



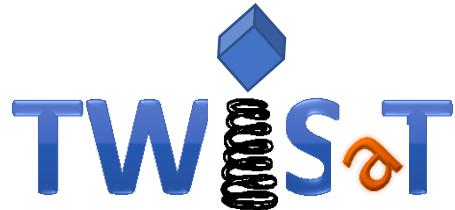
AMBER the French plasma monitor onboard JASON3

First Flight Results

Denis Payan CNES

Jean André Sauvaud IRAP

TRACKING WEAK INRUSH SIGNALS AND TRANSIENTS



CNES/ONERA Idea

- Masse < 1 kg
- Conso < 1.5 W
- Volume < 1 L
- 1L/1,5W/1kg based on the motherboard of a nanosat + wires over the internal harness collecting coupled current on the harness after ESD.
- By measuring transients coming from the solar array, we can register how long is the discharge on the panel (how many sections are involved).
- And the point is that we don't go on the solar panel which is already qualified. The main point is that this experiment is a non-intrusive experiment because it's without any contact (except some connection with structure).

AMBER The French plasma monitor aboard JASON3

Denis Payan, Gabriel Liabeuf, Eric Lorfèvre (CARMEN3), and
many technical support – **CNES**

Jean-André Sauvaud, Claude Aoustin, Benoît Lavraud, Henry
Claude Seran, Andreï Federov, Eric Le-Comte, Jean Rouzaud,
Jean-Louis Médale – **IRAP (FR)**

Gabriel Liabeuf, Yohann Ballot, Anita Bonnet, Philippe
Bourdoux – **EREMS (FR)**

Emmanuel Rodriguez, Olivier Carrion, Guy Peyre, Victor Pires,
Didier Espeilhac, Dominique Bruno, **COMAT (FR)**

Virginie Inguimbert, Gaël Murat, Didier Lazaro, Jean-Charles
Mateo-Velez, Didier Falguère, Daniel Boscher, **ONERA**

JASON 3 Team:

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 EUMETSAT



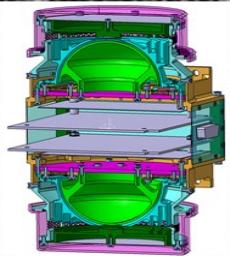
 JPL



 ThalesAlenia
Space
A Thales / Finmeccanica Company

 EREMS

 comat
GROUPE AGORA INDUSTRIES





Les anomalies en vol sur toutes les orbites

Les arcs sur la chaîne de puissance d'un satellite

GEO

Temposat 6 et Panamsat 7 (30% de perte de puissance en 3 jours)

Nig Com Sat-1 pertes de GS en avril et 11 Nov. 2008

TAS : 10 pertes de sections en 2015

AIRBUS : Pertes aile complète correction sur satellite en cours d'intégration à Intespace

Anomalie de charge interne US reportée en colloque à très faible flux

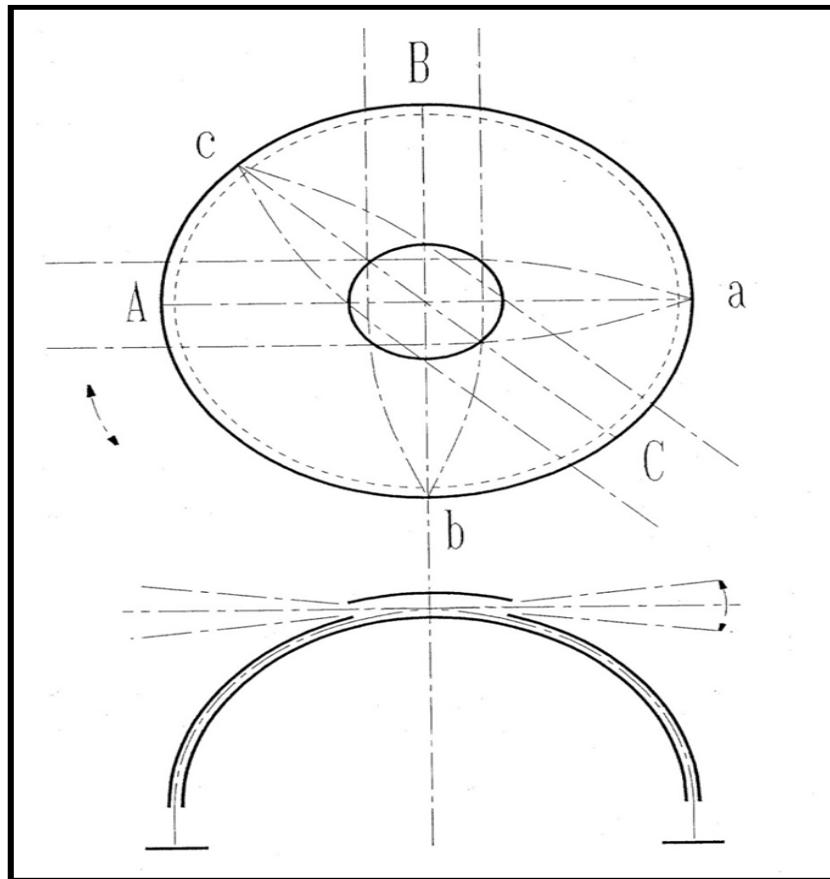
PEO héliosynchone : ADEOS 2 pertes du GS le 23 Octobre 2003

