

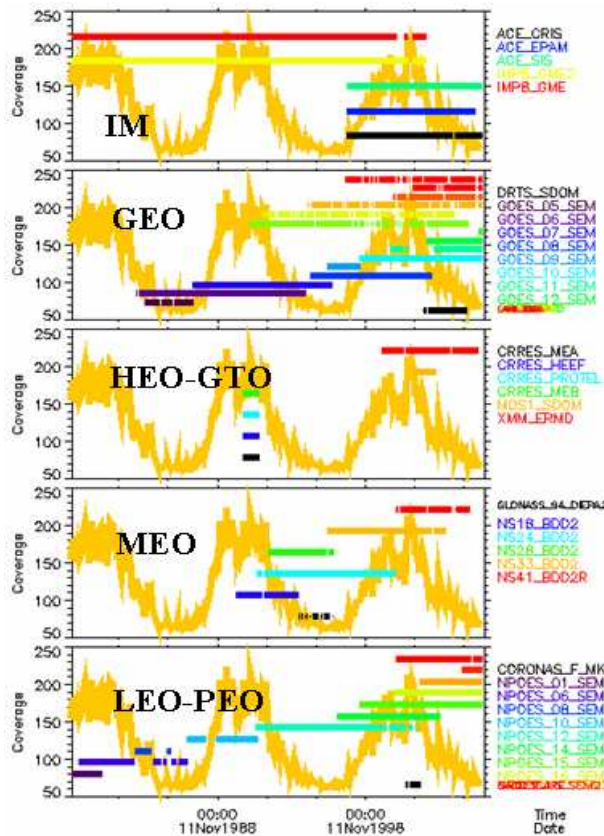
IPSAT 3.1

(Ionising Particle in Space Analysis Tool)

A Web
based
virtual
radiation
belts
observatory

The Space
and Time
Coverage:

Satellite engineers, operators, and radiation belt researchers share a common desire to understand and predict the structure and variability of Earth's radiation belts. In the radiation belt community, there is a need for improved scientific understanding of the radiation belts, more accurate dynamic and climatological models, and a mechanism for more efficient transfer of scientific understanding and models to the space technology and operational community. To allow for such advancements to take place, a *virtual radiation belt observatory* has been developed at ONERA/DESP under CNES funding. This Web based virtual observatory offers access to near-real-time measurements, historical data, analysis and visualization software.



The current data base (about 400 Go) is composed of in-situ ionising particle measurements covering a large range of orbits: interplanetary, geosynchronous (GEO), global positioning systems (GPS), elliptical (HEO) and low altitude (LEO). It has been developed through collaborations between ONERA-DESP and Los Alamos National Laboratory (LANL), Aerospace Corporation, JAXA (CNES-JAXA agreement), Moscow State University (MSU) and CONAE (CNES-CONAE agreement). The time coverage extends from 1976 (early for few mission) to present and the data time resolution ranges for 8 seconds to 5 minutes depending on the mission itself. This data base is updated every days and therefore allows to perform radiation

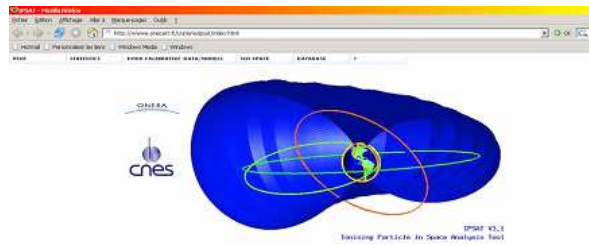
belt dynamics survey in near real time and in various regions of the radiation belts and interplanetary medium. When new data come in, they are automatically filtered to ensure good quality of measurements. *The principal strength of this data base is its global spatial and long time coverage. Most world-wide missions having (or having had) radiation monitors on-board are gathered here.*

The particle species being measured are relativistic electrons, high energy protons and heavy ions (note that heavy ions measurements are only available in the interplanetary medium). The energy range for each specie depends on each instruments on-board each spacecraft but covers roughly 100 keV to few MeV for electrons, greater than 10 MeV for protons and greater than 10 MeV/nucleon for heavy ions.

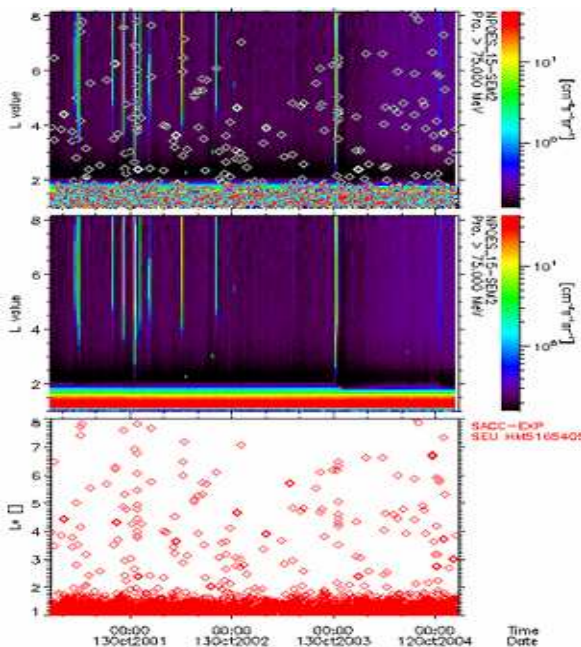
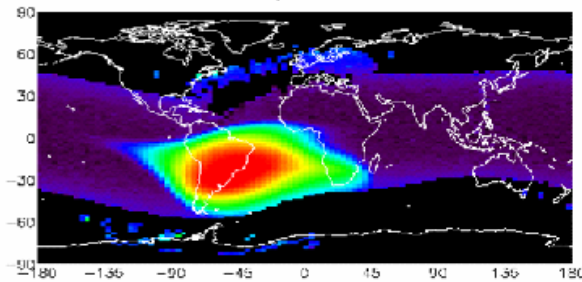
Particle
Species:



A Friendly User Interface



(IPSAT is originally developed in IDL and the web interface is developed in php and JavaScript.)



On top of the data base, the IPSAT software (Ionising Particle in Space Analysis Tool) provides an easy and a friendly to use user interface to analyse and visualize in-situ measurements, locate in-flight anomaly with in-situ environment from various sources. IPSAT allows to:

- ✚ Compose plots from various spacecraft data versus a common axis: the time. All data series are synchronized in times and can be therefore easily compared.
- ✚ Perform statistics (like correlation of any flux measurements done on a given spacecraft versus any flux measurements done on another given spacecraft or the same one).

Plot cartographies.

☞ This Figure gives a mapping of the average protons flux for energies greater than 35 MeV. (NPOES_12 / SEM detector during the period from 1994-01-01 to 1994-02-15).

- ✚ Get a direct comparison between in-situ data and AE8 or AP8. The use of this module allows to “fly” a spacecraft (available in the database) in the NASA model and plot the result in the same format.

- ✚ Plot /over plot spacecraft anomalies. This functionality helps the user to find or not any correlation with the space environment.

☞ In this example, the small circles represent single events registered with the ICARE / SAC-C experience. They are over plotted with the L-time flux graph coming from the NOAA-POES satellite.

A Very Versatile Embedded Graphics Tool



Access To IPSAT:

To have an access to IPSAT one have to register at the following URL: http://www-mip.onera.fr/craterre/ipsat/help/IPSAT_registration.php. To each users a personal profile is associated. Data access is regulated according to pre-defined rules established between ONERA and data providers.