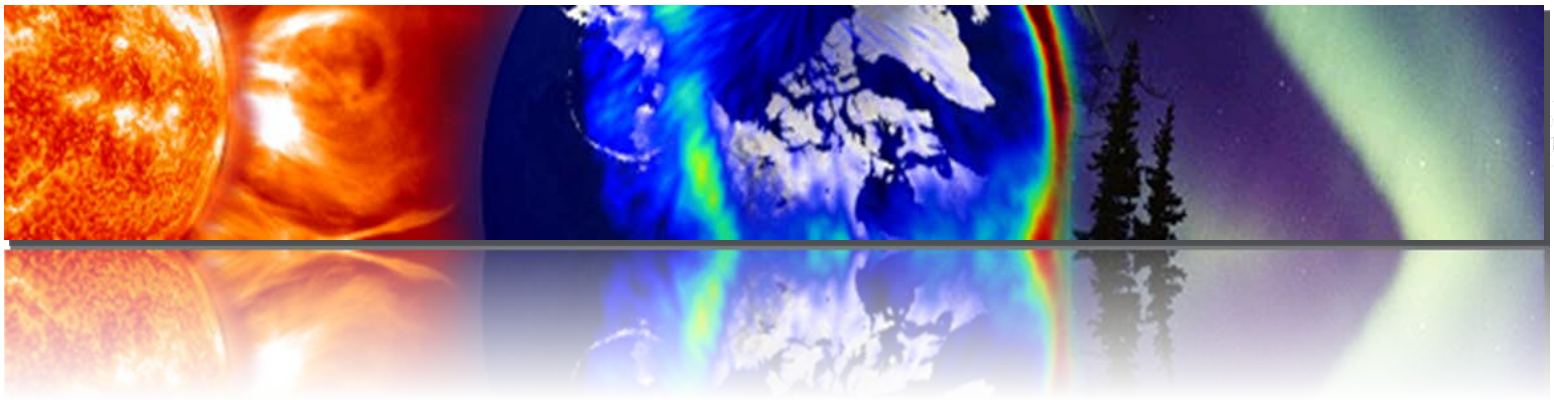


SSA Space Weather Service Network in Period 2: SWWT 2016 Presentation

Network Overview

A Glover

SSA Programme Office, ESA/ESOC

SWE Network Development Aims Period 2

- Operate and further develop the SSA SWE Coordination Centre (P2-SWE-VI & P2-SWE-XIX)
- Further develop the concept of Expert Service Centres and evolve from legacy products towards SWE services (P2-SWE-I)
- Expand the range of products available through the ESCs via the SWE portal (P2-SWE-I, P2-SWE-II: Additional Services, P2-
- Strengthen links with user communities: key task of SSCC, ESWW user meetings, dedicated meetings & workshop dedicated meetings & workshop participation. ESA Mission operation support campaigns.
- Establish a new ESC focusing on Heliospheric Weather (P2-SWE-I)
- Further develop the SWE Data Centre infrastructure to provide improved product access and additional data browsing access and additional data browsing capabilities supporting users and developers (P2-SWE-XI)
  (P2-SWE-XI)

ESA SSA SWE System

SSA-SWE Users

SSA and collaborating sensor systems

Federated data archives

SSCC
Space Pole, Belgium

SWE Data Centre

swe.ssa.esa.int

SWE Expert Service Centres

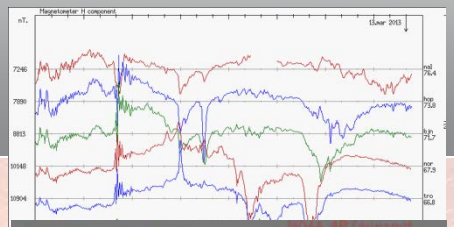
Solar Weather	Ionospheric Weather	Space Radiation	Geomagnetic Conditions	Heliospheric Weather

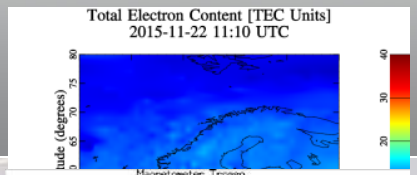
European expert groups and centres of excellence