Anomalie « Cheveux d'ange » MEGS TAS 2003



Objectives

- Low energy data no more available (LANL data, above 40keV classified ITAR in 2008)
- The Needs:
 - ◆ Follow particles in the magnetosphere
 - ◆ Knowledge of the incoming particles fluxes on the spacecraft (thanks to the electron head) and its response to this fluxes: its absolute voltage (thanks to the ion head)
- Usefull to know if the specified EMC rules are well adapted to the orbit. The objective is to prevent from over specifications
- Usefull to know the voltage and electrostatic situation in case of anomaly
- Usefull to know the magnetosphere and interaction with low energy plasma
- Sharing data with scientists (IRAP, Europe)



TOP HAT Electrostatic analyser :
2 Biased Half-Sphere (High Voltage proportional to particles energy)
Collimator
Entrance selection Grid

AMBER In heritage: IRAP Radiation Monitors

GIOTTO : ELECTRONS

INTERBALL : ELECTRONS ET IONS

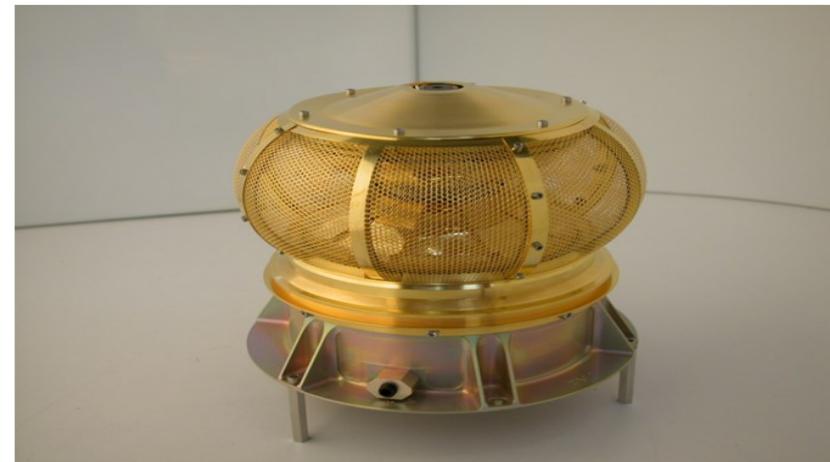
BEPICOLOMBO,

STEREO : ELECTRONS

CLUSTER : IONS



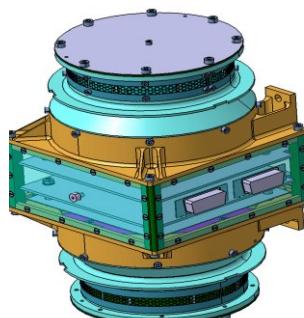
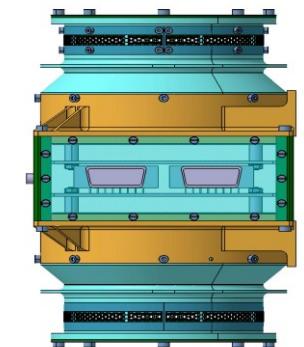
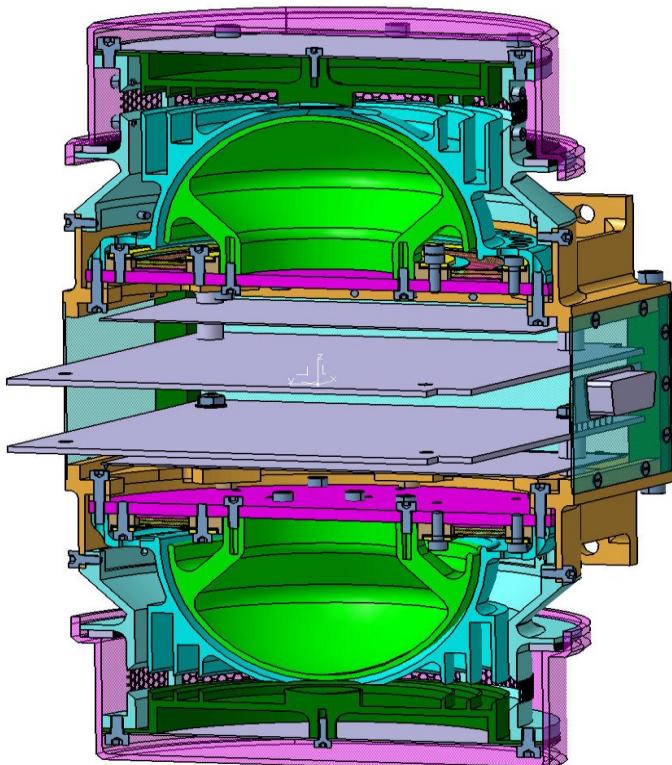
**Ions Spectrometer
HIA/CLUSTER**



