COMMUNITY COORDINATED MODELING CENTER
6th 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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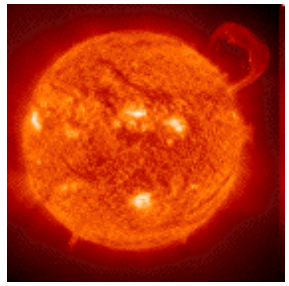
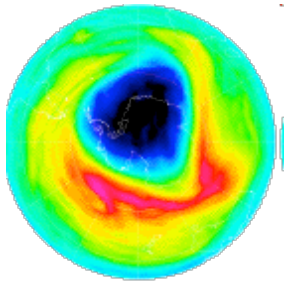
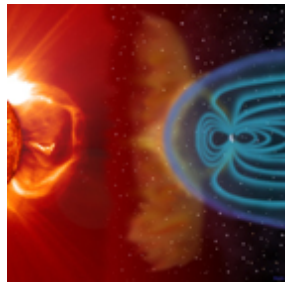
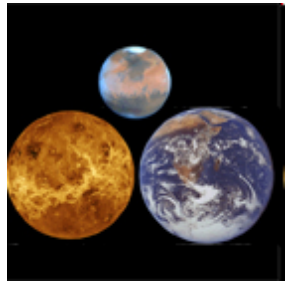
Belgian Institute for Space Aeronomy

- 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

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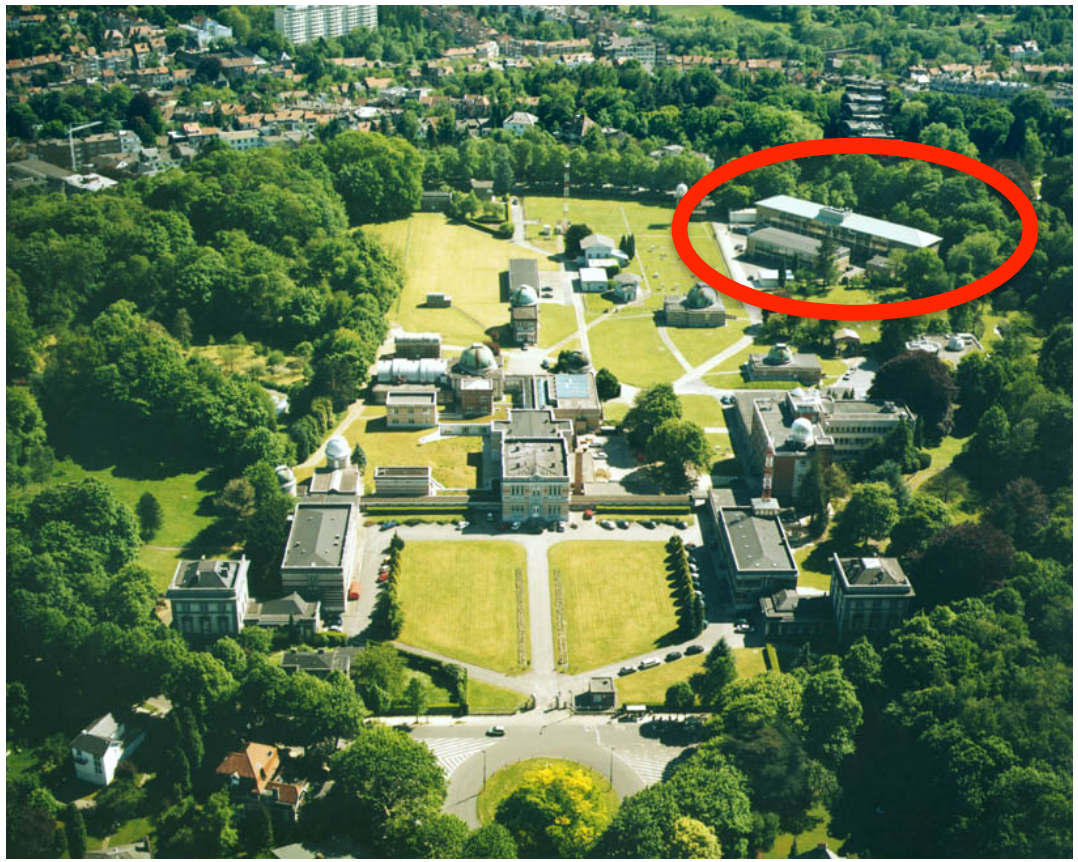
(STCE)