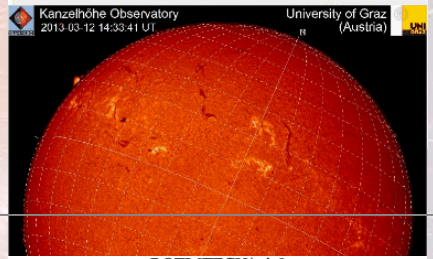
SSA Space Weather Coordination Centre

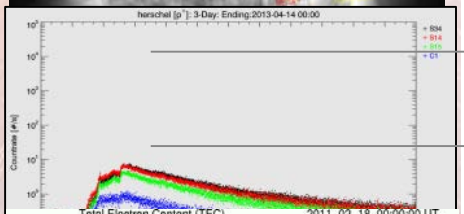
- User Support
  - Helpdesk (8/5) & guidance
  - Link to 2nd line support
- Service Monitoring
  - Overall SWE network performance
    - SWE Data centre applications
    - Federated services
- Service Improvement
  - Engaging with user community
  - Targeted campaigns
  - Facilitating access to new SWE services

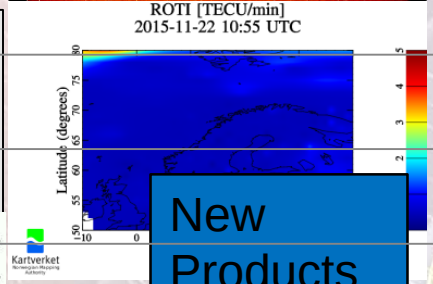
SWE Network Product Growth

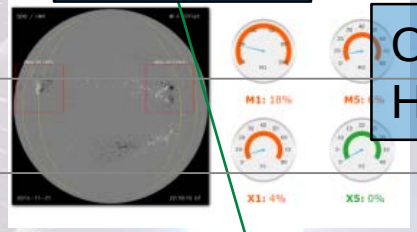


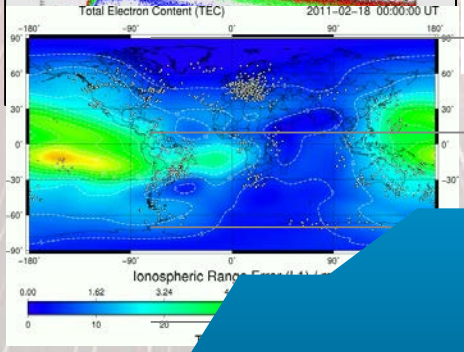












4xESC & SWE portal

New Products

New Products

Opening H-ESC

All ESCs new products

mrt/12 mei/12 jul/12 sep/12 nov/12 jan/13 mrt/13 mei/13 jul/13 sep/13 nov/13 jan/14 mrt/14 mei/14 jul/14 sep/14 nov/14 jan/15 mrt/15 mei/15 jul/15 sep/15 nov/15 jan/16 mrt/16 mei/16 jul/16 sep/16 nov/16

SSCC operations

ESC Definition:
Structuring the Federated Network

User interface & tailoring

SSCC & SWE Portal
http://swe.ssa.esa.int

Roles and responsibilities, coordination, >300 customer requirements, >1900 (!) system requirements

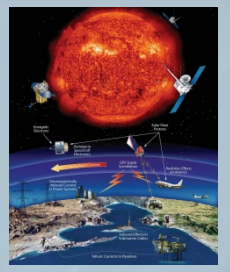
Service Composition

Expert Service Centre 5x Thematic Coordination
& 39 SWE Service Composition

Consistent presentation, validation, user focus, metadata…

Individual Products

SWE Product layer
>30 Expert Groups, >140 products



End Users

ESC Development and Planning

- Service build-up, testing and operational demonstration
  - **Benchmark products**: testing and validation, assessed against SWE user needs → with real users
  - Further work towards targeting **user needs** and delivery requirements
  - Demonstrable steps towards **meeting SWE Customer Requirements**
- **Blueprint for a sustainable network** of SWE service provision based on distributed network
  - Service provision according to KPIs
  - Roles & responsibilities within network & interfacing procedures
  - SLA templates to secure critical data

