



COMMUNITY  
COORDINATED  
MODELING  
CENTER

6<sup>th</sup> CCMC Community Workshop  
January 16–20, 2012  
Space Weather Tools and Services

# BIRA-NASA Space Weather Center Collaboration

M. Kruglanski  
BIRA-IASB

- BIRA-IASB = Belgian Institute for Space Aeronomy
  - Who are we?
  - What are we doing?
- NASA-SWC Collaboration
  - BIRA Models
  - COMESEP
  - SPENVIS-NG

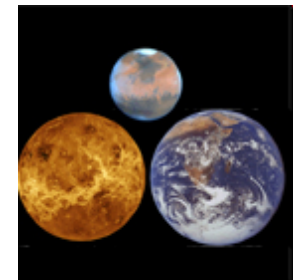
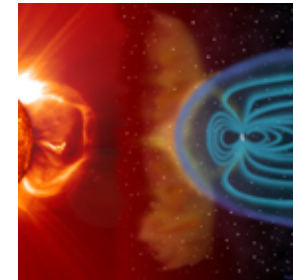
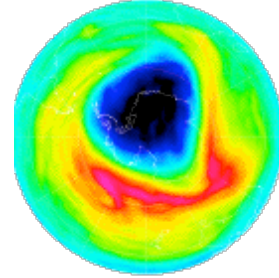


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# Belgian Institute for Space Aeronomy

- Federal Scientific Institute
- Research topics
  - Climate
  - Ozone
  - UV index
  - Air Quality
  - Space Physics
  - Planetary Atmospheres
- Divisions
  - Space Physics
  - Atmospheric Composition
  - Solar Radiation in Atmospheres
  - Scientific Services



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# Belgian Institute for Space Aeronomy

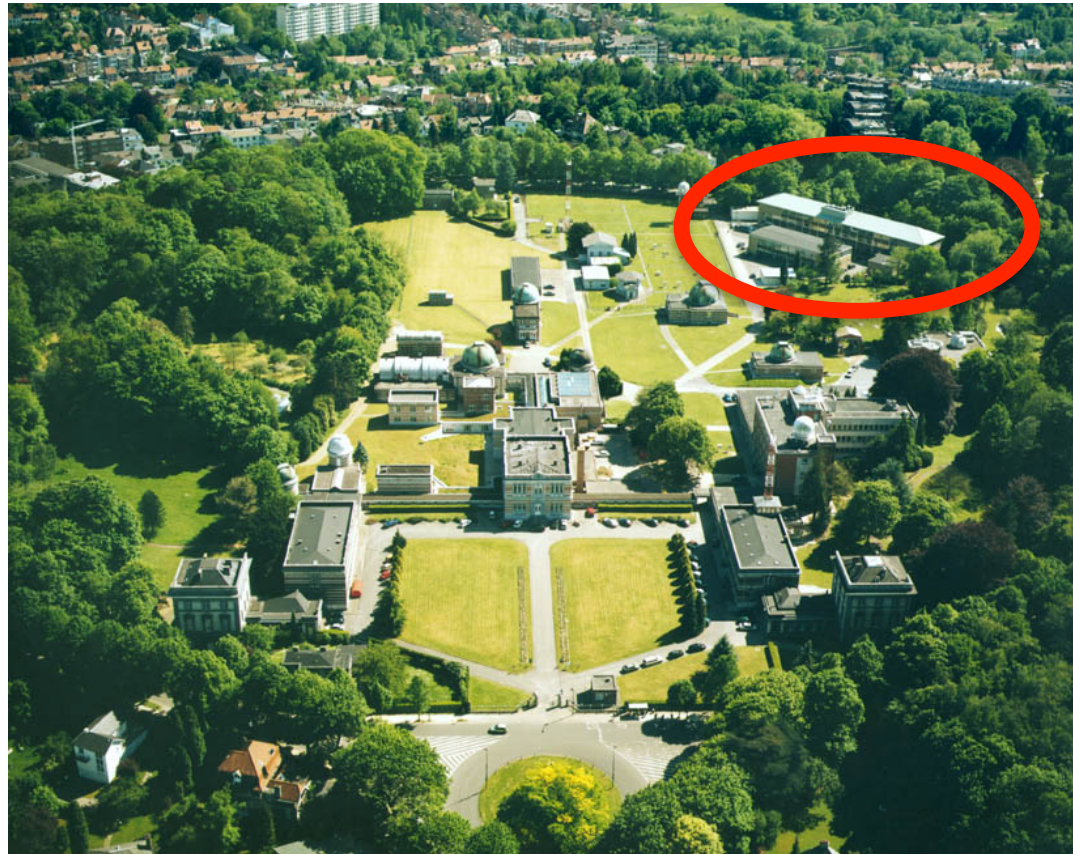
- Neighbors:
  - Royal Meteorological Institute
  - Royal Observatory of Belgium → RWC / SIDC

