



MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

Opportunities in Space and Atmospheric Science at INPE

Presented by:

Clezio Marcos De Nardin (PhD)

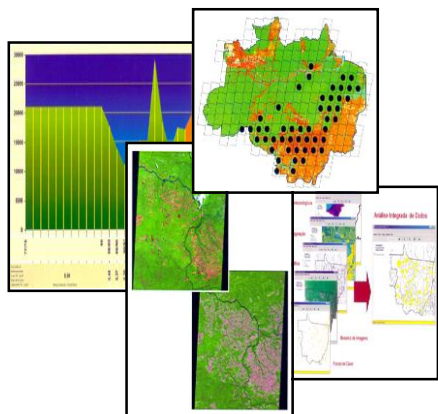
Head of Space and Atmospheric Science

For the occasion of the

54th Session of the Technical and Scientific Subcommittee of COPUOS
held in Vienna, Austria from January 30th to February 11th, 2017.



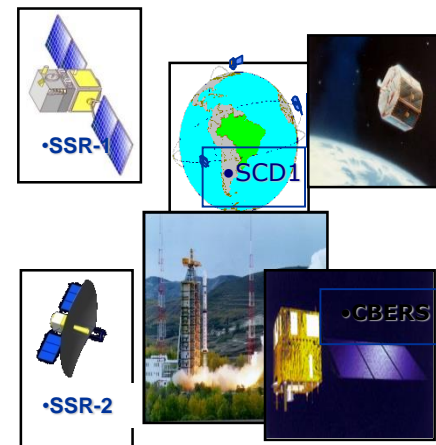
Areas of Activities at INPE



Earth Observation



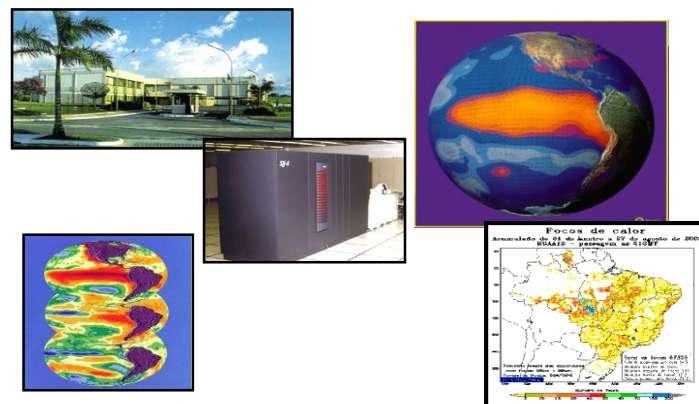
Space Science



Space Technology



Earth System Sciences

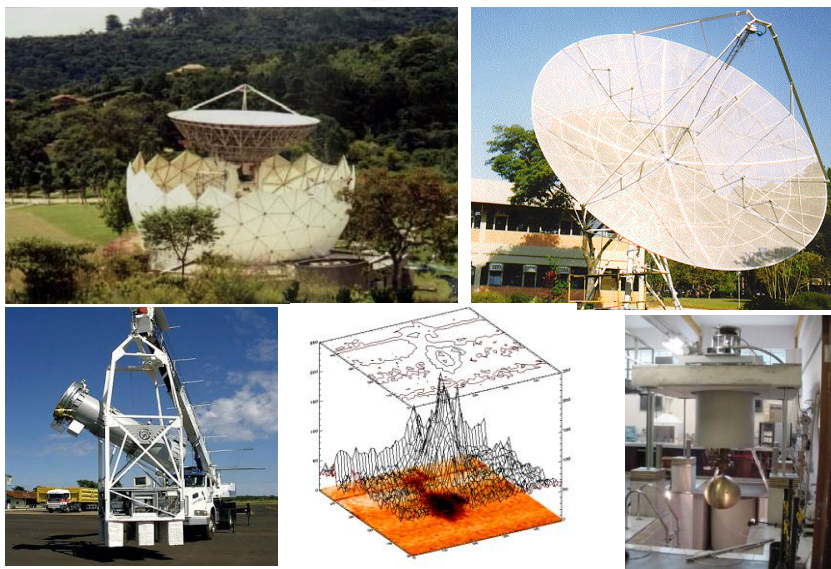


Meteorology and Climate

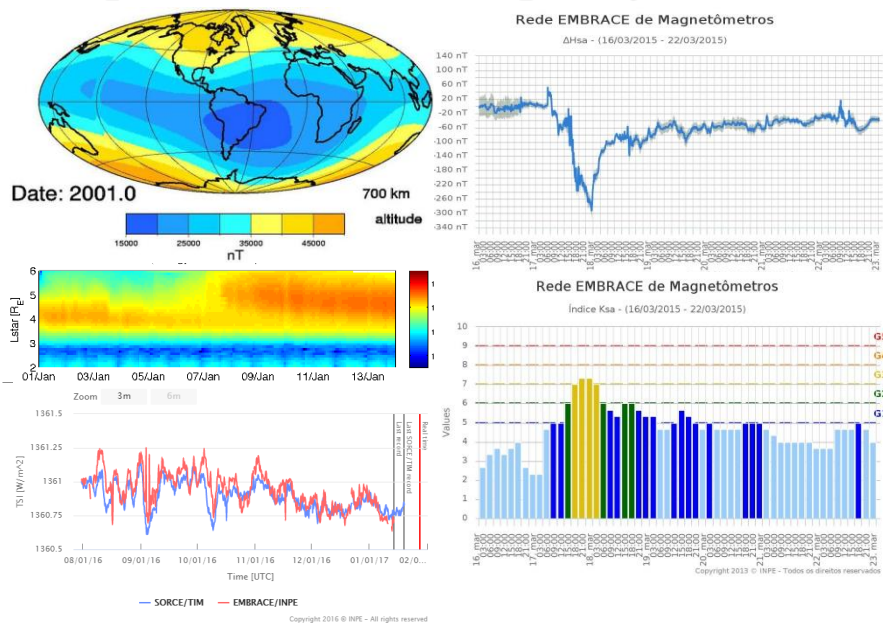


Space and Atmospheric Sciences (CEA)