Located in Brussels

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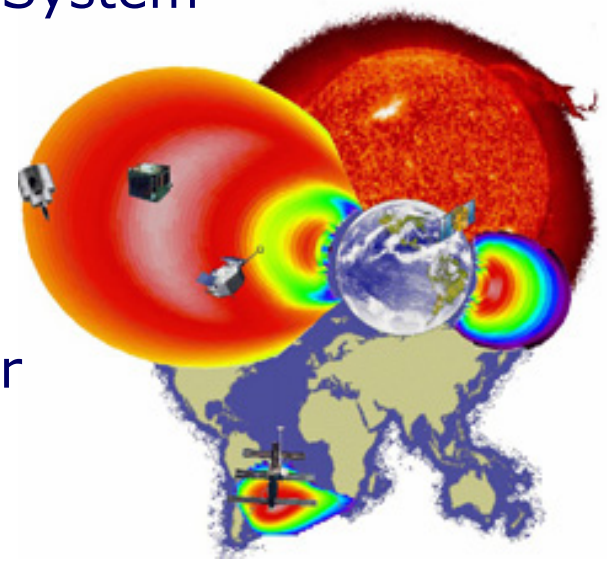
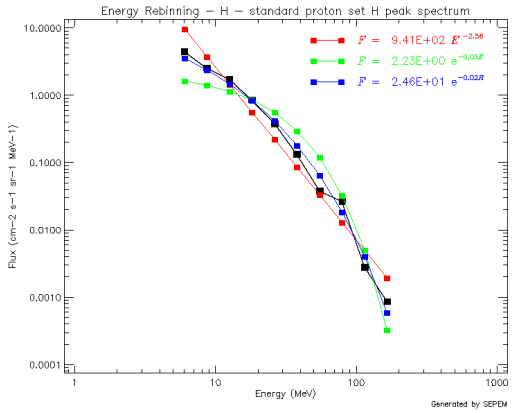
Scientific Services > Space Weather Projects

- 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 (COMESEP) ← FP7
- Solar Energetic Particle Environment Modelling (SEPEM) ← ESA





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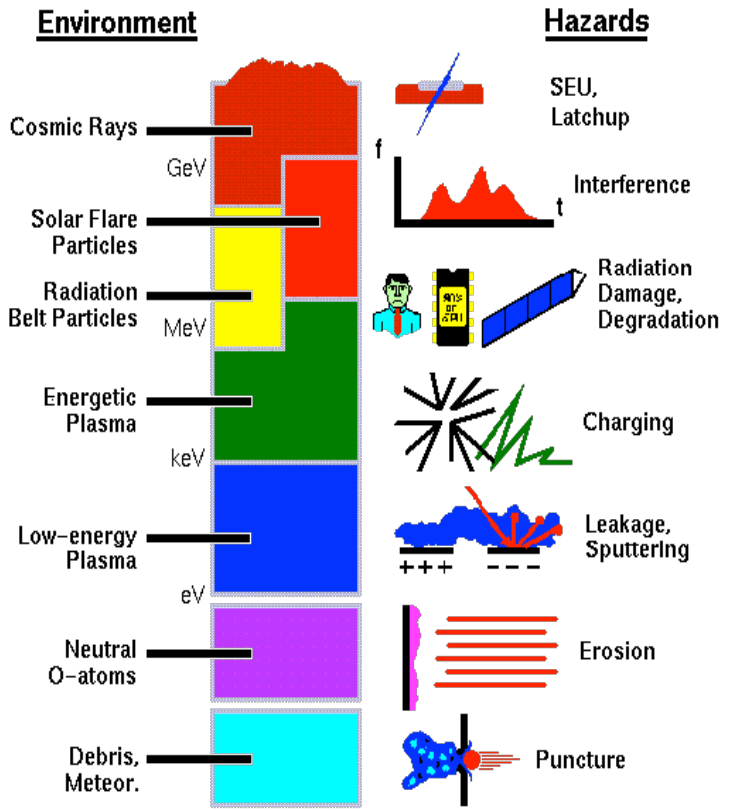
Space Environment Information System