**Electron Spectrometer
SWEA/STEREO**

AMBER sensor

Active Monitor Box of Electrostatic Risk



Capteur AMBRE

Appareil de Mesure à Bord du Risque Electrostatique

Angle of visibility 175° /12°

Electrons and Ions measurement

Flux from some pA/cm² to some nA/cm². Energy from 10eV up to 30keV

One measurement every 500ms

Consumption <2W

Weight 2.3kg

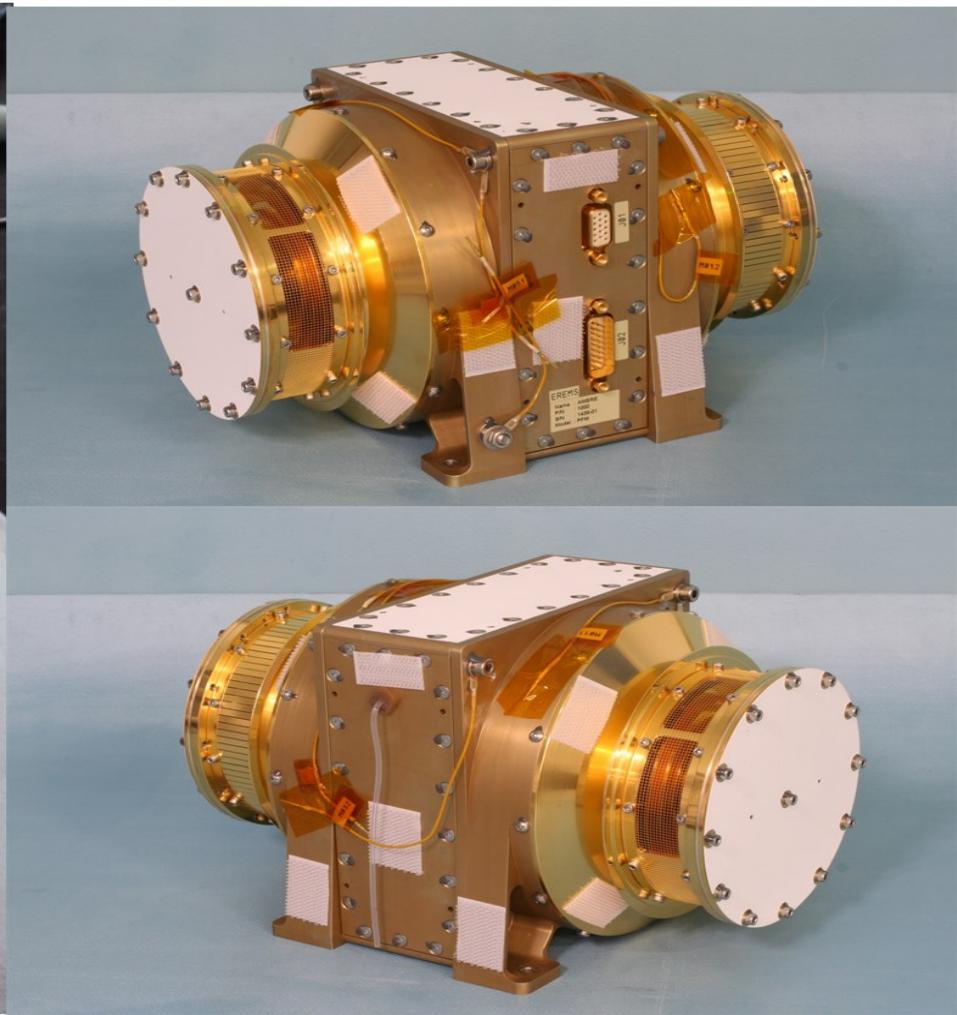
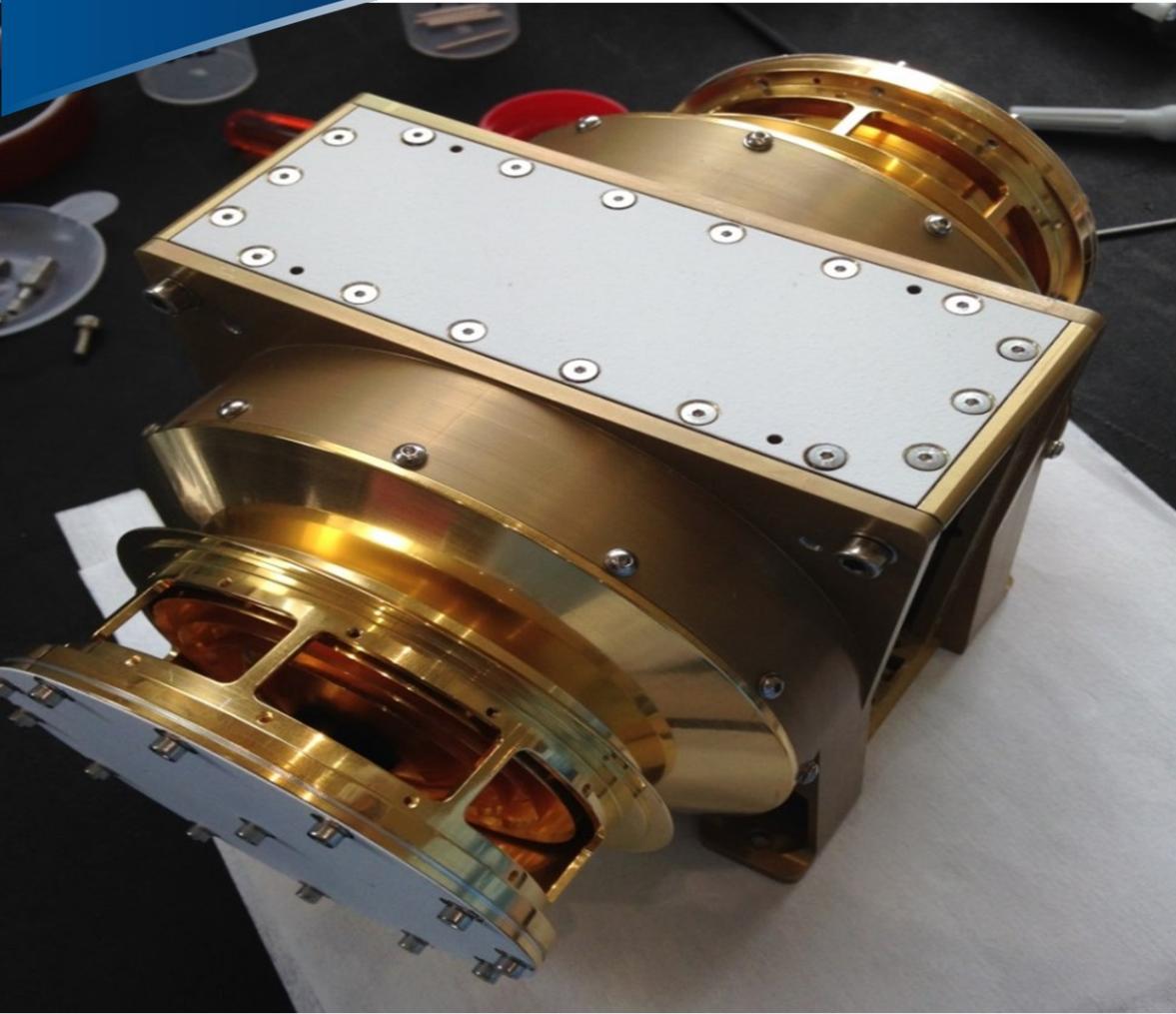
AMBRE : Moniteur de plasma chargeant sur JASON3 PNST publication