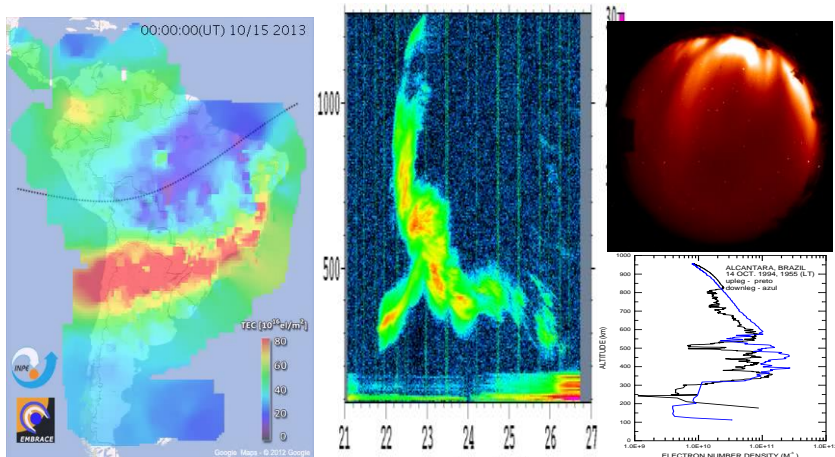
Astrophysics



Space Geophysics



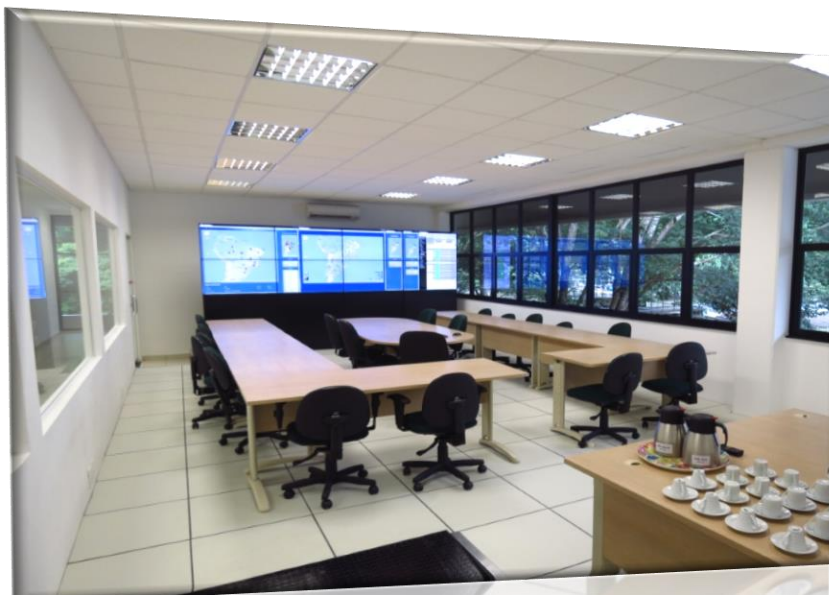
Aeronomy



Balloons Launcher

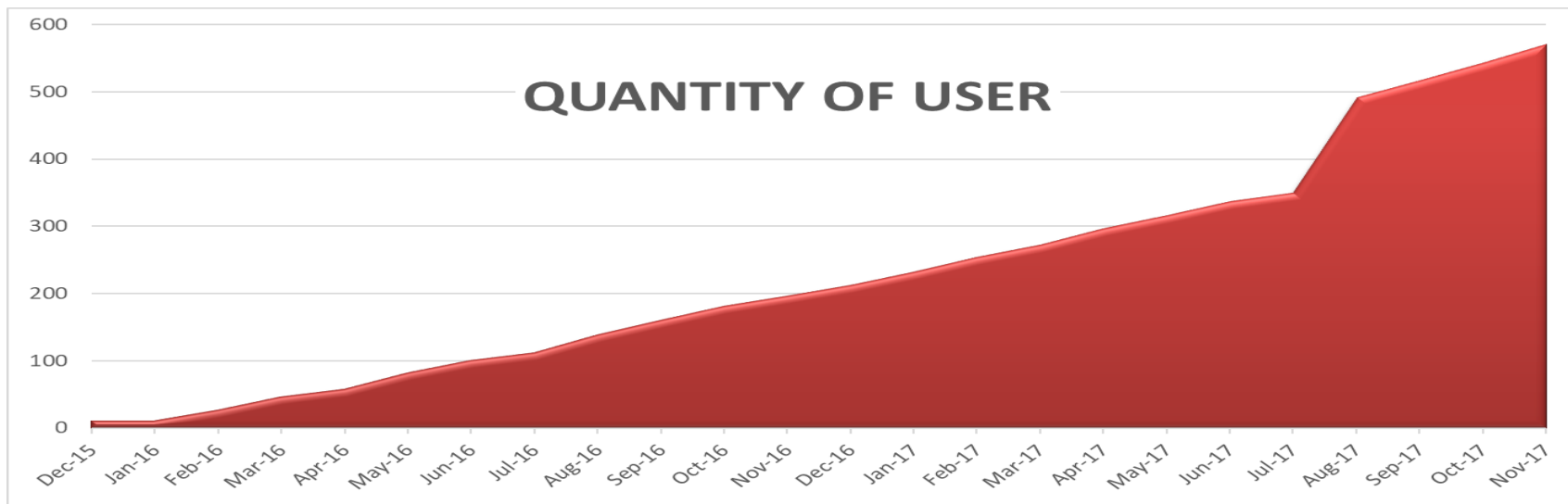
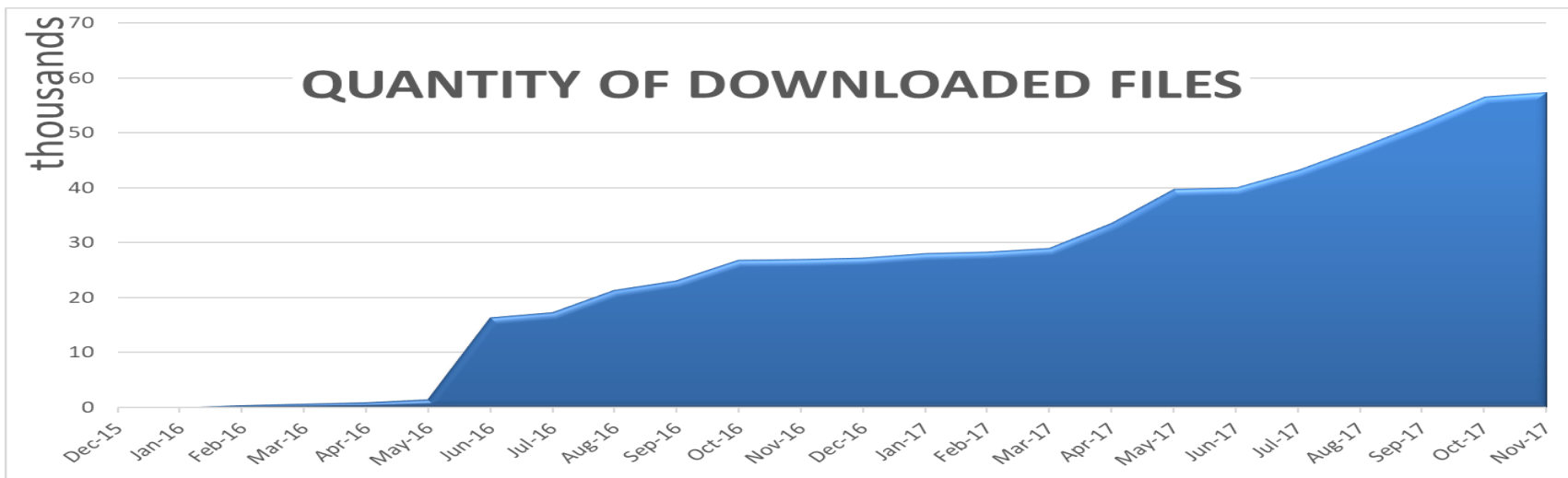


