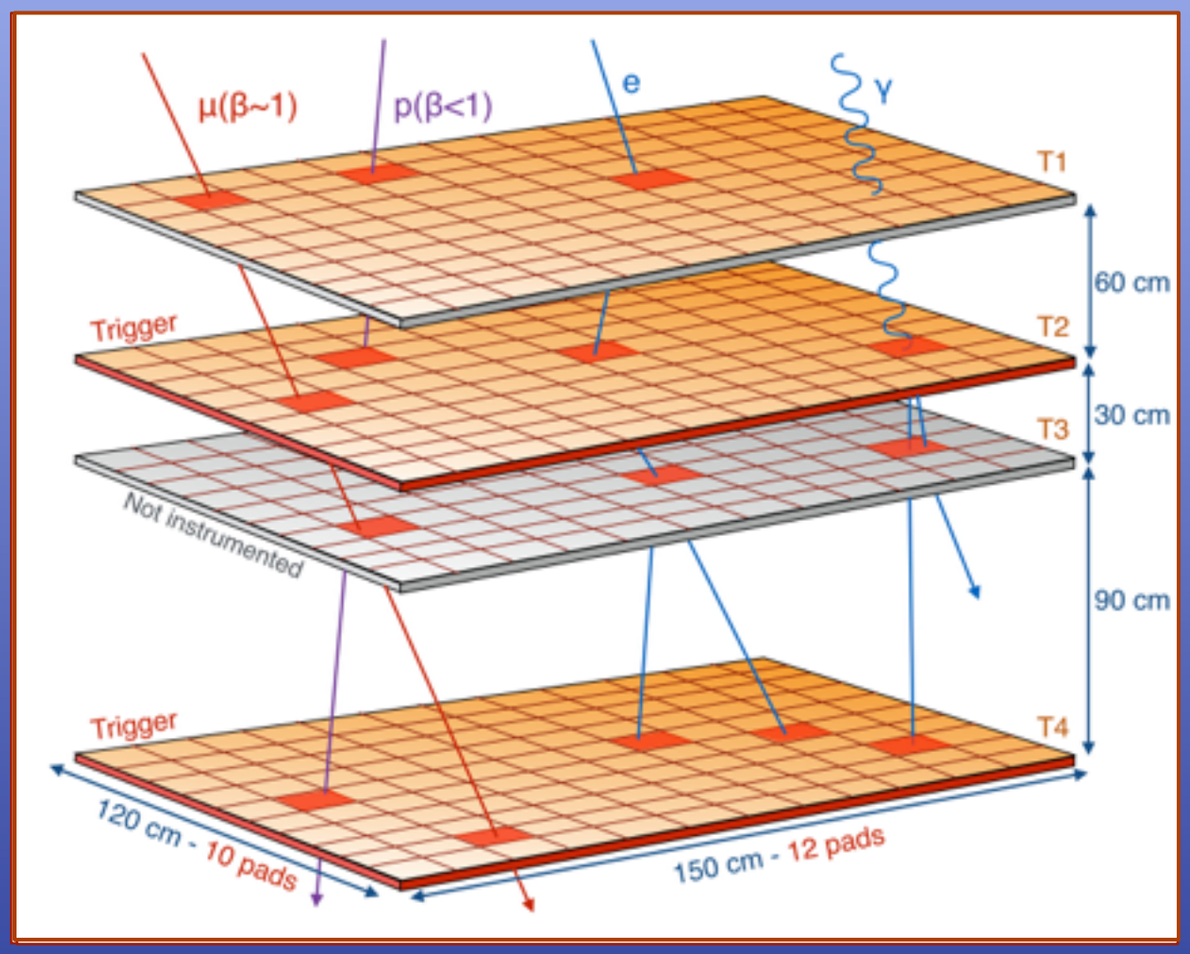
Juan A. Garzon, LabCAF / Univ. Santiago de Compostela

1st. IGFAE-LIP Meeting, Braga May, 4th. 2018

THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS* (USC)





PID capabilities

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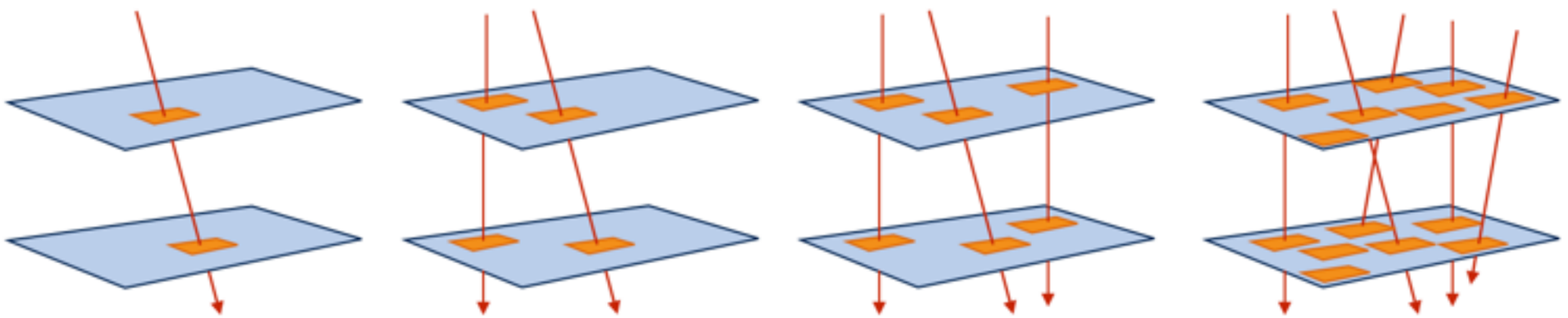
THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS* (USC)