Le détecteur de particules chargées AMBRE placé à bord du satellite **JASON-3** orbitant à 1336 km d'altitude a été construit dans l'industrie (EREEMS COMAT PHOTONIS) sous maîtrise d'ouvrage du CNES, en collaboration avec l'IRAP.

Il mesure depuis février 2016 les électrons et des ions de **10 eV à 27 keV** le long de l'orbite du satellite.

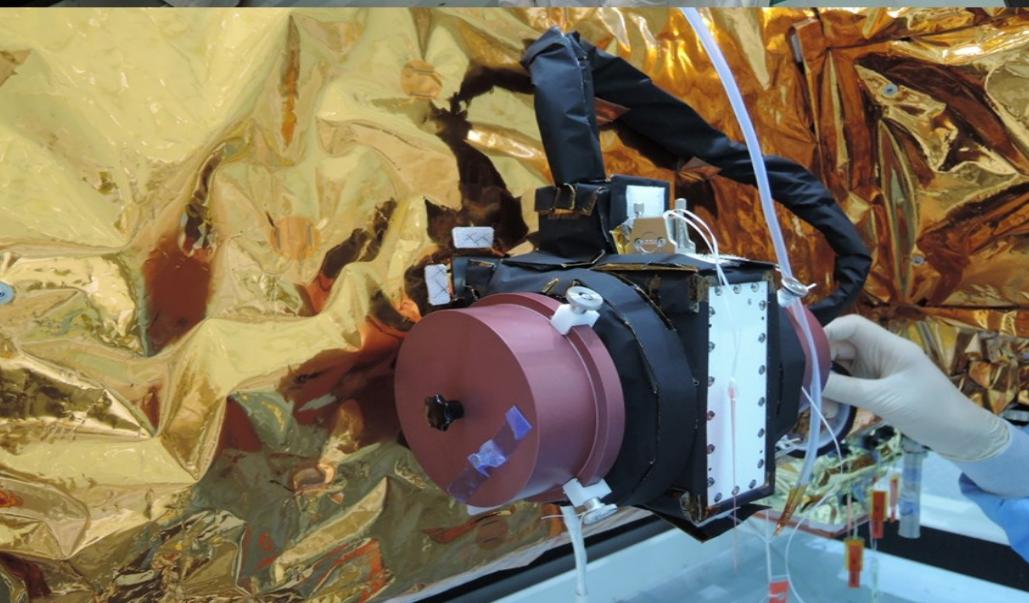
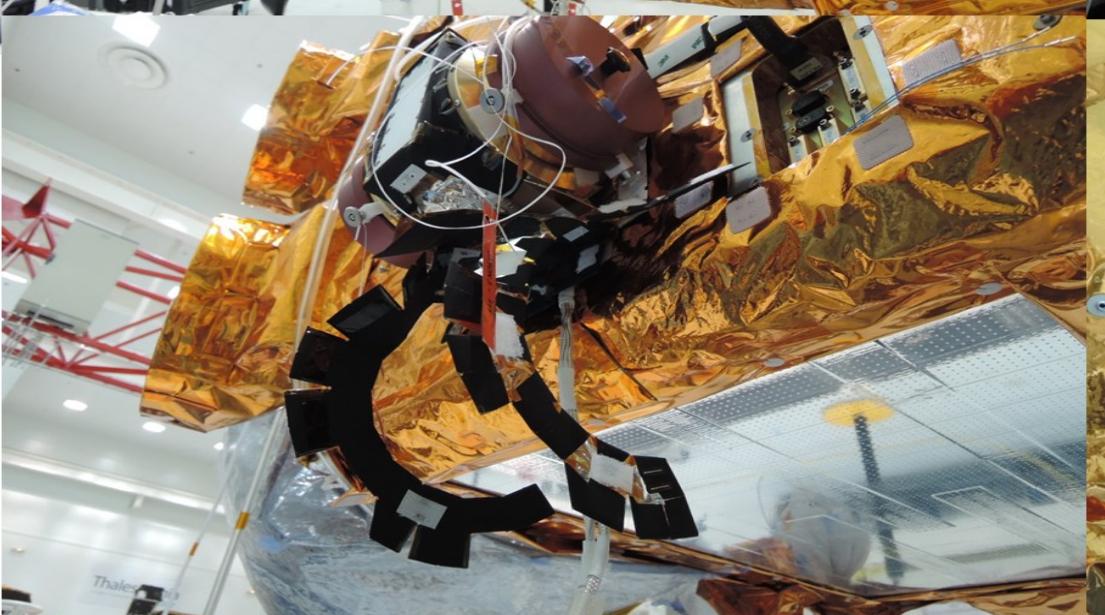
Ce détecteur permet la mesure des particules aurorales aux hautes latitudes et celle de **la charge du satellite** qui se développe lorsqu'il est situé dans l'ombre/pénombre de la Terre et est irradié par des flux intenses d'électrons d'une dizaine de keV