Solar-Terrestrial  
Centre of  
Excellence



(STCE)

Located in Brussels



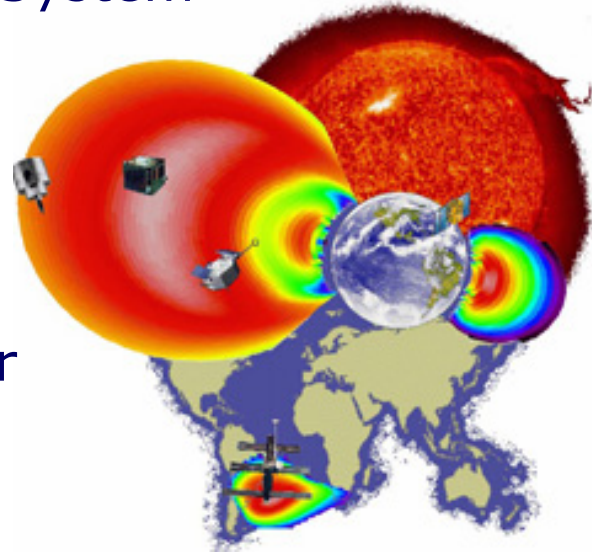
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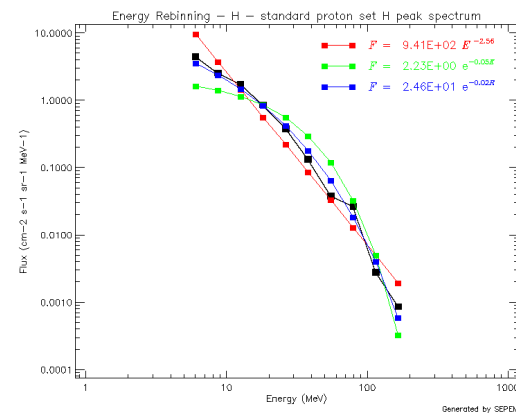
# Scientific Services > Space Weather Projects



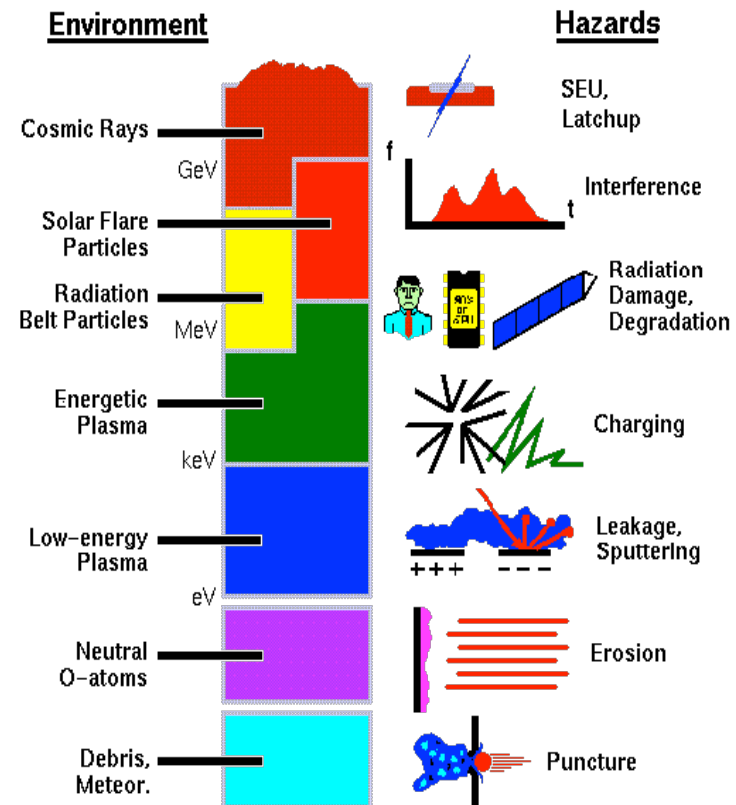
- Space Environment Information System (SPENVIS) ← ESA
- European Space Weather Portal (ESWeP) ← COST
- SSA-PP Space Weather Precursor Services: Definition and Service consolidation (SN-I) ← ESA