Space Weather Effects





Space Weather Data for **FREE** download





Embrace MagNet with FREE data available

Radio Science

AN AGU JOURNAL

Volume 53 • Issue 3 • March 2018 • Pages 241–394

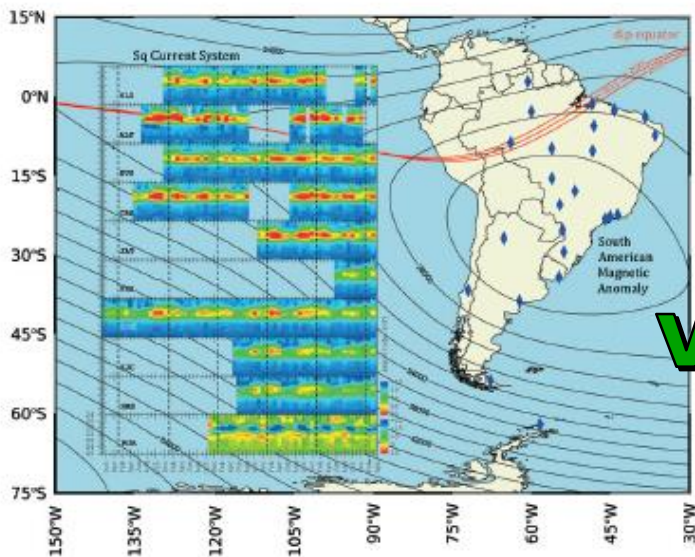


Cover of

Radio Science,

volume 53, issue 3,

March 2018



Radio Science

RESEARCH ARTICLE
01002/2017RS006477

The Embrace Magnetometer Network for South America: Network Description and Its Qualification

C. M. Denardini¹, S. S. Chen¹, L. C. A. Resende¹, J. Moro^{2,3}, A. V. Bilbio¹, P. R. Fagundes⁴, M. A. Gende^{5,6}, M. A. Cabrera^{7,8}, M. J. A. Bolzan⁹, A. L. Padiha¹, N. J. Schuch², J. L. Hormaechea^{1,10}, L. R. Alves¹, P. F. Barbosa Neto^{1,10}, P. A. B. Nogueira¹¹, G. A. S. Picanço¹, and T. O. Bertolotto^{1,12}

¹National Institute for Space Research (INPE), São José dos Campos, São Paulo, Brazil, ²Southern Regional Space Research Center in collaboration with the IACSWCT-UFPA, Santa Maria, Rio Grande do Sul, Brazil, ³State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Science (CAS), Beijing, China, ⁴PPG, Universidade do Vale do Paraíba, São José dos Campos, São Paulo, Brazil, ⁵Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata (UNLP) and CONICET, La Plata, Buenos Aires, Argentina, ⁶Laboratorio de Telecomunicaciones, Departamento de Electricidad, Electrónica y Computación, Facultad de Ciencias Exactas y Tecnología (FACET), Universidad Nacional de Tucumán (UNT), San Miguel de Tucumán, Tucumán, Argentina, ⁷Centro de Investigación sobre Atmósfera Superior y Radiopropagación, Facultad Regional Tucumán, Universidad Tecnológica Nacional (UTN), San Miguel de Tucumán, Tucumán, Argentina, ⁸Departamento de Física, Universidade Federal de Jataí (UFJ), Jataí, Goiás, Brazil, ⁹Estación Astronómica Rio Grande (EAR), Facultad de Ciencias Astronómicas y Geofísicas (FCAG), Universidad Nacional de La Plata (UNLP), Rio Grande, Terre do Fuego, Argentina, ¹⁰Departamento de Engenharia Elétrica, Centro Universitário Salesiano de São Paulo (Unisal—Campus São Joaquim), Lorena, São Paulo, Brazil, ¹¹Federal Institute of Education, Science and Technology of São Paulo, Jacaré, Brazil, ¹²Departamento de Engenharia Elétrica, Universidade de Taubaté (UNITAT), Taubaté, São Paulo, Brazil

Correspondence to:
c.m.denardini@inpe.br

Key Points:
Magnetic measurements in South America ready for space weather
Magnetic station measurement with near-observatory data quality
New real-time data providing proxy for SW and the new K_u magnetic

Supporting Information:
Supporting Information for this article is available at <https://doi.org/10.1002/2017RS006477>

Radio Science

RESEARCH ARTICLE
01002/2017RS006540

The Embrace Magnetometer Network for South America: First Scientific Results

C. M. Denardini¹, S. S. Chen¹, L. C. A. Resende¹, J. Moro^{2,3}, A. V. Bilbio¹, P. R. Fagundes⁴, M. A. Gende^{5,6}, M. A. Cabrera^{7,8}, M. J. A. Bolzan⁹, A. L. Padiha¹, N. J. Schuch², J. L. Hormaechea^{1,10}, L. R. Alves¹, P. F. Barbosa Neto^{1,10}, P. A. B. Nogueira¹¹, G. A. S. Picanço¹, and T. O. Bertolotto^{1,12}