	E1	<	E2	<	E3	<	E4
Rate	~ 40 Hz		~ 4 Hz		~ 0.04 Hz		~ 0.1 Hz

Multiplicity ~ Energy of primary cosmic rays

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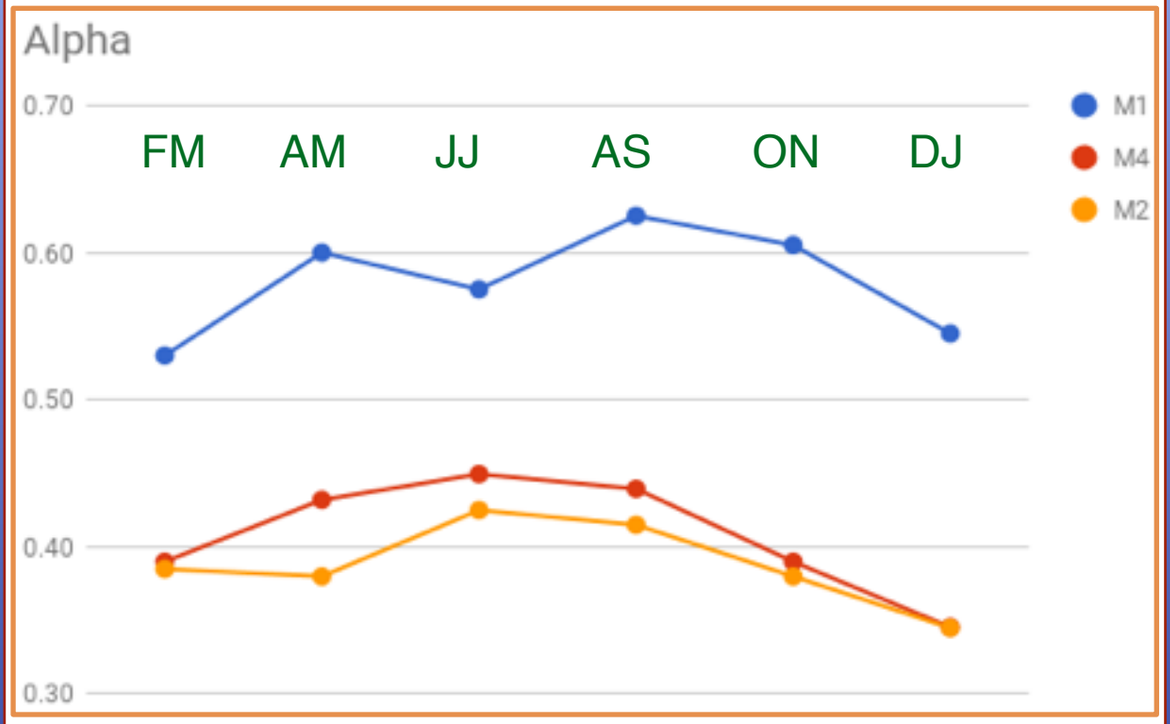
THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS*

A few results

Forbush Decrease Jun. 22nd 2015

Atmospheric Seasonal Effect



Muon:NTotal ratio at different multiplicities

Forbush Decrease Jun. 22nd 2015

Atmospheric Seasonal Effect

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THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS*

The Collaboration

H. Alvarez-Pol[8], A.Blanco[4], J.J.Blanco[1], P.Cabanelas[8], F.Clemencio[4], J.Collazo[10], J.Cuenca[10], P.Fonte[4], Y.Fontenla[10], D.García Castro[10], J.A.Garzón[10], A.Gómez-Tato[7], A.Gomis[6], G.Kornakov[5], T.Kurtukian[2], L.Lopes[4], C. Loureiro[4], A.Morozova[3], J.C.Mouriño[7], M.A.Pais[3], A.Pazos[9], V.Pérez Muñuzuri[11], P.Rey[7], I.Riádigos[11], M.Seco[9], V. Villasante[6].