Enregistrement à -1000Volts



cnes

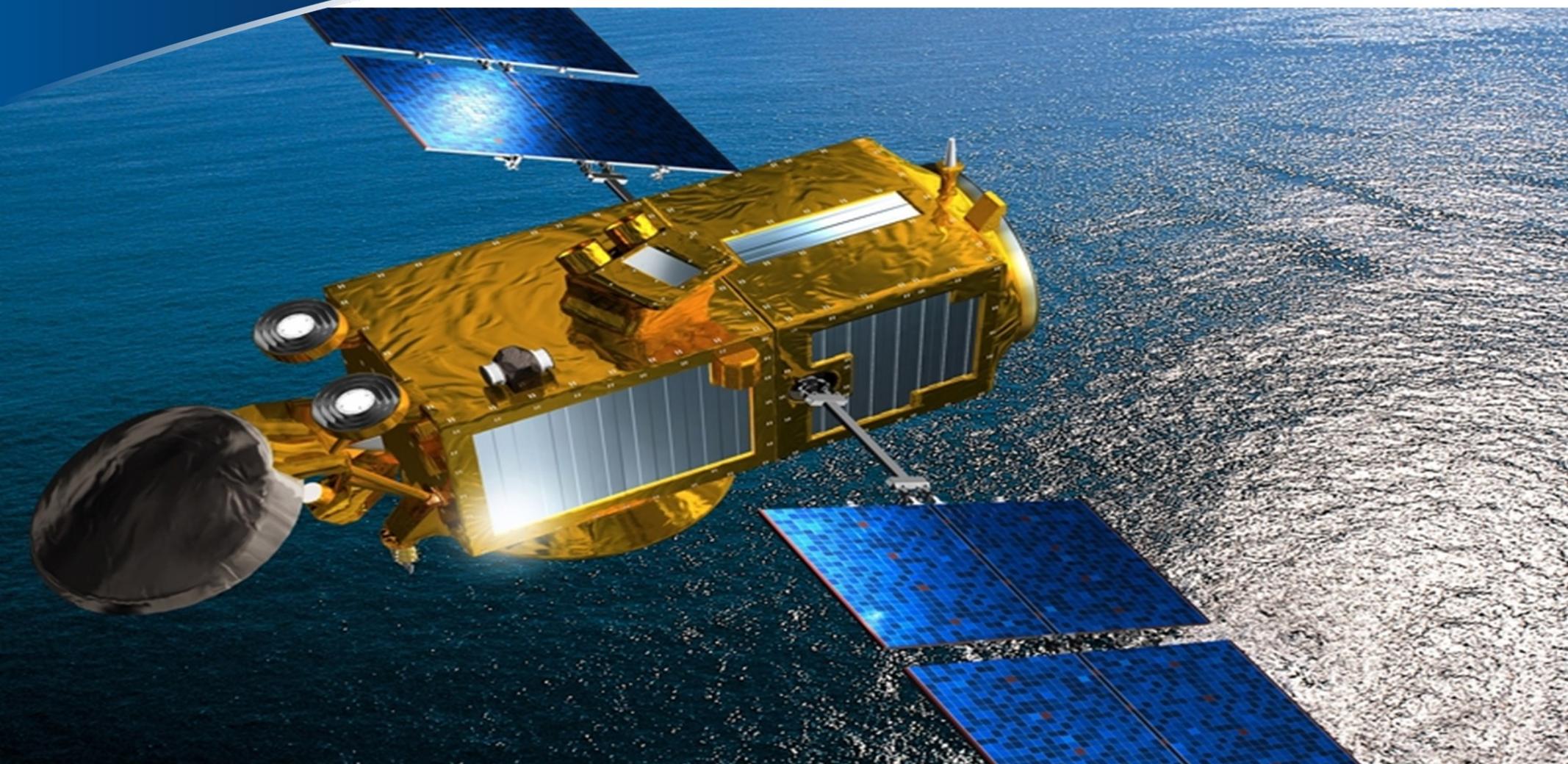
AMBER on JASON3 at THALES ALENIA SPACE

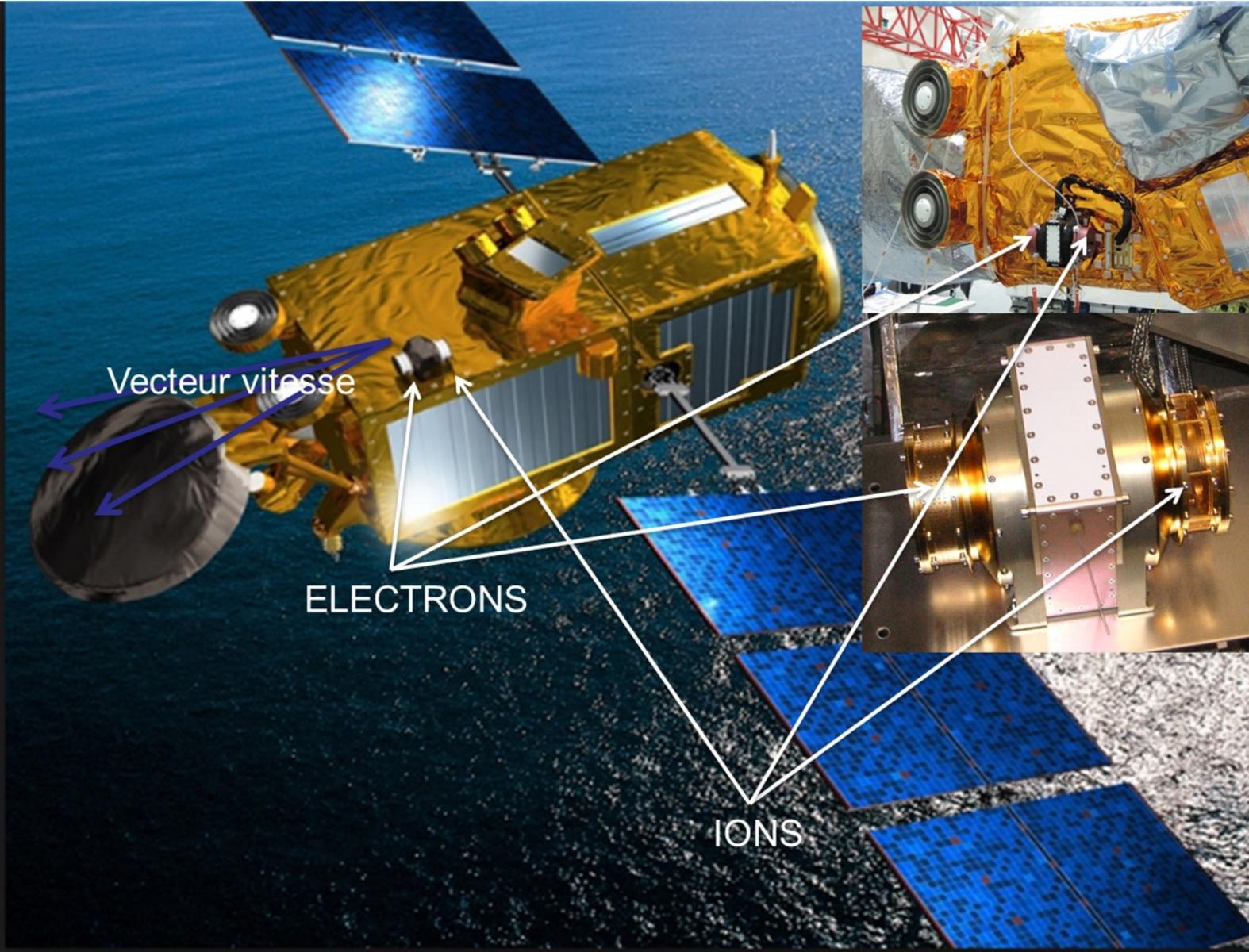


SPACEX FALCON 9 Launch