- Coronal Mass Ejections and Solar Energetic Particles (COMESSEP) ← FP7
- Solar Energetic Particle Environment Modelling (SEPEM) ← ESA



- ESA operational software
- User-friendly human interface to models of the space environment and its effects
- Main resource for
  - specifications (early project phase)
  - first-step analyses
  - quick answers
- In case of problems related to
  - cosmic rays
  - solar energetic particles
  - natural radiation belts
  - magnetic fields
  - space plasmas
  - upper atmosphere
  - meteoroids and debris
  - Illumination
- Target user domain
  - Spacecraft designer



( TEC-ESS <http://space-env.esa.int> )

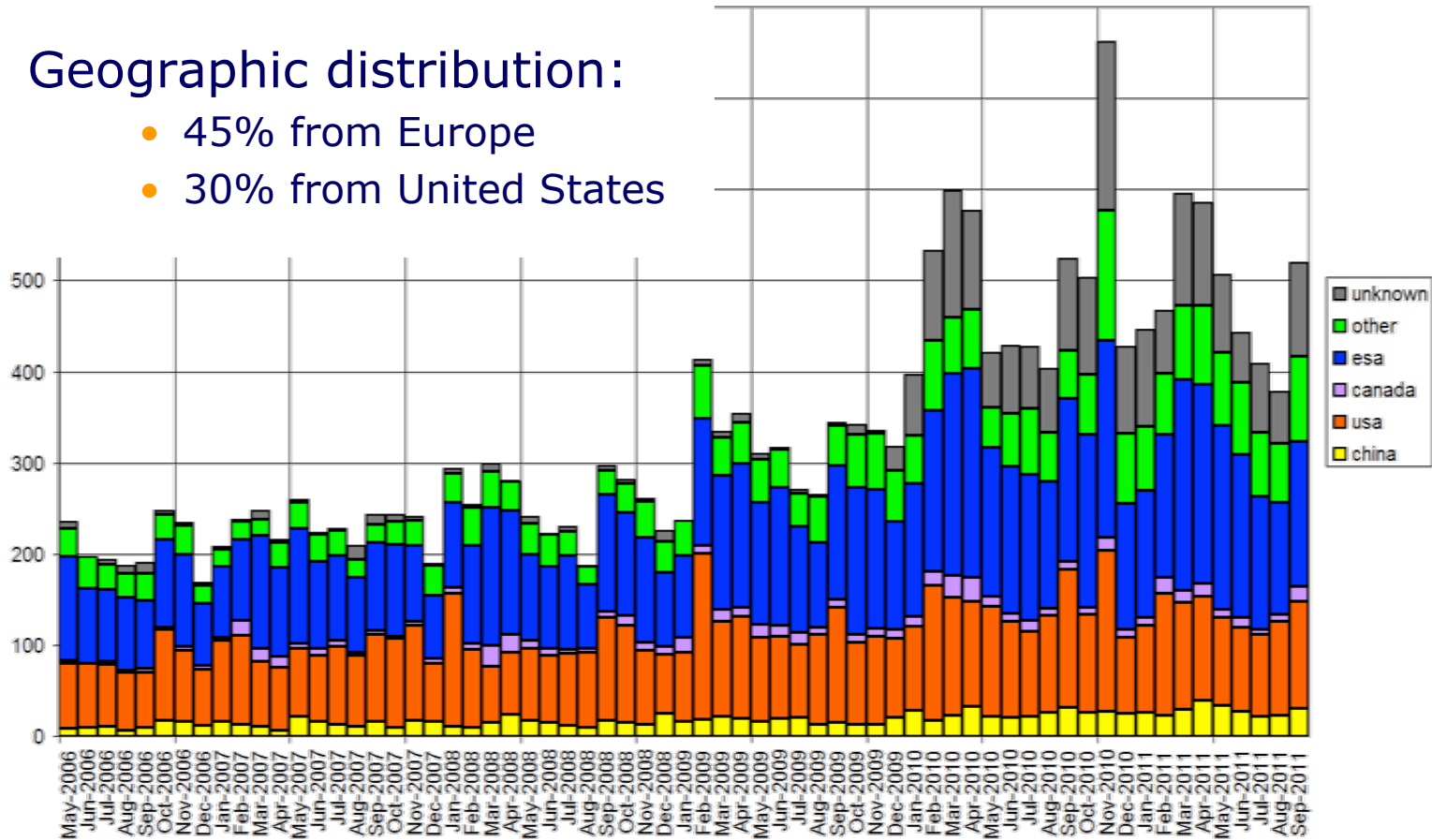


# Who is using SPENVIS?

- Large still-growing worldwide community
  - Spacecraft designers or component designers
  - Educational programs
  - Scientists (model developers)