Laboratory / Task

1. Univ. Alcalá de Henares, Spain / **Solar Physics**
2. CEN - Bordeaux, France / Nuclear and Solar Physics
3. CITEUC - U. Coimbra, Portugal / **Geomagnetic field and Space Weather**
4. LIP- Coimbra, Portugal / RPC detectors and instrumentation
5. Teknische Univ. Darmstadt, Germany / Software development
6. IGN - Madrid, Spain / **Geomagnetic field**
7. CESGA Super-computation Center - Santiago de Compostela, Spain / Data storage and distribution
8. GENP - Univ. Santiago de Compostela, Spain / Software development and simulation
9. IGFAE - Univ. Santiago de Compostela, Spain / Monitoring and Slow control
10. LabCAF - Univ. Santiago de Compostela, Spain / **Cosmic rays physics**, software and tracking
11. GFNL - Univ. Santiago de Compostela, Spain / **Atmosphere Physics and Climate**

Other partners:

ATI Sistemas. La Coruña, Spain

Club Desarrollo de las Ciencias, Madrid, Spain

Hydra Technologies Spain S.L. Vigo, Spain

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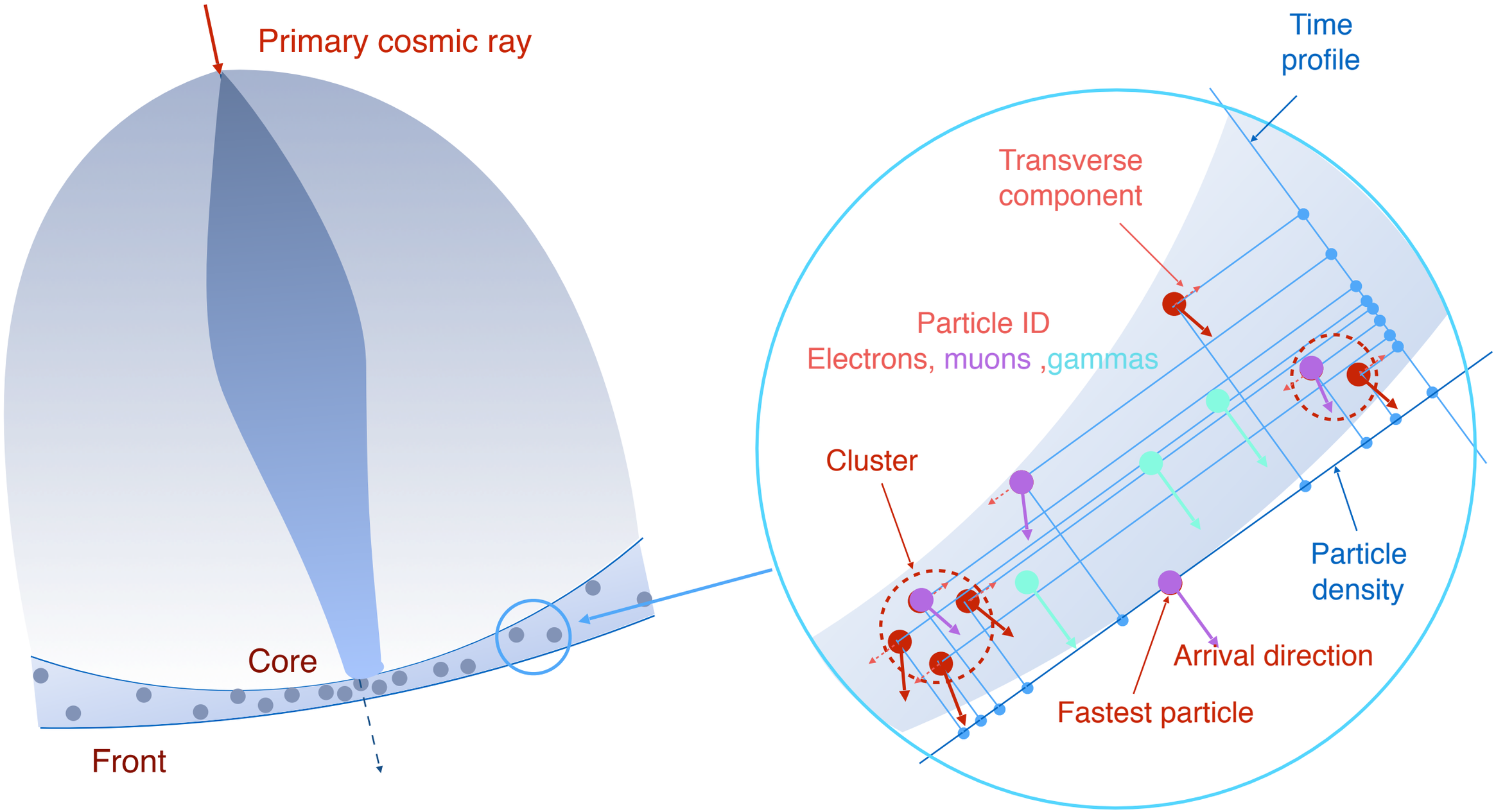
THE TRASGO PROJECT

