Servicios de Clima Espacial de Apoyo Para Proteccion de Infraestructuras Criticas

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• Space Weather occurs on a range of timescales and magnitudes throughout the ~11yr solar cycle
  • Solar max and solar min produce different challenges – extremes in each case can be challenging

• Severe Space Weather: Low frequency, potentially high impact events

• Technology advancement & increase dependence on space-based infrastructure means increased need to understand & mitigate for the risks associated with space weather

• Example affected critical infrastructures:
  ➢ Communications
  ➢ Navigation
  ➢ Power systems
SPACE WEATHER
Challenges for Space Weather Services

- Approaching peak of solar cycle 24
  - expected ~Mid 2013
- Comparatively small solar cycle observed so far
  - Activity picking up in 2012
  - Large events aren’t excluded
- Predicting long term trends and individual events also a scientific challenge!
SSA Preparatory Programme established in 2009

Overall SSA SWE Aim: Knowledge, understanding and maintained awareness of the natural space environment and space weather
  - Detection and forecasting of space weather and its effects

End users perspective a key driver:
  - Understanding disturbances & what constitutes a realistic worst case event
  - Statistical information
  - Reliable monitoring and individual forecasts tailored to sector needs
Example End Users

- Spacecraft designers & operators
- Launch operators
- Transitionospheric radio link users
  - Communication
  - Navigation
- Non-space system operation
  - Aviation
  - power and pipeline network operators
• Core of the SWE precursor service network

• Distributed centres based on existing national expertise
  – Coordinating group
  – (N)*expert groups

• New Expert Groups added to the ESC framework in SSA PP in 2012

• Next phase (2013+):
  – New ESCs are foreseen
  – Network of Expert Groups to expand

New ESCs to come
(Theme ?)
European Space Agency

SPACE WEATHER
First Steps to Federate Services in SSA PP

SWE Service Coordination Centre, BIRA, Belgium

SSA SWE Users

SWE Data Centre
Redu, Belgium

SWE Expert Service Centre
Solar Weather
Coordinator: ROB, Belgium

SWE Expert Service Centre
Ionospheric Weather
Coordinator: DLR, Germany

SWE Expert Service Centre
Space Radiation
Coordinator: BIRA, Belgium

SWE Expert Service Centre
Geomagnetic Conditions
Coordinator: TGO, Norway
• SSA SWE access web portal currently being finalised

• SSCC: Space Weather Service Coordination Centre: **SSA SWE front desk** being established
  – First line user support

• SWE Data Centre at Redu
  – Several applications redeployed
    • Incl. SEISOP, SWENET, SEDAT, SPENVIS...
  – Further development of enhanced portal to follow
• Initial review of assets >200 SWE assets in database including several Spanish

• Scientific expertise in SWE science, ground based monitoring and instrumentation.

• Some examples in interplanetary propagation:
  • UAH Space Weather Service
    ➢ Real-time warning of severe geomagnetic disturbances
  • SOLPENCO
    ➢ Engineering model allows statistical analysis of SEP events including helio-radial variation
    ➢ Univ. Barcelona STP and Space Weather group
  • UMASEP forecaster
    ➢ SEP forecast using neural network techniques provides complementary approach
    ➢ Univ Malaga
• Spanish institutes provide regular ionospheric monitoring:
  ➢ Ebro observatory
  ➢ INTA (El Arensillo)

• ATMOP: FP7 project to develop an enhanced thermosphere model with operational applications
  • supports improved survey and precise tracking of objects in LEO
• Reliable services need reliable space and ground based data incl.:
  – L1 in-situ monitoring
  – Solar observation
  – Geospace monitoring
  – Upper atmosphere/ionosphere monitoring
  – Plus, good statistical information and archives
• SWE PP work on identifying potential hosted payloads and measurements requiring dedicated mission(s)
• International collaboration will be strengthened to ensure continued access to key datasets.
• Space weather has the potential to significantly impact critical infrastructure
• SSA-SWE is currently establishing a range of precursor services based on existing European expertise & data
• Spain has substantial scientific expertise in SWE science and monitoring
• SSA SWE next phase to be decided at ESA C/MIN(2012)
  • Expanded precursor service network
  • Additional expert groups
• This presentation focuses on services, but also anticipated scope for instrumentation development and deployment supporting underlying data needs for reliable services
THANK YOU

For more information:
www.esa.int/ssa

Coming Soon:
http://swe.ssa.esa.int/