¹National Institute for Space Research (INPE), São José dos Campos, Brazil, ²Southern Regional Space Research Center in collaboration with the IACSWCT-UFPA, Santa Maria, Brazil, ³State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Science, Beijing, China, ⁴Universidade do Vale do Paraíba/PPG, São José dos Campos, Brazil, ⁵Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, La Plata, Argentina, ⁶Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires, Argentina, ⁷Laboratorio de Telecomunicaciones, Departamento de Electricidad, Electrónica y Computación, Facultad de Ciencias Exactas y Tecnología, Universidad Nacional de Tucumán, San Miguel de Tucumán, Argentina, ⁸Centro de Investigación sobre Atmósfera Superior y Radiopropagación, Facultad Regional Tucumán, Universidad Tecnológica Nacional, San Miguel de Tucumán, Argentina, ⁹Departamento de Física, Universidade Federal de Jataí (UFJ), Jataí, Brazil, ¹⁰Estación Astronómica Rio Grande, Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, Rio Grande, Argentina, ¹¹Departamento de Engenharia Elétrica, Centro Universitário Salesiano de São Paulo (Unisal—Campus São Joaquim), Lorena, Brazil, ¹²Federal Institute of Education, Science and Technology of São Paulo, Jacaré, Brazil, ¹³Departamento de Engenharia Elétrica, Universidade de Taubaté, Taubaté, Brazil

Key Points:
First scientific results Radio Science

Supporting Information:
Supporting Information for this article is available at <https://doi.org/10.1002/2017RS006540>

AGU100

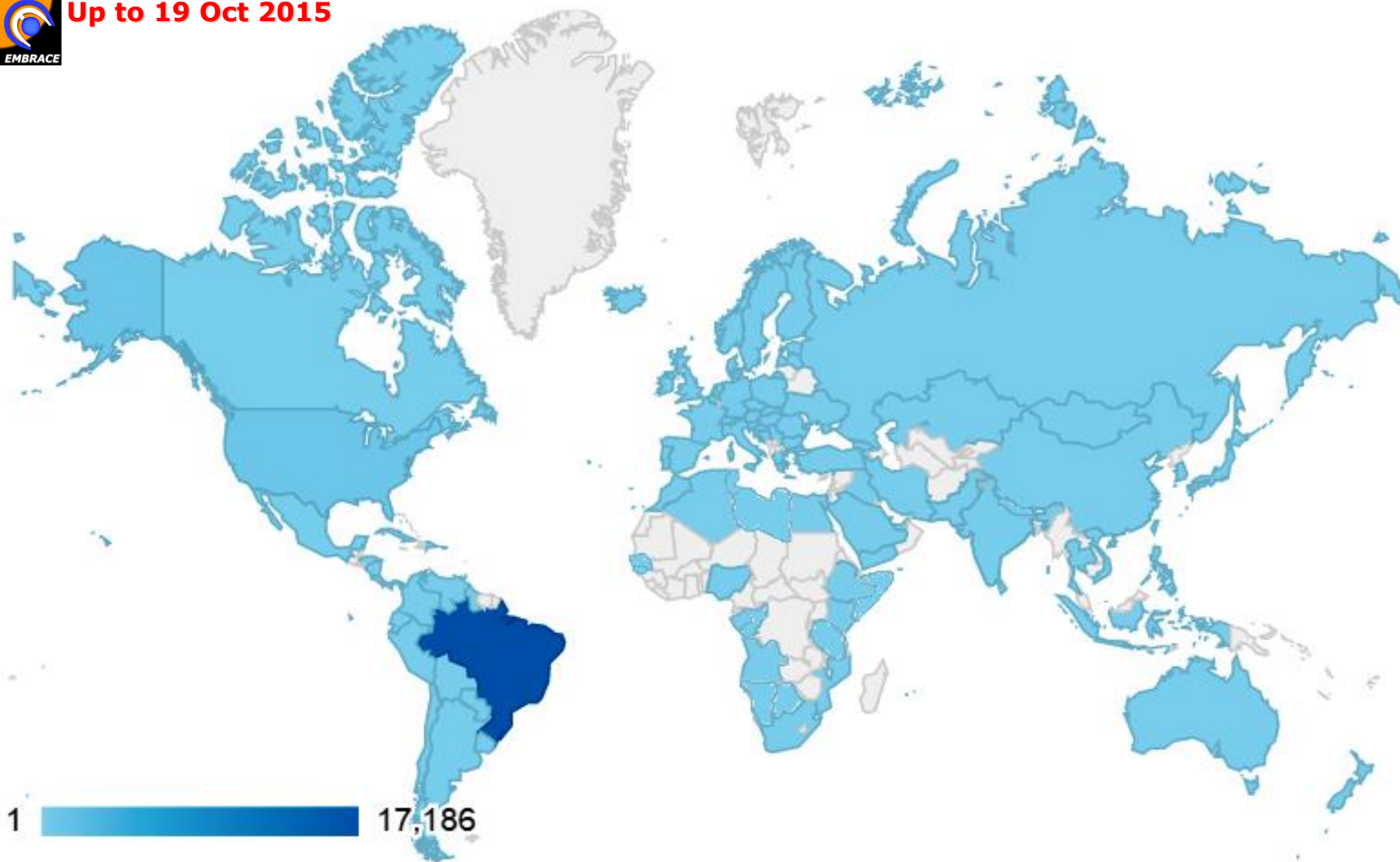
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Space Weather Information - **FREE Access**



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Editors' Choice



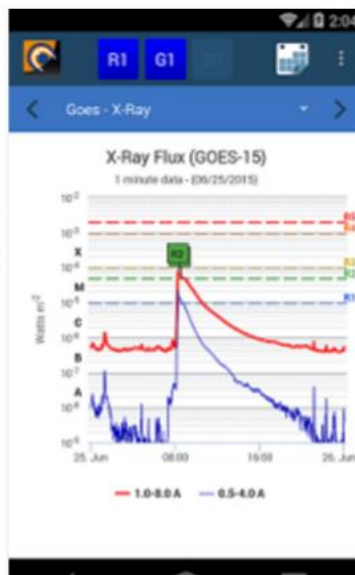
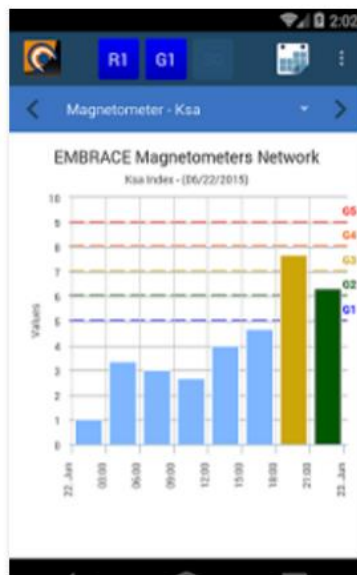
Embrace Mobile

Brazilian Study and Monitoring of Space Weather Weather ★★★★★ 5

L

This app is compatible with all of your devices.