- 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

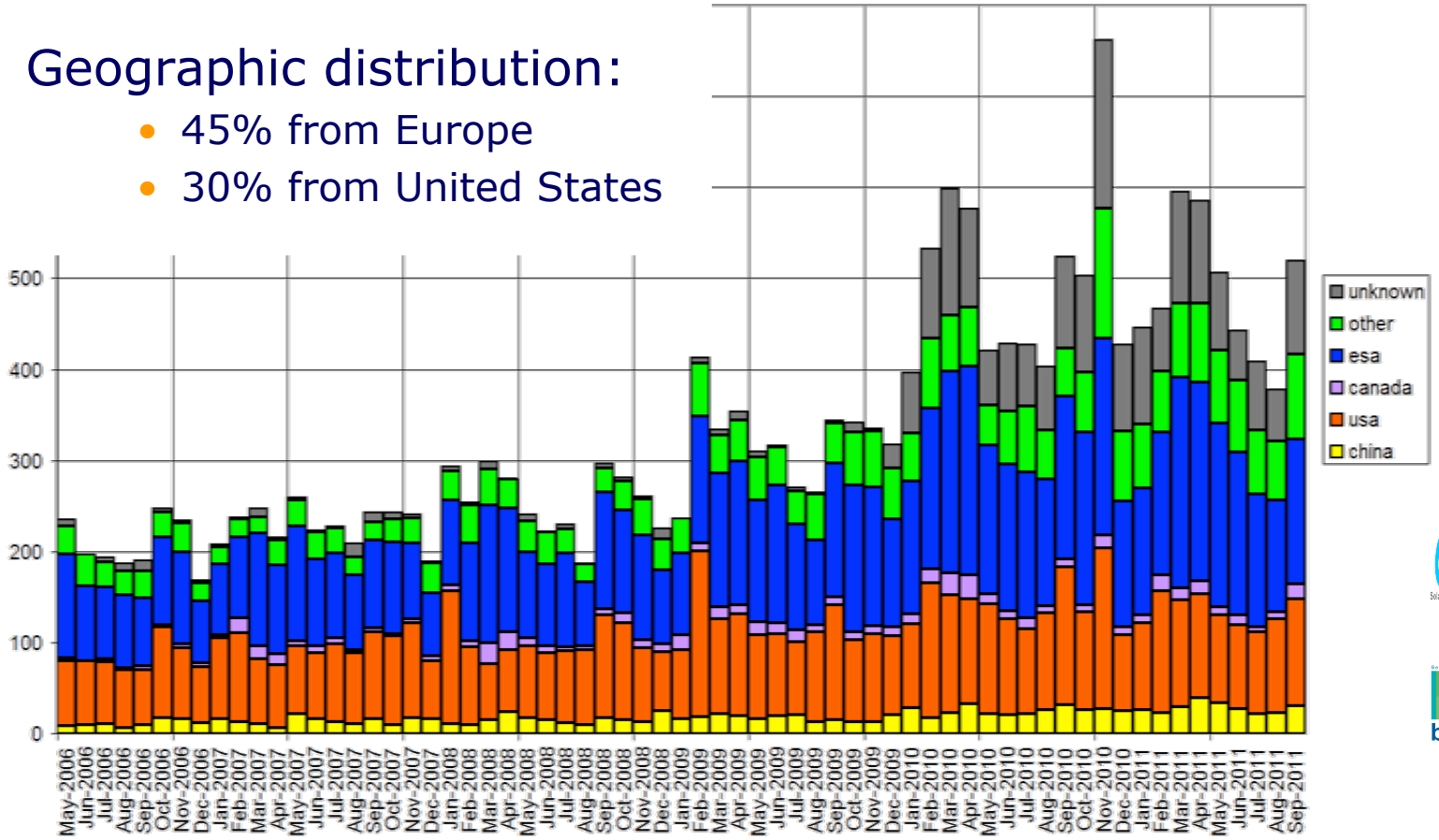


(TEC-ESS http://space-env.esa.int)