17TH January 2016

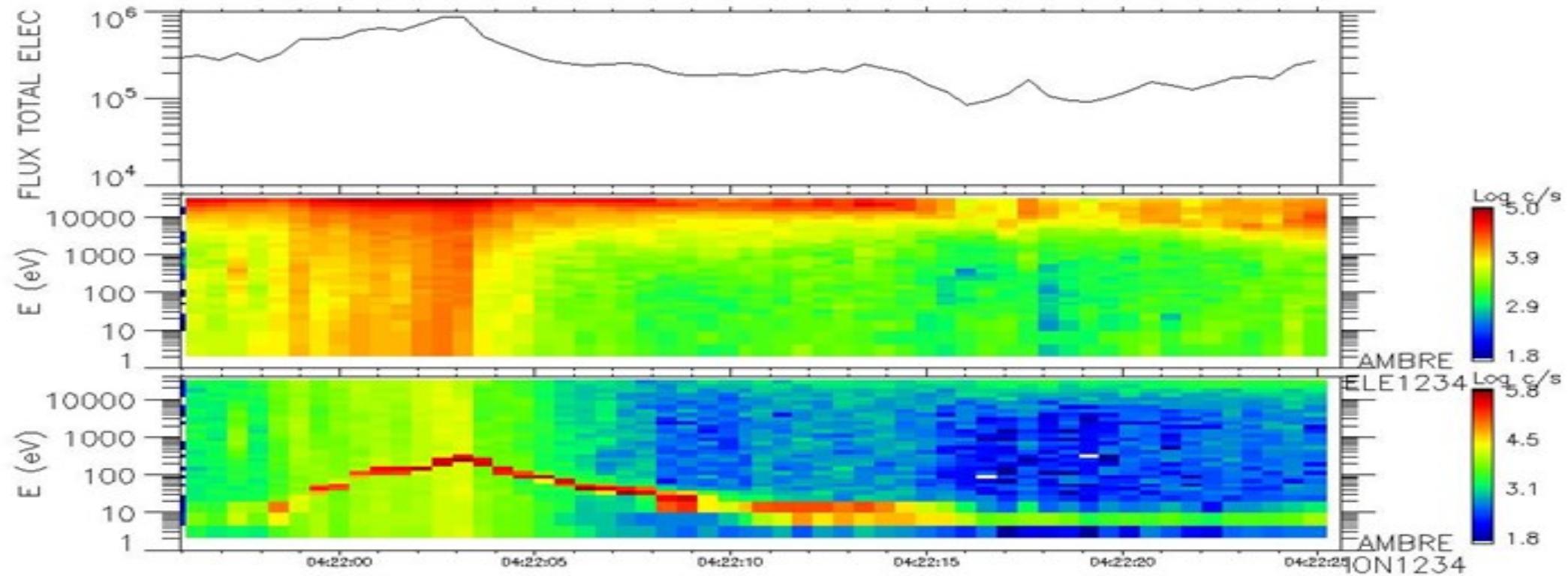








09/May/2016



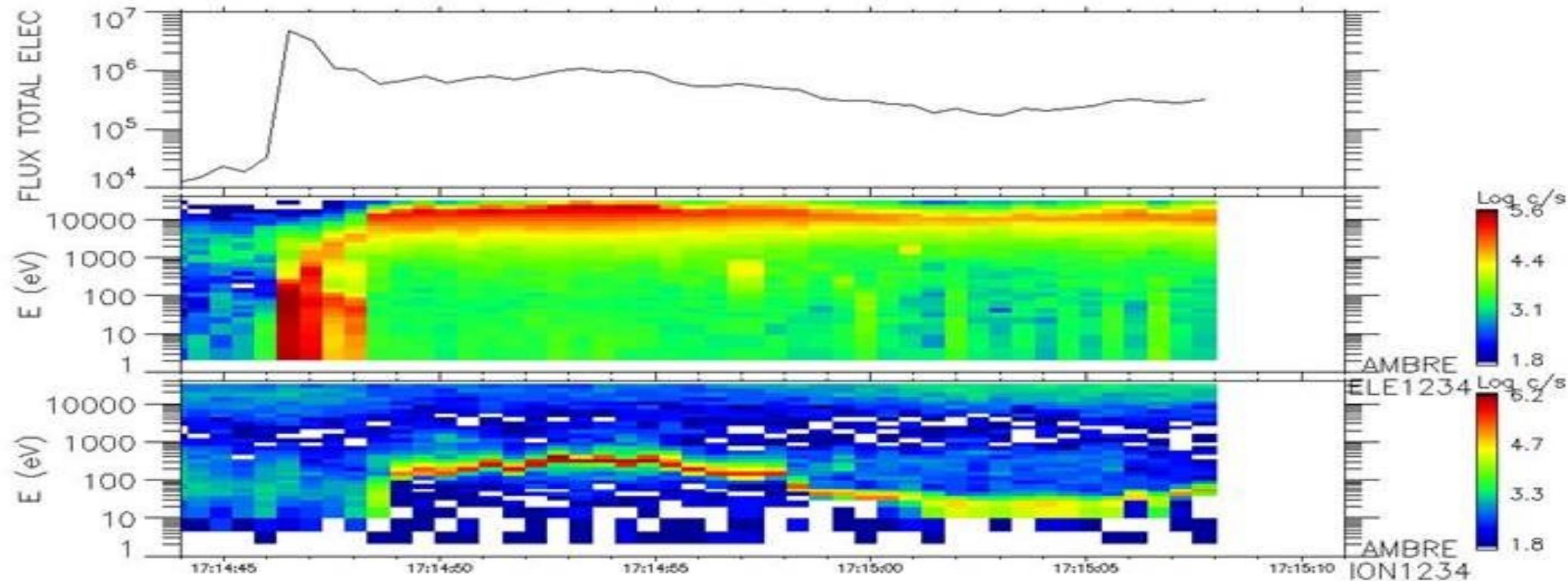
L	5.63	5.65	5.46	5.37	5.30
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MLT	20.13	20.18	20.23	20.28	20.33
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INVLAT	65.07	64.86	64.67	64.44	64.26
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08/May/2016