Installed



Bulletin

Magnetometer - Ksa

Goes - X-Ray

Bulletin

Alert - G Scale

Alert - R Scale

News

There exist no region returning to the visible disk of the Sun. Last 24 hours recorded low solar activity. In accordance with the LASCO and STEREO experiments, at the moment this bulletin is being posted, there exist no CME Earth directed. The recurrent transequatorial coronal hole, CH 682, is due to be Earth directed on 12th-13th August. By now, and for the next 48 hours, both the



Space Weather Science Towards Improved Forecasting



COSPAR Capacity Building Workshop
September 17-28 2018



- COSPAR Capacity Building: 17-26 September 2018
 - 30 students (+ de 140 applicants)
 - 11 International Speakers





Civil Aviation Organization Training

Meeting in Panama with all Countries of the Americas were EMBRACE served as advisory agent

Acknowledgement letter and invitation for training of the ICAO authorities of Americas by INPE in 2019



International Civil Aviation Organization

Organisation de l'aviation civile internationale

Organización de Aviación Civil Internacional

Международная организация гражданской авиации

منظمة الطيران المدني الدولي

國際民用航空組織

LN/3.24.1 - SA5380

Lima, 30 de julio de 2018

Sr. Ricardo Magnus Osório Galvão
Director
Instituto Nacional de Pesquisas Espaciais (INPE)
Sao Paulo, Brasil



Asunto: **RLA/06/901 – Asistencia para la implantación de un Sistema Regional de ATM considerando el concepto operacional de STM y el soporte de tecnología CNS correspondiente**
Agradecimiento por los servicios del señor Joaquim E. R. Costa durante el Seminario en Meteorología Espacial y Modelo de intercambios de Mensajes Meteorológicos de la OACI (IWXXXM) - Ciudad de Panamá, Panamá, 16 al 20 de julio 2018

Distinguido señor:

Tengo el honor de dirigirme a usted para expresarle nuestro agradecimiento por el valioso apoyo recibido de su Organismo, que permitió al señor **Joaquim E.R. Costa**, Gerente General del Departamento de Meteorología Espacial, cumplir con éxito su exposición durante el Seminario en Meteorología Espacial y Modelo de intercambios de Mensajes Meteorológicos de la OACI (IWXXXM), llevado a cabo en Ciudad de Panamá, Panamá, del 16 al 20 de julio de 2018.

Con el concurso profesional del señor Costa, fue posible cumplir con las expectativas del Seminario, motivo por el cual le ruego se sirva expresarle nuestro reconocimiento por su valiosa colaboración.

Asimismo, aprovecho la oportunidad para expresarle nuestro interés en explorar la posibilidad de realizar en el futuro (finales 2019/2020), un entrenamiento práctico en Meteorología Espacial en sus instalaciones, contando con la aprobación previa de los Estados considerando que los resultados de ese taller serían de beneficio para toda la Región.

Mucho apreciaré contar con su favorable acogida a lo solicitado y recibir su pronta respuesta para iniciar los arreglos administrativos correspondientes.

Le ruego acepte, distinguido señor, los sentimientos de mi mayor consideración y estima.

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Fabio Faizi Rahnemay Rabbani
Director Regional
Oficina Sudamericana de la OACI
Lima



MINISTÉRIO DA
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CEP 12227-010 - Bairro Jardim da Granja
São José dos Campos - SP, (12) 3208-6035

Ofício nº 1860/2018/SEI-INPE

Sr. Fabio Faizi Rahnemay Rabbani
Director
Oficina Sudamericana de la OACI
Lima

Señor Director,

Reciba de nuestra parte un cordial saludo y la ratificación de nuestra satisfacción en colaborar con la OACI.

Con mucho gusto concordamos con su propuesta de realizar un entrenamiento práctico en Meteorología Espacial utilizando la infraestructura disponible en el Proyecto EMBRACE del INPE.

Encargamos el Dr. Joaquim Costa de las tratativas administrativas necesarias, por parte de INPE.

Agradecemos de antemano su colaboración, renovamos nuestros protestos de estima y consideración, Atentamente