- Geographic distribution:
  - 45% from Europe
  - 30% from United States

Distribution of active users per month and origin



www.SPENVIS.oma.be



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Belgian Institute for Space Aeronomy... Resources

iswa.gsfc.nasa.gov/iswa/Resource

NASA Space Weather LAB

Main Resources Tutorials

INTEGRATED SPACE WEATHER ANALYSIS SYSTEM

iSWA Tutorial Videos

iSWA Blog

iSWA Wiki

NASA GSFC Space Weather Lab

The Space Environment Information System (SPENVIS)

SPENVIS The Space Environment Information System

esa

The Space Environment Information System (SPENVIS) is an ESA software system developed and maintained at the Belgian Institute for Space Aeronomy. It provides standardized access to a series of models of the hazardous space environment, through a user friendly web interface. The system allows spacecraft engineers to perform a rapid analysis of environmental problems related to natural radiation belts, solar energetic particles, cosmic rays, plasmas, gases, magnetic fields, and micro-particles. The system includes several engineering models to assess problems such as surface and internal charging, energy deposition, solar cell damage, and single event upset (SEU) rates. The SPENVIS system is accessible through the web via the URL <http://www.spennis.oma.be/>.

Curator: Marlo Maddox | NASA Official: Michael Hesse | Privacy and Security Notices

Important Disclaimer Notice

SPENVIS - Space Environment, Effects, and Education System - Mozilla Firefox

http://www.spennis.oma.be/intro.php

SPENVIS - Space Environment, Effect...

SPENVIS The Space Environment Information System

Navigation

- Home
- Access
- Register
- About SPENVIS
- Documentation
- Credits
- Rules of conduct
- My account
- Forums
- Bug tracker
- Lost password

Welcome to ESA's Space Environment Information System, a WWW interface to models of the space environment and its effects, including the cosmic rays, natural radiation belts, solar energetic particles, plasmas, gases, and "micro-particles".

**SPENVIS User's Workshop**  
We are pleased to announce the User's Workshop, to be held in Mechelen, Belgium, on 7--9 June, 2010. [Read more.](#)

**Need help?**  
Beside a large set of contextual help pages, the SPENVIS system includes a forum where users can exchange their experiences and tips. In case of problems, please consult our bug tracker system and feel free to post any bugs.

If you have forgotten your password, you can reset it [here](#). If you want to change your password, you can do it [here](#).

**Registration**  
Use of SPENVIS on this site is free of charge, but a user registration is required. Please read the [terms & conditions](#) before registering.

If you are student or teacher, please read [this](#) first.

[Register now](#)

**System requirements**  
SPENVIS requires a browser with JavaScript support (tested with Firefox 2.0.0.6 and MS-IE 7.0). Some outputs require a [VRML/X3D plugin](#) (tested with Octaga Player 2.3.0.3).

**Current version**  
The current version of SPENVIS (4.6.3) was released on February 11, 2010.

Project Manager: Michel Kruglanski  
Application Engineers: Erwin De Donder & Neophytos Messios  
IT development: Emmanuel Gamby, Laszlo Hetey & Stijn Calders  
Contact: [spennis\\_team@aeronomie.be](mailto:spennis_team@aeronomie.be)

ESA Technical Officer: H. Evans

Sponsors:  
Belgian Federal Science Policy

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# COMESSEP: Forecasting the Space Weather Impact

- Project Coordinator: Norma B. Crosby
- Consortium:
  - Belgian Institute for Space Aeronomy
  - University of Graz
  - Royal Observatory of Belgium
  - HVAR Observatory (University of Zagreb)
  - Technical University of Denmark
  - National Observatory of Athens
  - University of Central Lancashire
- External Collaborators
  - Nandita Srivastava: Udaipur Solar Observatory, India
  - Michael Hesse: **Community Coordinated Modelling Center**
  - Dusan Odstrcil: George Mason University, NASA/GSFC