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



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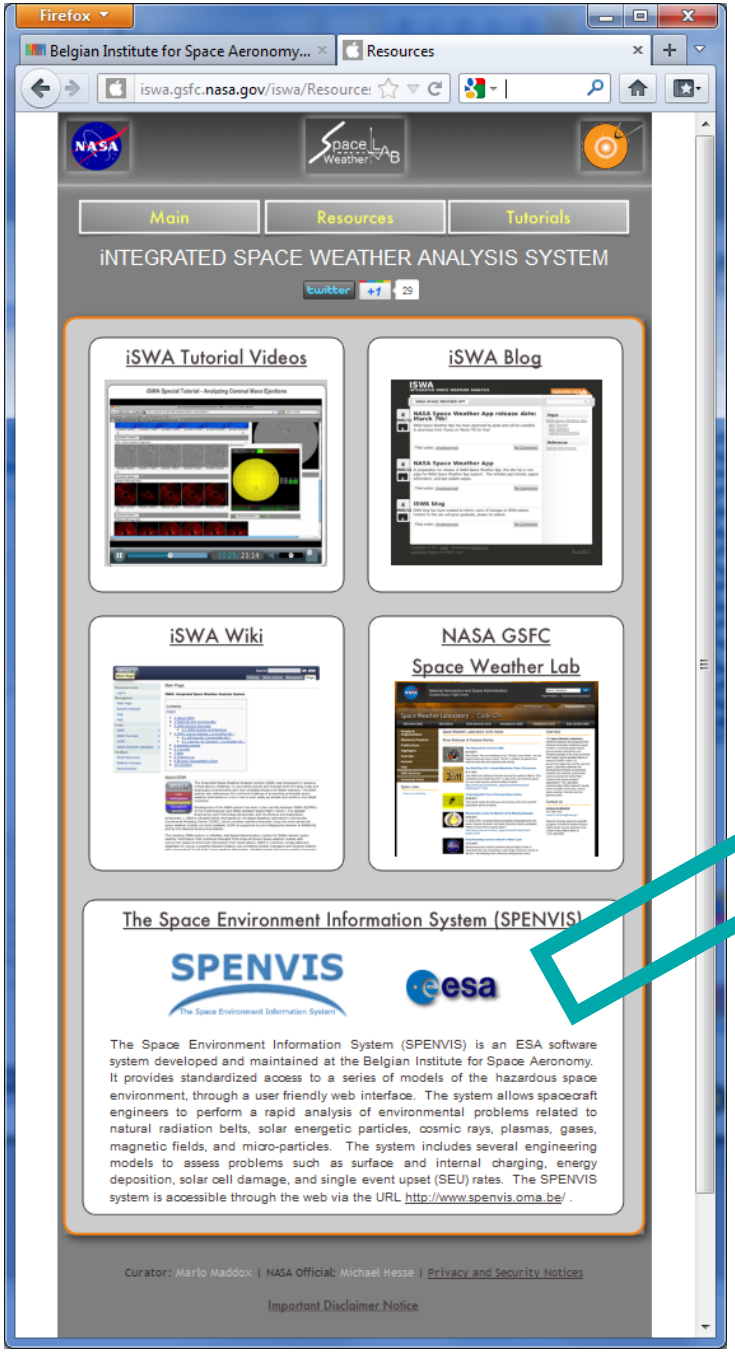
www.SPENVIS.oma.be



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COMESEP:
Forecasting the Space Weather Impact

- Project Coordinator: Norma B. Crosby

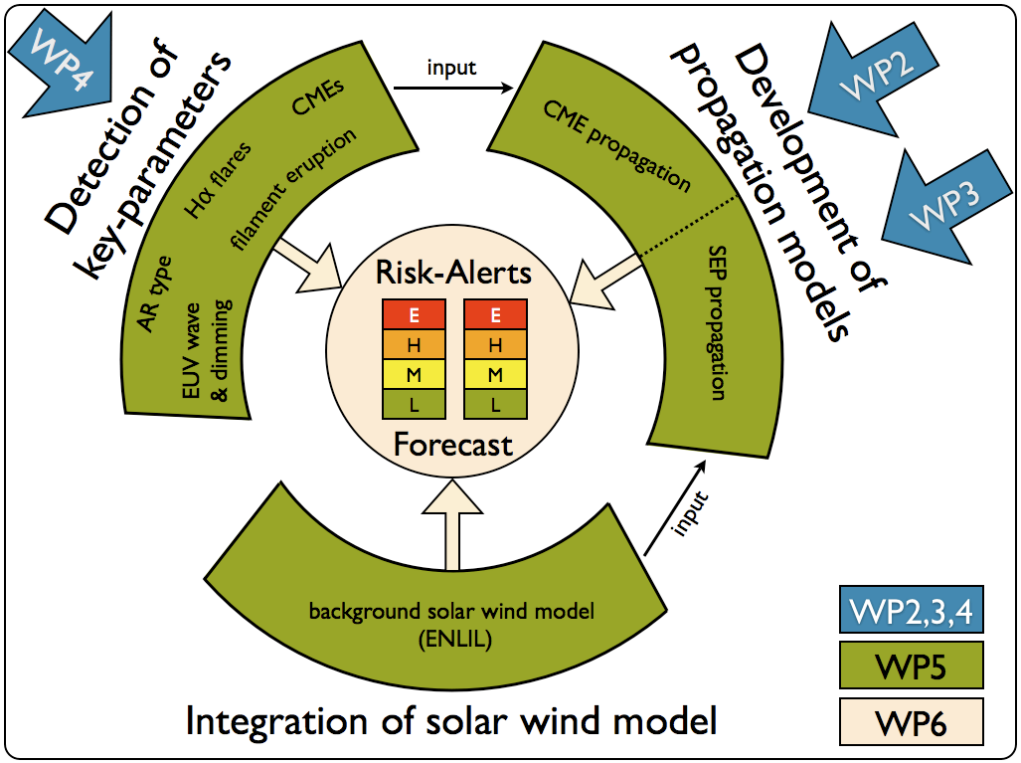
- Consortium:
  - Belgian Institute for Space Aeronomy
  - University of Graz
  - Royal Observatory of Belgium
  - HVAR Observatory (University of Zagreb)
  - Technical University of Denmark
  - National Observatory of Athens
  - University of Central Lancashire