Ricardo Galvão

C/C: Dr. Joaquim Costa



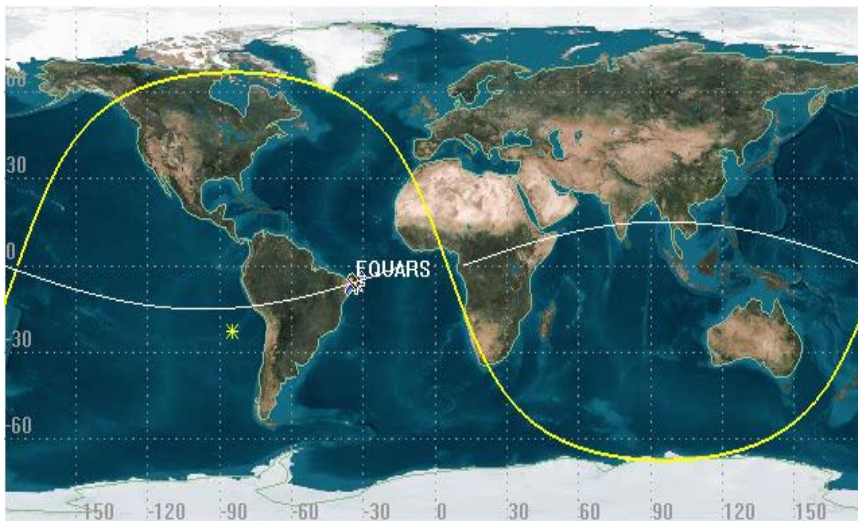
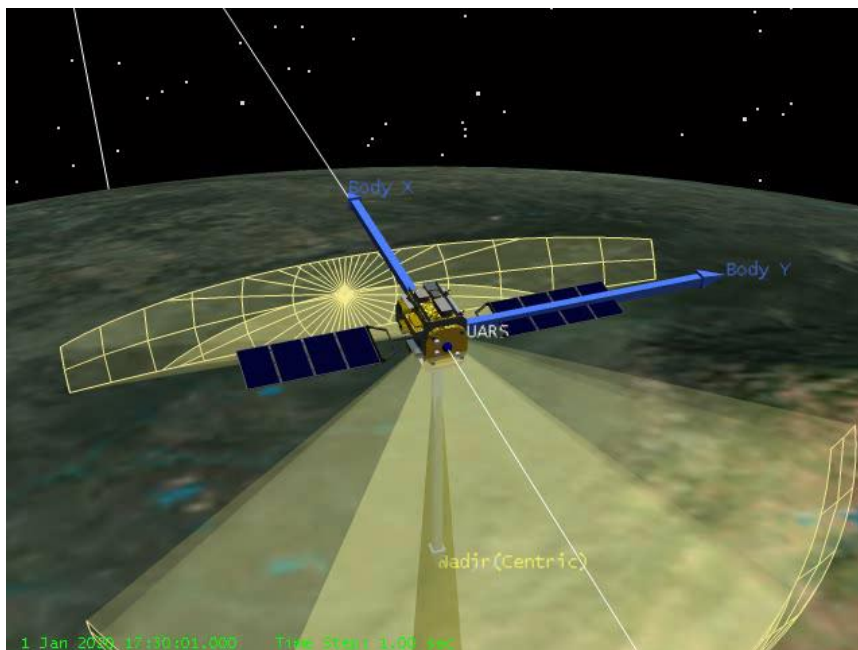
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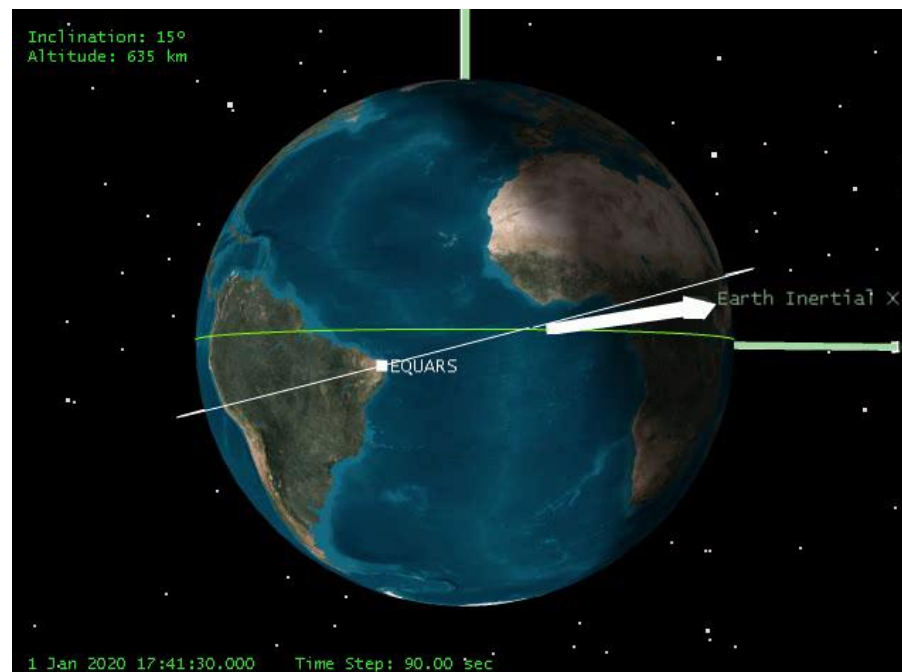
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EQUARS Mission – Status: Fase A



Instrumento	Faixa de altitude desejada (km)	Faixa de altitude aceitável (km)	Faixa de latitude de interesse (graus)
GROM	800	600 a 800	-20º a +20º
GLOW	700 a 800	600 a 800	-15º a +15º
IONEX	400 a 650	300 a 700	-15º a +15º
ELISA	700	600 a 800	-16º a +16º
APEX	650 a 750	-	-15º a +15º