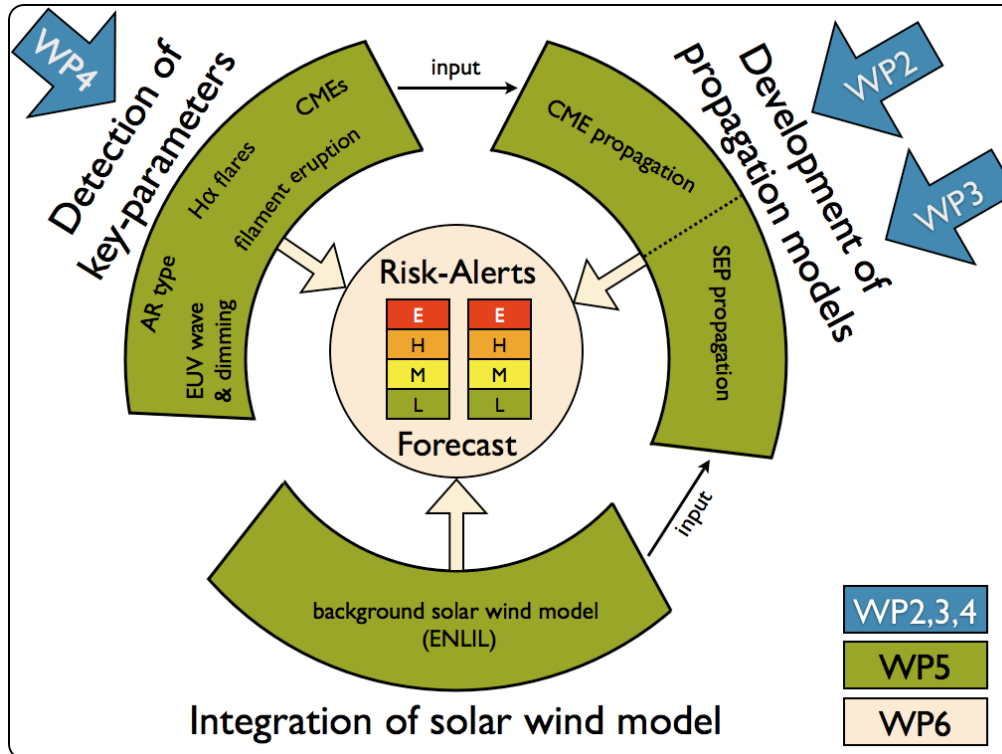
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# COMESEP objectives and work logic

- Main objective:  
developing tools for forecasting geomagnetic storms and solar energetic particle (SEP) radiation storms
- Work logic



# COMESEP definition of risk.

Likelihood of occurrence	Almost certain	M	H	H	E	E
	Likely	M	M	H	H	E
	Possible	L	M	M	H	E
	Unlikely	L	M	M	M	H
	Rare	L	L	M	M	H
	Storm Level	Minor	Moderate	Strong	Severe	Extreme
	Physical Measure (Kp)	5	6	7	8	9