Trasgo 1: TRAGALDABAS*



Important feature: Access to forbidden cosmic ray observables

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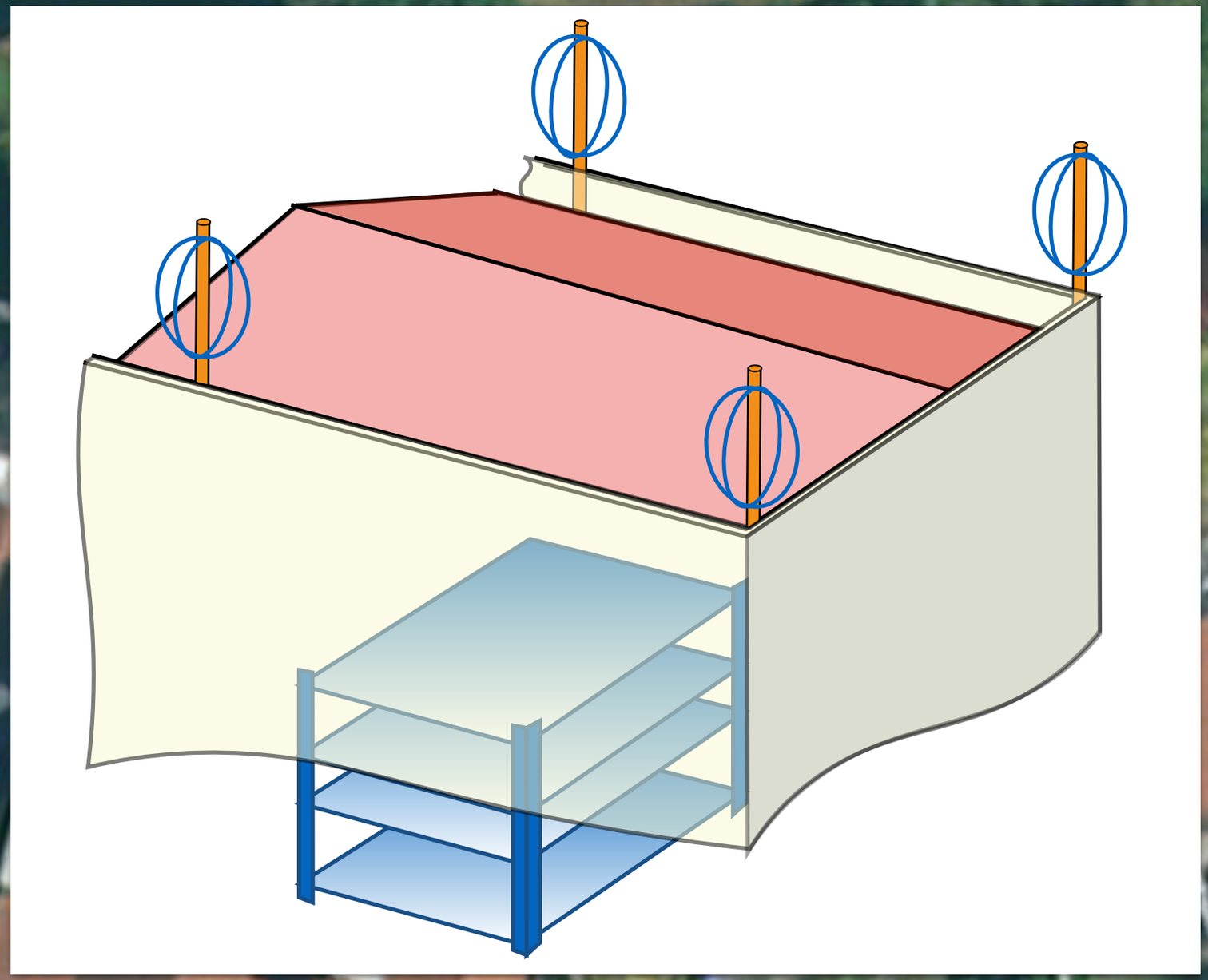
MICROSCOPE

MIni **C**osmic **R**ay **O**bservatory of **S**antiago de **CO**m**P**ost**E**la