- External Collaborators
  - Nandita Srivastava: Udaipur Solar Observatory, India
  - Michael Hesse: Community Coordinated Modelling Center
  - Dusan Odstrcil: George Mason University, NASA/GSFC

COMESEP objectives and work logic

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

- Work logic



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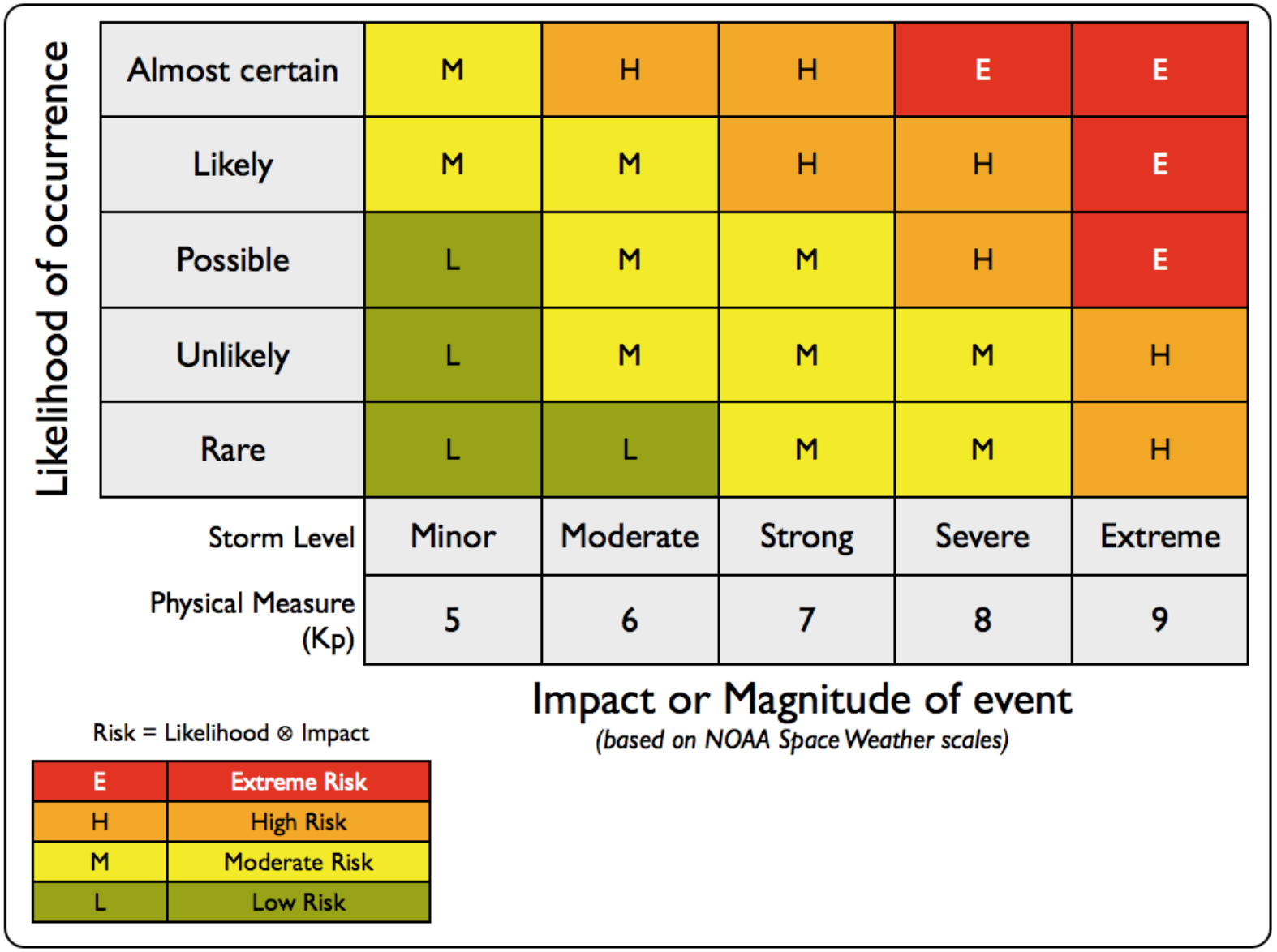
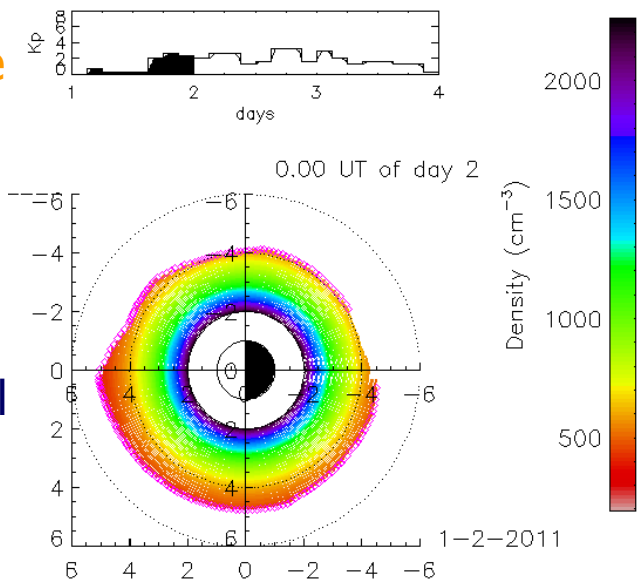
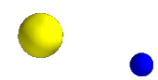
COMESEP definition of risk.