**Impact or Magnitude of event**  
(based on NOAA Space Weather scales)

Risk = Likelihood ⊗ Impact

E	Extreme Risk
H	High Risk
M	Moderate Risk
L	Low Risk

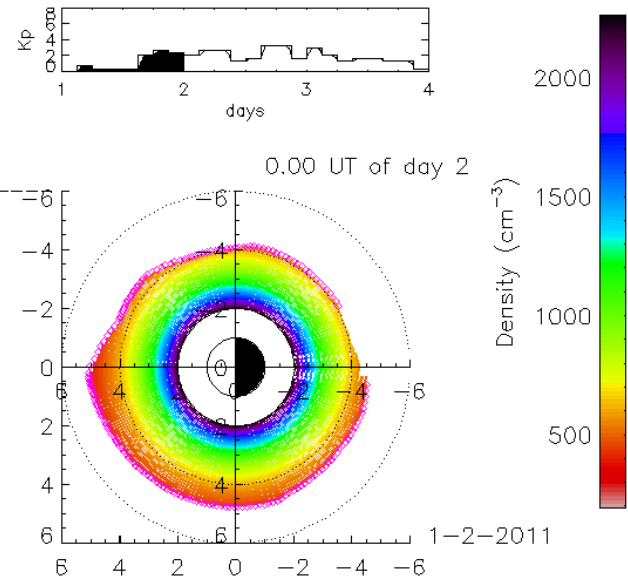


# Collaboration > NASA SWx Center



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- BIRA Models → CCMC
  - ✓ • Plasmasphere density model  
Viviane.Pierrard@aeronomie.be
  - ✓ • Exospheric Solar Wind model  
Herve.Lamy@aeronomie.be
- ENLIL @iSWA
  - ✓ • European Space Weather Portal  
Stijn.Calders@aeronomie.be
  - • COMESEP  
Norma.Crosby@aeronomie.be
- Data exchange / web services
  - • Post-event analysis
  - • SPENVIS Next Generation
- Miscellaneous
  - ◎ • Planetocosmics (GEANT4 based)



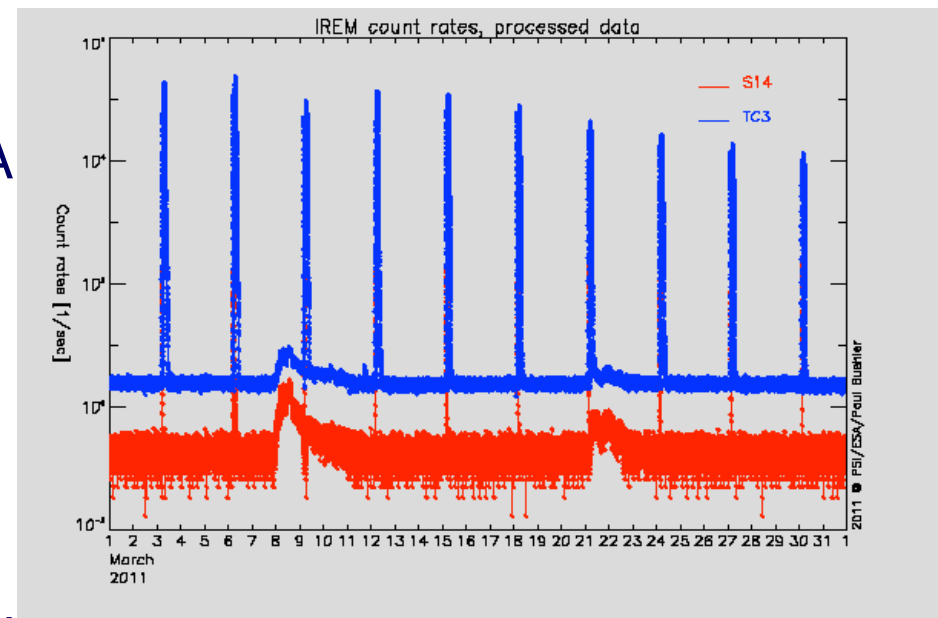
# ENLIL@iSWA > COMESEP

- Risk Alert Demonstrator
  - Background Solar Wind
    - ← ENLIL
    - SEP propagator
  - CME Propagation
    - ← Cactus (<http://sidc.be/cactus/>)  
Computer Aided CME Tracking
    - ← Operator @ ROB [6 hours in advance]
    - ENLIL → iSWA
- Current status:
  - Studying ways forward



# Post-event analysis

- Service demonstrator for spacecraft designers: estimating space environment and effects actually experienced by a spacecraft, instrument, ...
- Use case: SREM onboard INTEGRA crossing:
  - Radiation belt
  - Interplanetary medium
- Current status:
  - Selecting models
  - Prototyping the data exchange





# SPENVIS Next Generation

- Current SPENVIS: initial development in 1996
  - Design and implementation of a new framework
  - Main objective:
    - *Implementation of a new system as a web-based service-oriented distributed framework supporting plug-in of models related to the hazardous space environment, and including both*
    - *a user-friendly interface for rapid analysis and*
    - *a machine-to-machine interface for interoperability with other software tools*
- ➔ Interaction with tools at NASA SWx Center ?
- ← Way to direct access to drive execution of some NASA models
- Current status:  
SPENVIS-NG project started (15-Nov-2012)



# Collaboration BIRA - NASA SWx Center

- Started in July 2010 (COSPAR @ Bremen)
- Meeting
  - November 2010 @ Brussels
  - May 2011 @ Washington DC
  - November 2011 @ Namur
  - January 2012 @ Key Largo
- Some challenging objectives



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