Juan A. Garzon, LabCAF / Univ. Santiago de Compostela



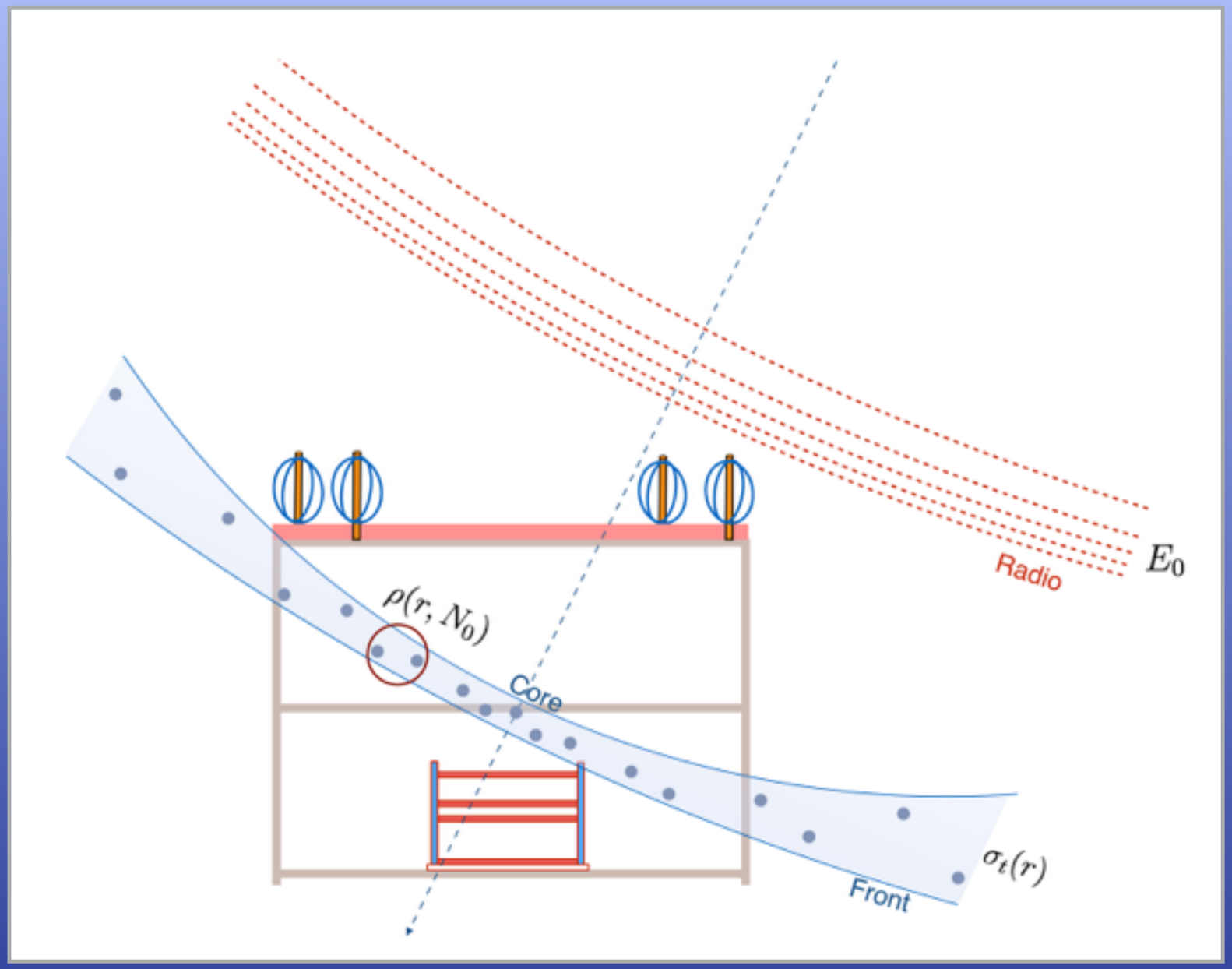
Ftad. de Física. Univ. de Santiago de Compostela

THE MICROSCOPE

SALLA antennas already available

Next step: Install 4 SALLA radio-antennas provided by KIT (Karlsruhe), on top of Tragaldabas for identifying high energy air showers.

THE MICROSCOPE



Main goal: To look for correlations between Tragaldabas events and high energy EAS

Other Trasgos

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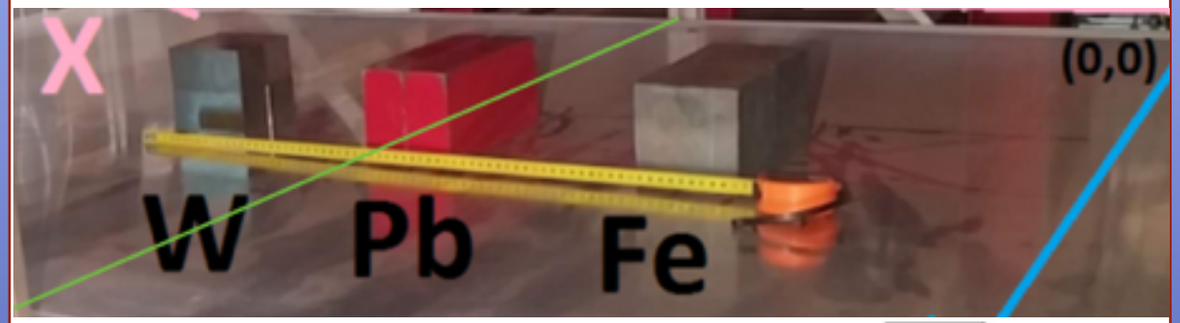
Proyecto trasgo Project