Collaboration > NASA SWx Center

- 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

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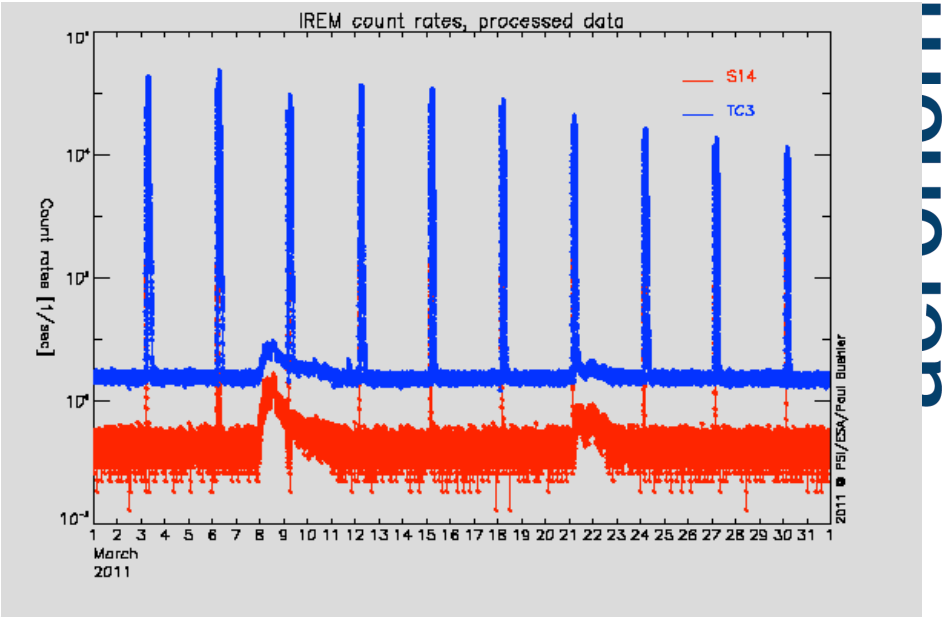
Post-event analysis

- 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)

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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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