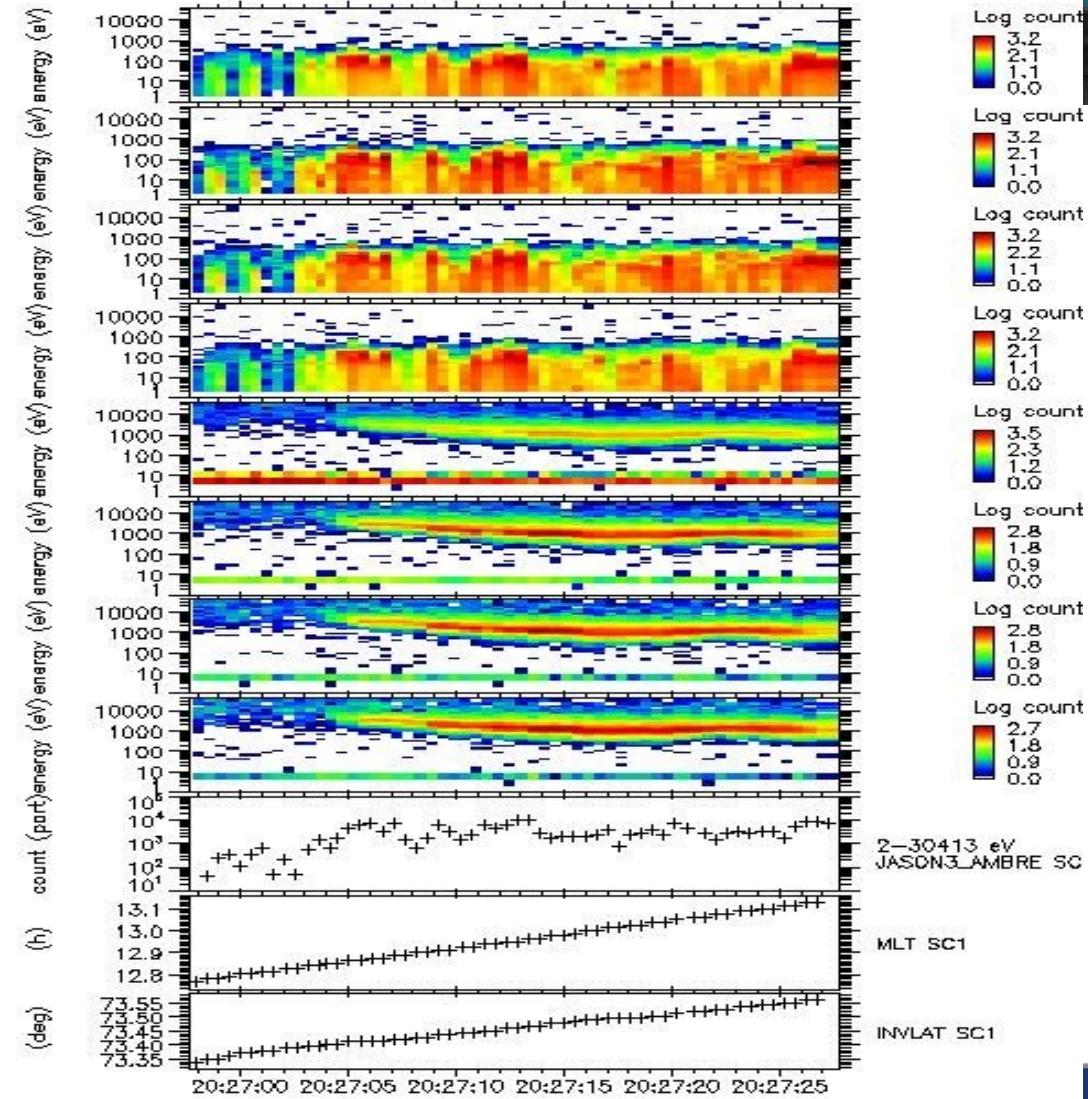


L	8.40	8.30	8.19	8.06
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MLT	21.53	21.57	21.63	21.67
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INVLAT	69.82	69.69	69.54	69.57
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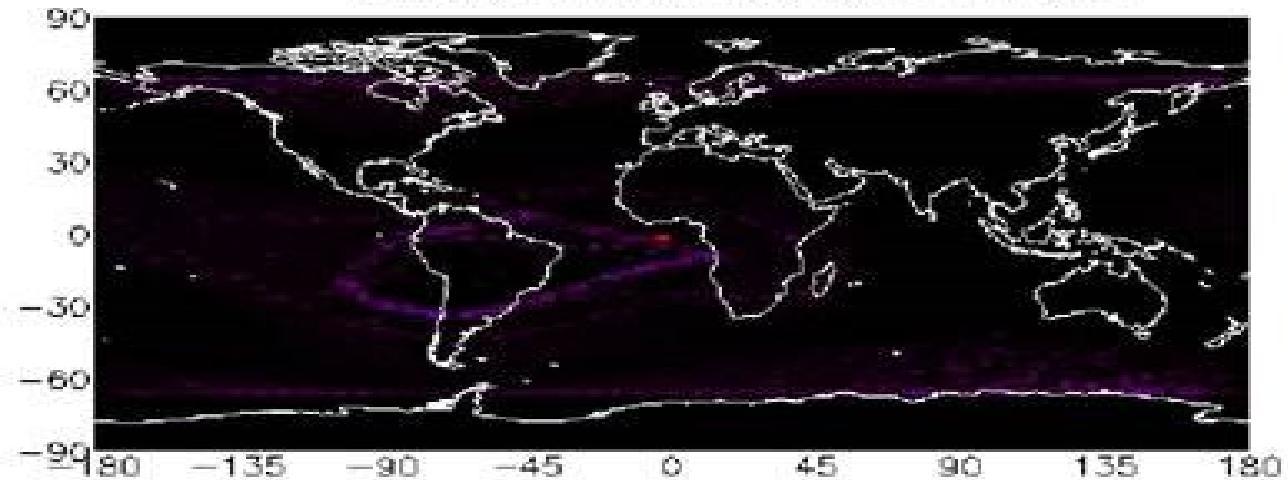
03/Apr/2016



**AMBER Data freely available on
CLWEB IRAP server**

**Ask for an account to
epenou@irap.omp.eu**

IPSAT_V5.5 SYN:599
CountRate Channel 020 [#/s] (Number of points)
JASON3/AMBRE_ELE1 20160210–20160403



CountRate Channel 020 [#/s] (Average)
JASON3/AMBRE_ELE1 20160210–20160403