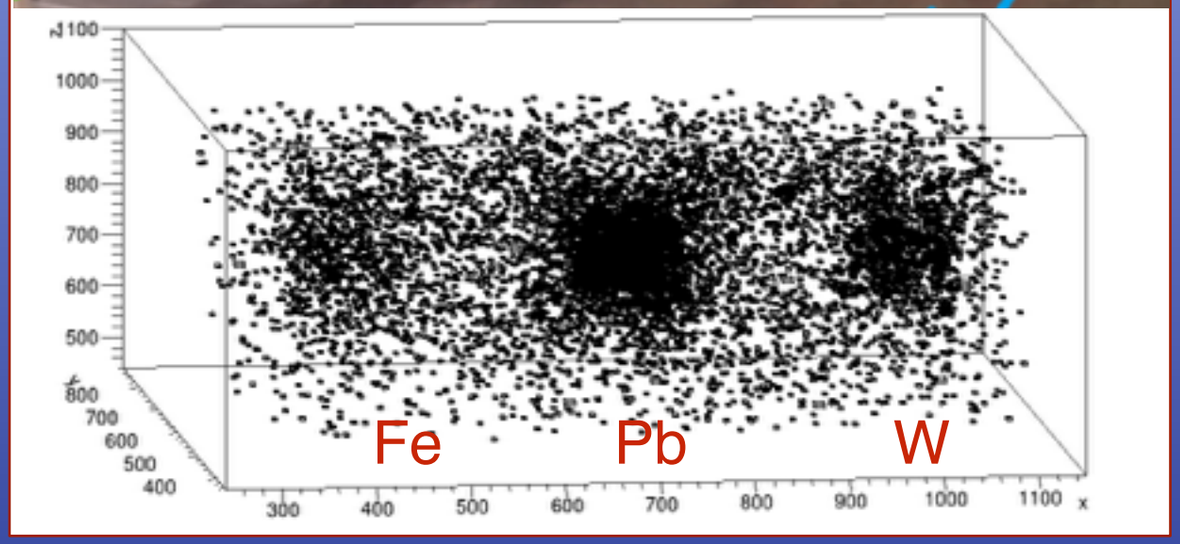
TRAL DABAS

OTHER TRASGOS

Trasgo 2: MuTT (Porriño)

Industrial scanner for containers





Allready taking data in Pol. As Gándaras / Porriño

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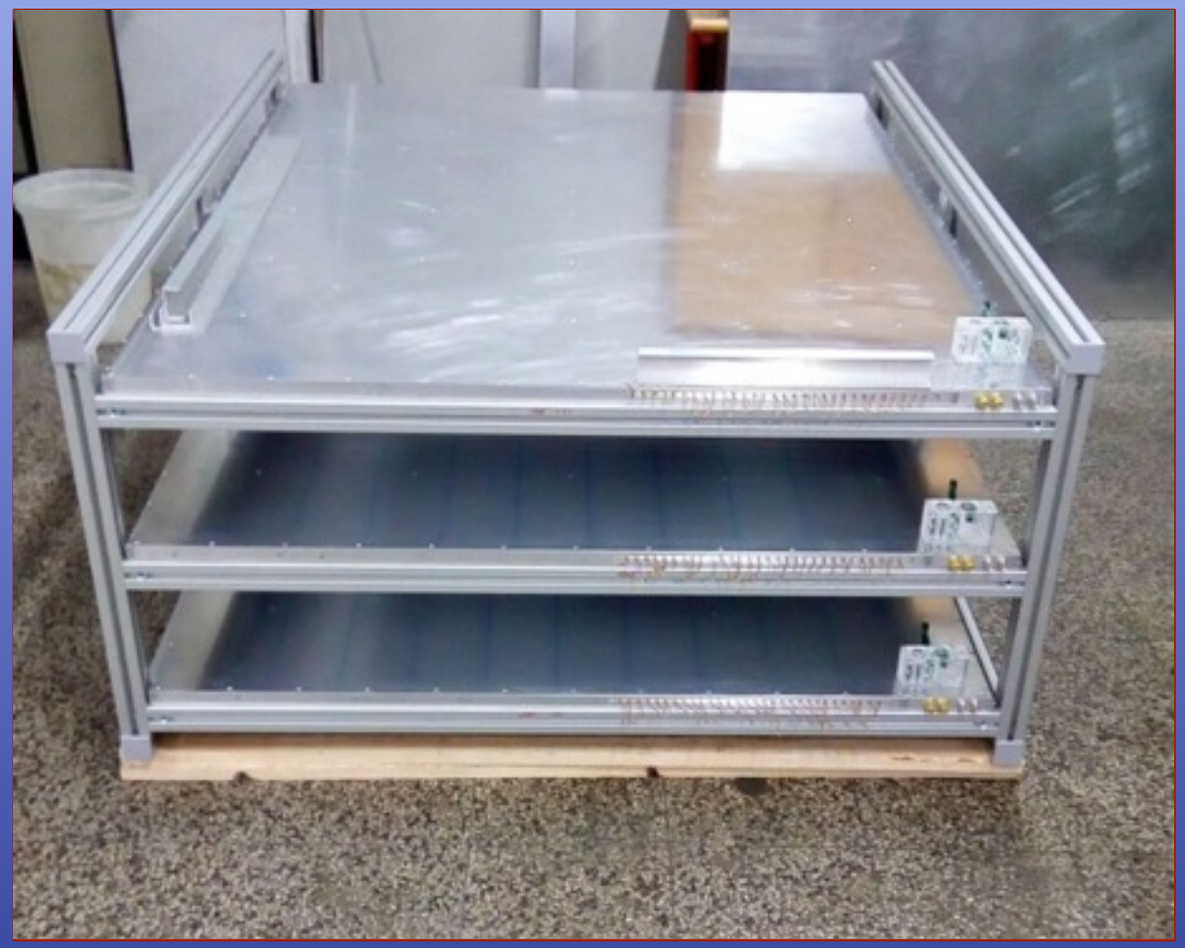
THE TRASGO PROJECT