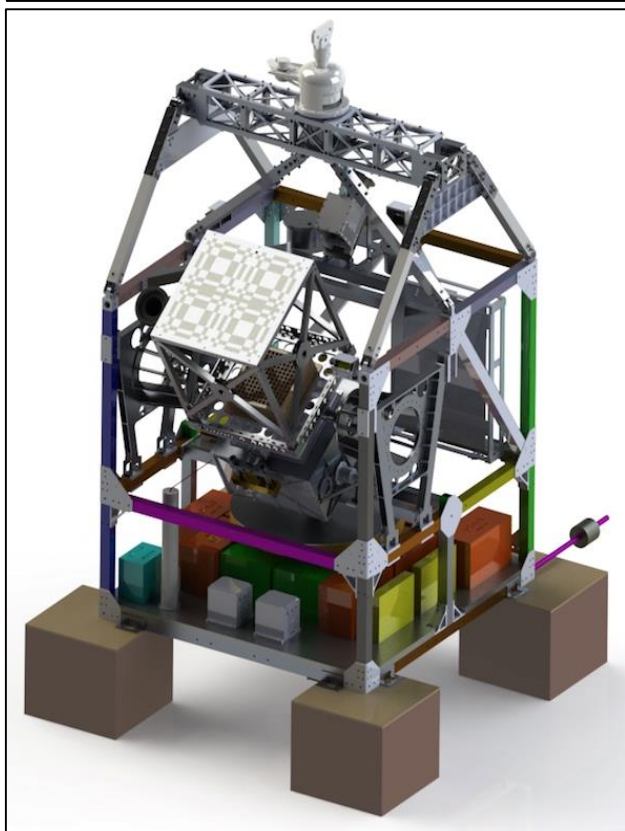


Inclination = 15°
3 axis Control

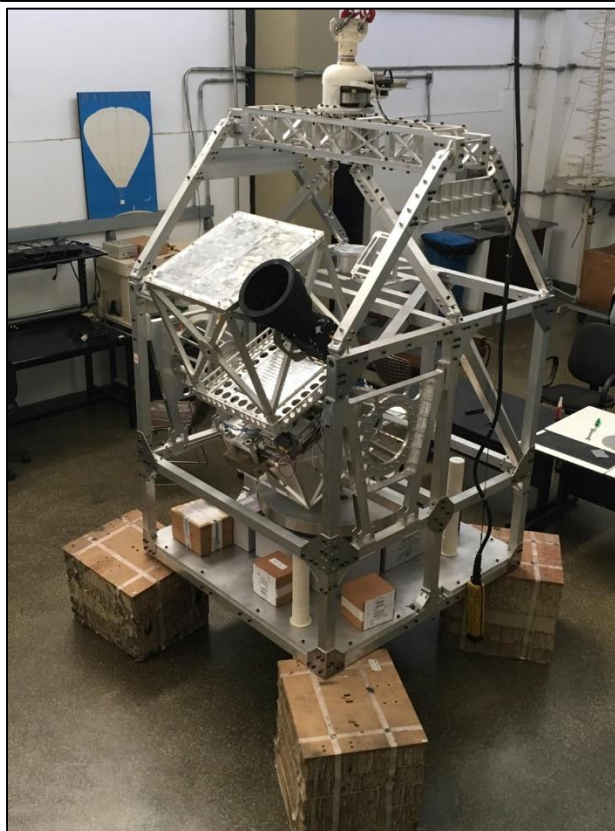
Altitude = 635km
Pointing to Nadir

Mirax Mission – Finalizing Tests and Concept

Concept



Prototype



1. Testing various MIRAX subsystems in (quasi) spatial environment
2. Develop CZT detector technology and data acquisition systems
3. Testing an imager system and a new attitude control system
4. Measure atmospheric X radiation in the SAMA region

COMP **SIS** ...

Finep
INOVAÇÃO E PESQUISA

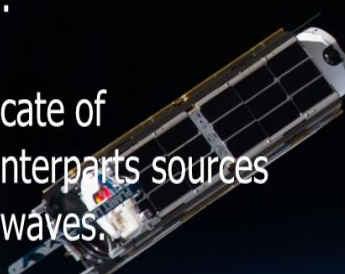
protoMIRAX

CubeSats Currently Under Development

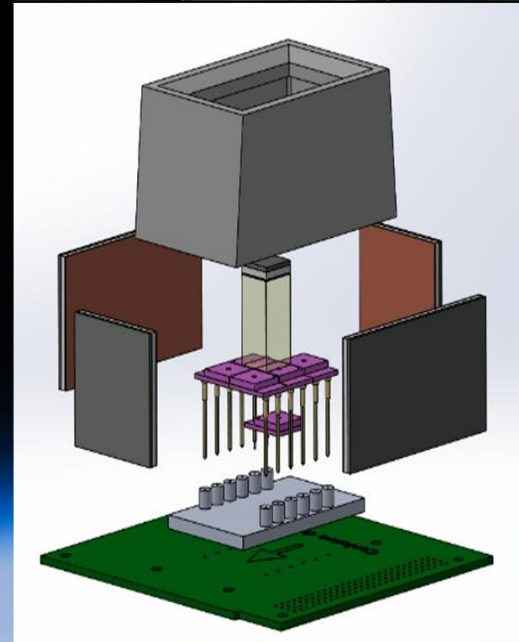
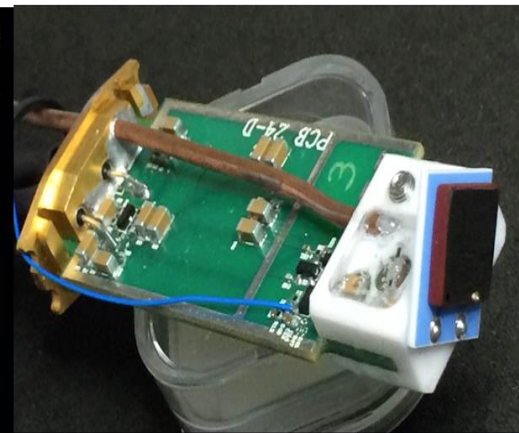
CubeSats LECX

Payload of the nanosat CRON-1 (2U)
Projeto PIPE FAPESP

1. It can detect one cosmic explosion per month and locate it within few degrees of precision.
2. It can be used for locating electromagnetic counterparts sources due to gravitational waves.



4 CZT detectors
(tested in the protoMIRAX)

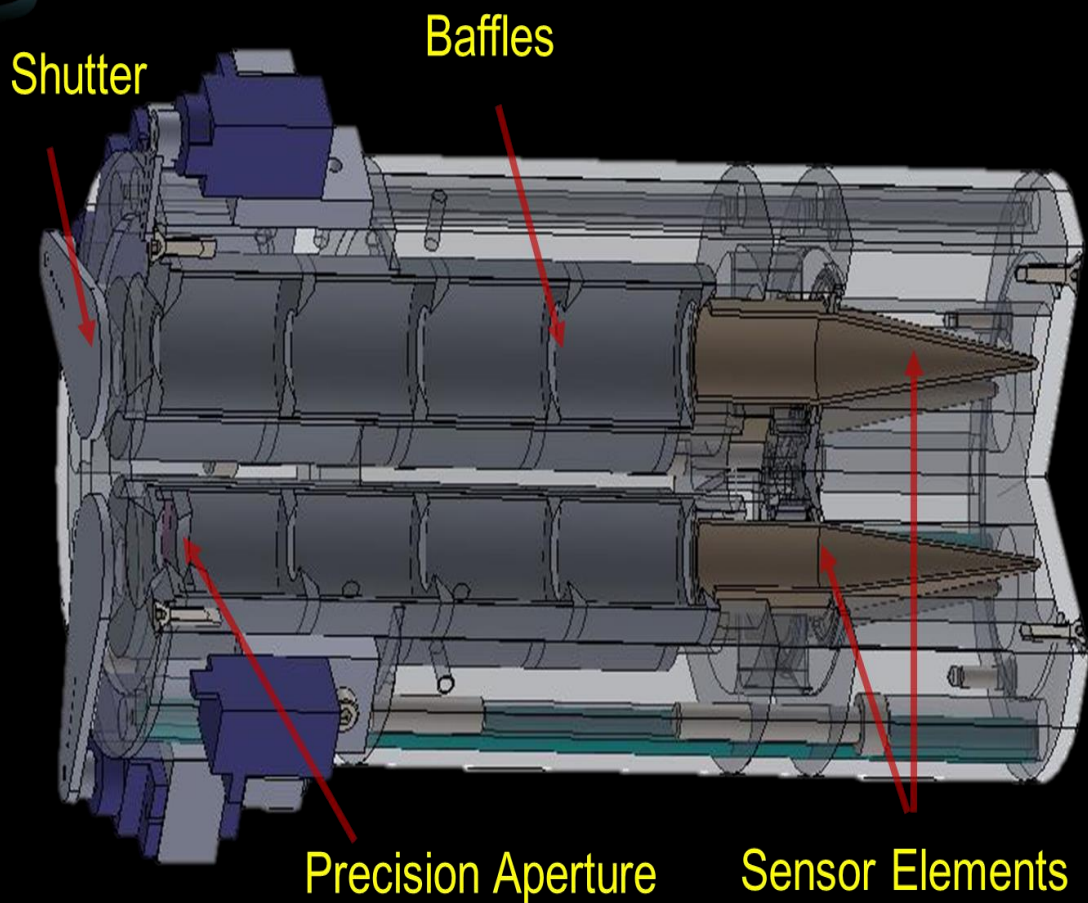
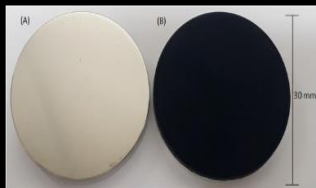
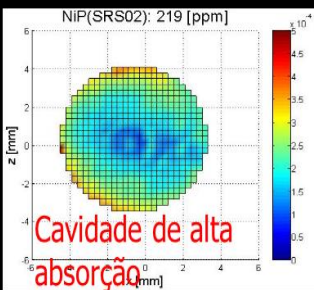
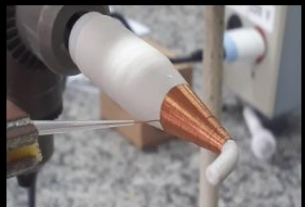
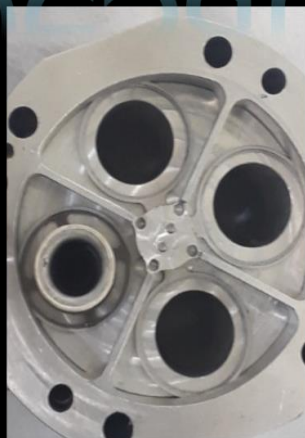
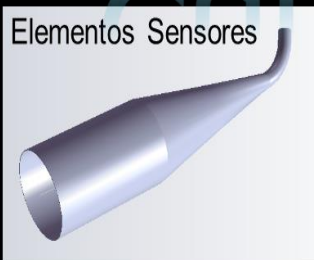


Exploded Model of the LECX

CubeSats Currently Under Development

CubeSats

Observation of the variability of total solar irradiance
 Instrument: Absolute Radiometer
 Approach: Electrical Replacement Radiometer

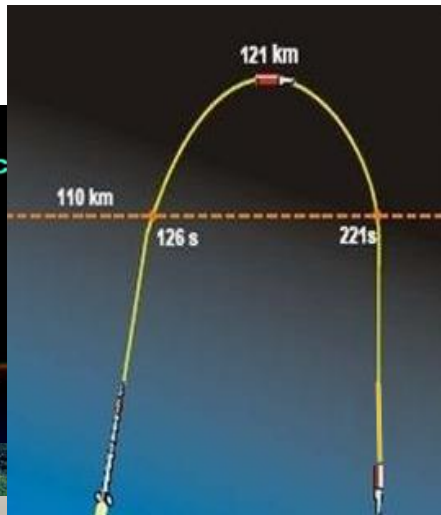
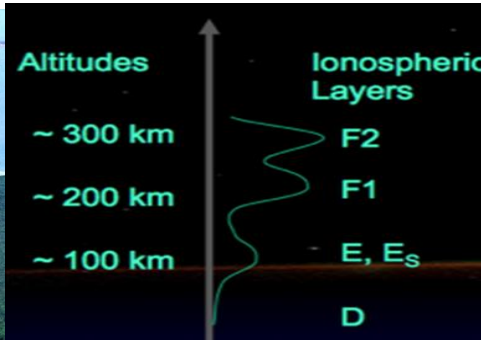


Micro satellites – Electronic Development

Langmuir Probe onboard the VS-30 sounding rocket for ionospheric plasma studies



Validation of the electronic of the Langmuir probe for CubeSat experiments



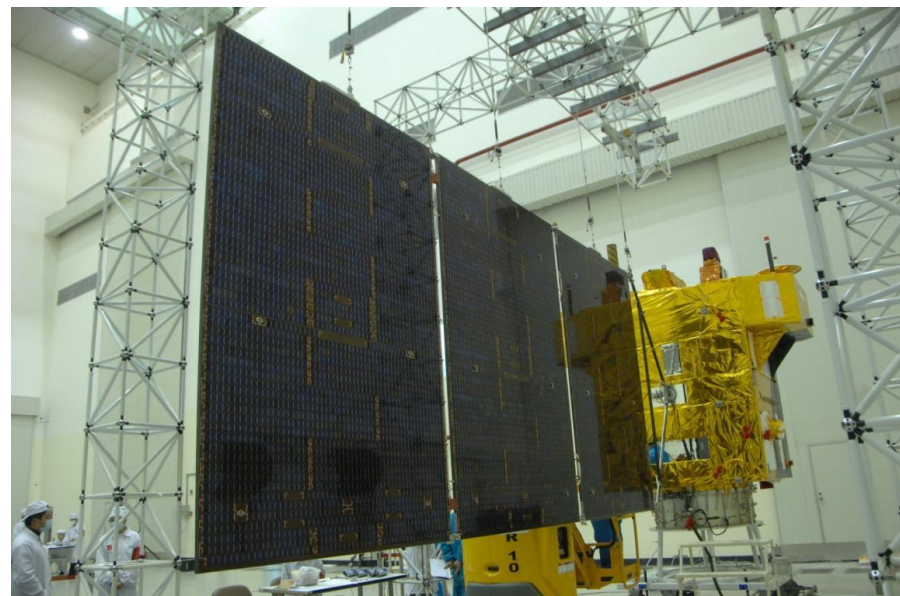


Integration and tests laboratory - LIT





Integration and tests laboratory - LIT





Ground Systems

C u i a b a S t a t i o n



A l c a n t a r a S t a t i o n



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GOES-15

SCD-2
COSMIC-1/2

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