Trasgo 3: TRISTAN (Spanish Antarctic Base)



To be embarked next November 2018

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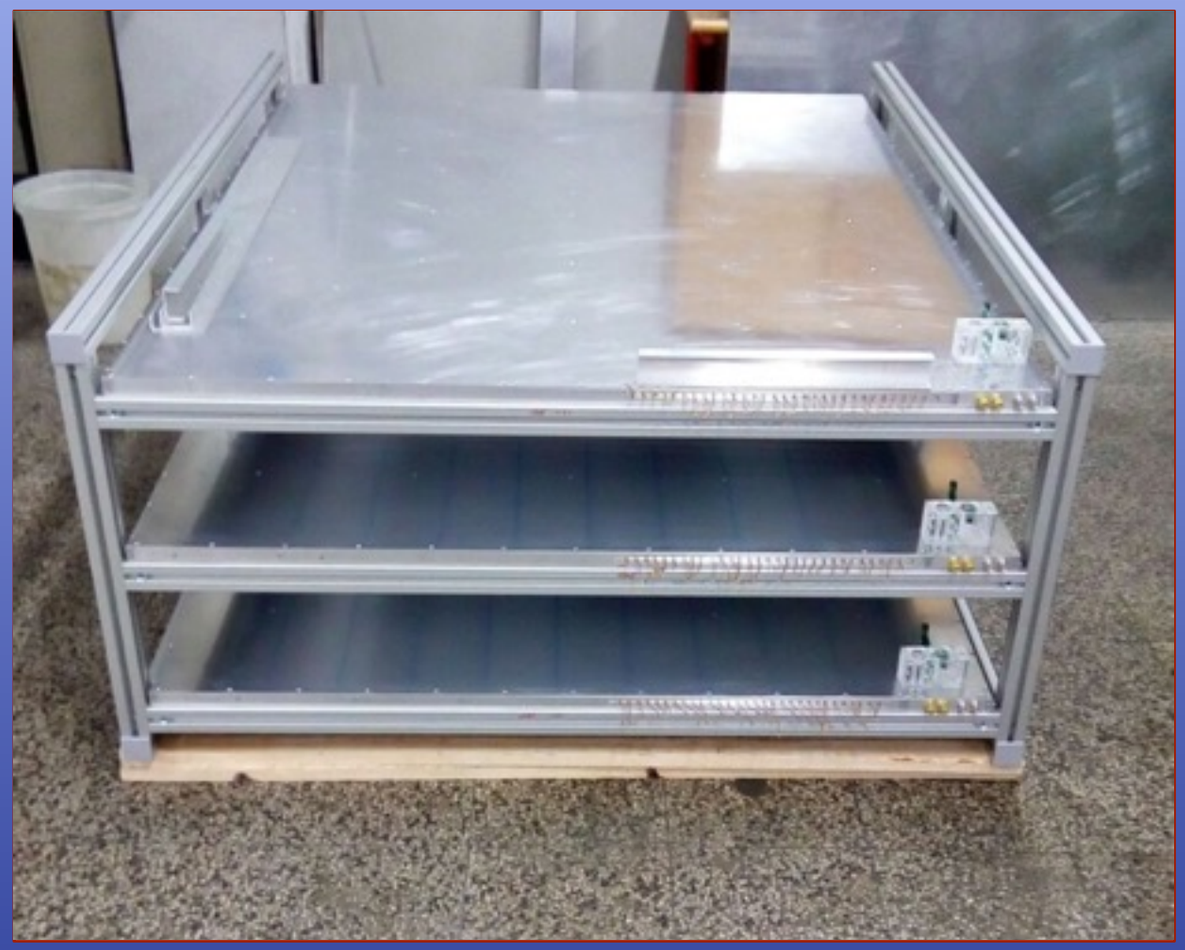
THE TRASGO PROJECT

Trasgo 4: Trasgo for Tunja (Colombia)



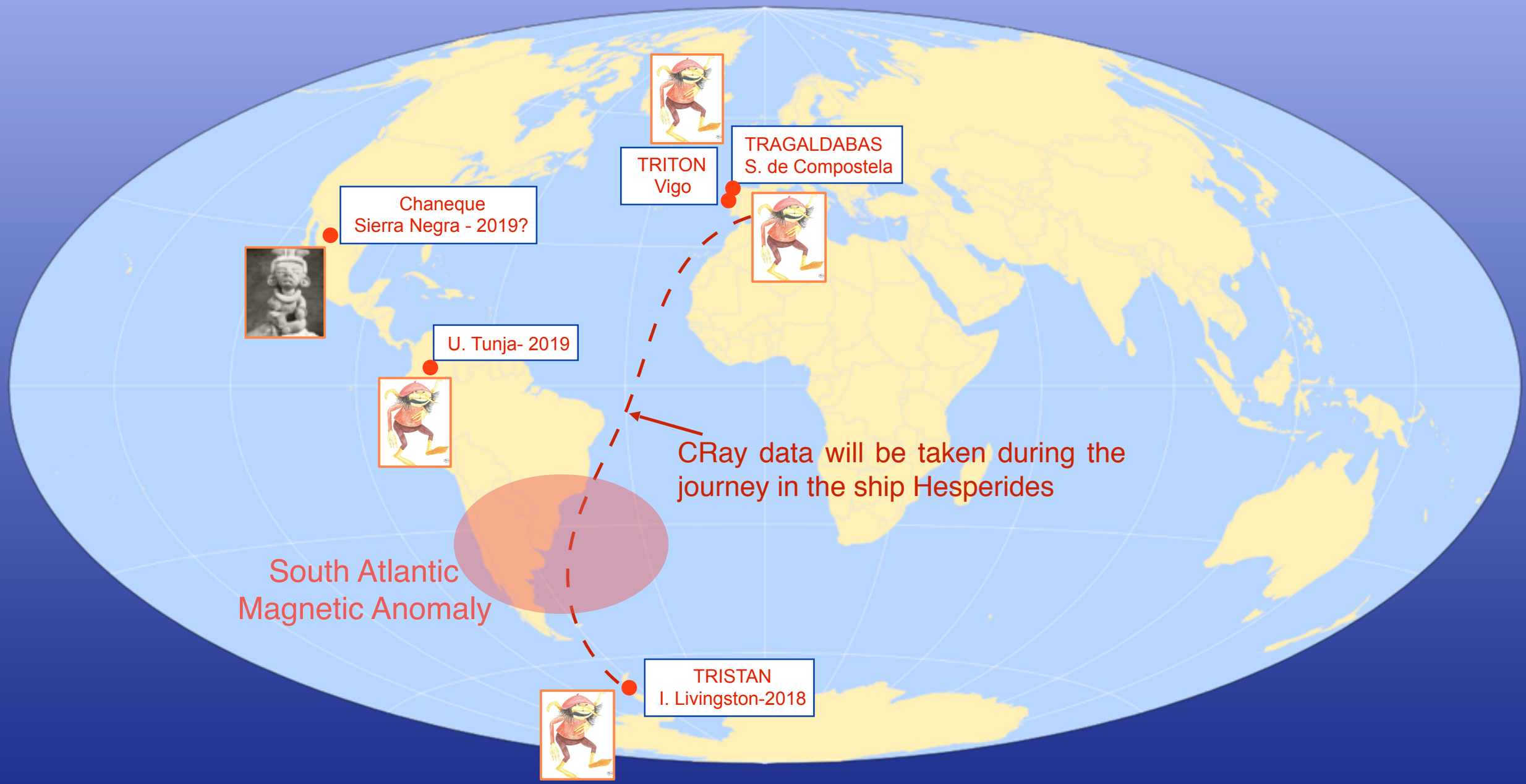
To be installed and commissioned in Sommer 2019

*TRAsGo for the AnaLysis of the nuclear matter Decay, the Atmosphere, the earth B-field And the Solar activity

Summary & Conclusions

SUMMARY and CONCLUSIONS

Towards a world wide TRASGO network?

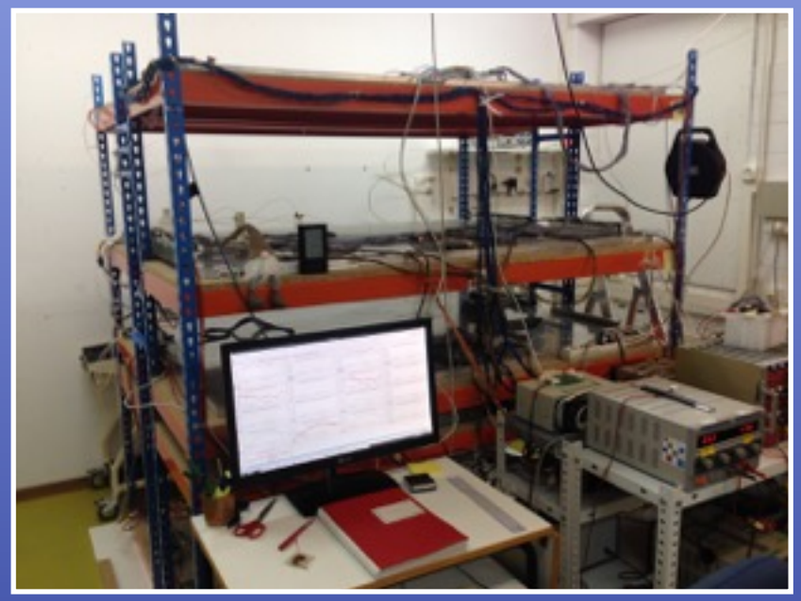


SUMMARY and CONCLUSIONS

- A new family of detectors, Trasgos, for the regular study of cosmic rays has been proposed by the LIP-Coimbra & LabCAF/IGFAE team
- Two Trasgos are now operative and soon other two detectors will be installed in the Antarctica and in the Colombian Andes
- Trasgos may became a NEW STANDARD for the study of cosmic rays all around the world: they are small and affordable and do offer high performances

Trasgos are amazing devices!

Triton (MuTT)



Tragaldabas

Tristan

The end

Thanks!