- Review of 37 SWE service roadmaps
  - Reflect progress and identify **key technology developments** for long term improvement of forecasts

New SWE Service Pages: ESWW Fair, Wednesday
http://swe.ssa.esa.int

About SWE
- What is Space Weather
- SSA Space Weather Activities
- Current Space Weather
- Contact

Service Domains
- Spacecraft Design
- Spacecraft Operation
- Human Space Flight
- Launch Operation
- Transionospheric Radio Link
- Space Surveillance and Tracking
- Power Systems Operation
- Airlines
- Resource Exploitation System Operation
- General Data Service

Expert Service Centres
- Solar Weather
- Space Radiation
- Ionospheric Weather
- Geomagnetic Conditions
- Heliospheric Weather

Other Resources
- Documents
- SWWT
- SWEN NewsLetter
- Upcoming Events

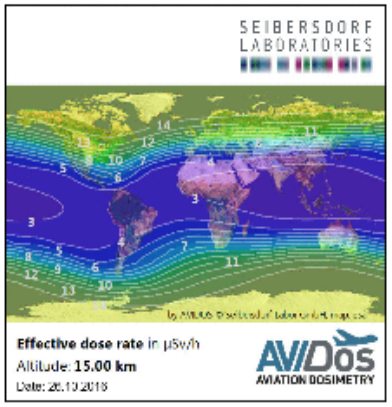
Sign-In
- You are not signed in.
- Sign In
- Request For Registration

Non-Space Systems Operations – Service to airlines

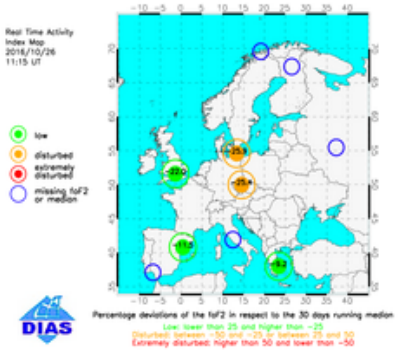
Service | User Manual | Products | Tools | Alerts | Auxiliary Info

A range of space weather phenomena can affect both aircrew and aviation technical infrastructure. The health of aircrew can be affected due to elevated radiation exposure mainly caused by Galactic Cosmic Rays (GCR) and by occassional solar eruptions of energetic charged particles. Technical infrastructure can suffer from degradation or loss of communication and navigation signals, as well as avionics errors. Such disruptions can be caused by both electromagnetic and charged particle radiation, as well as changes in the ionespheric conditions.

The service **"Non-Space Systems Operations – Service to airlines"** aims at provision of access to global information, data, models and tools addressing these issues to help airlines' dispatchers in flight planning, especially for flights affected by space weather effects.



Effective dose rate map due to current cosmic radiation



Real-time foF2 index activity map over Europe

This service is implemented through a combination of products, tools and alerts which can be found through the following tabs along with expert support provided by the teams constituting the SWE Network. Should you require further guidance in the use of this service, or have specific questions about any aspects of the service presented here, don't hesitate to contact the Helpdesk.

AVIDOS	ANeMoS	RadSEP	IMPC
RTIM	EIS	IONMON	SWE Data

A number of tools and products are available through this service, such as:

- the Aviation Dosimetry (AVIDOS) tools providing a real-time assessment of cosmic radiation exposure at flight altitudes;
- the Athens Neutron Monitoring Station (ANEMOS) providing tools like a real time GLE alerting system and access to multi-station neutron monitor data;
- the RadSEP product providing an SEP post-event analysis for aviation radiation exposure;
- the Ionosphere Monitoring and Prediction Center (IMPC) providing TEC maps and local scintilation indices;
- the Real-Time Ionosphere Monitor (RTIM) providing VTEC, GIVE, S4 and σ_{cp} maps;
- the European Ionosonde Service (EIS) providing TEC and foF2 maps, and ionospheric condition at several locations;
- the Ionosphere Monitoring Facility (IONMON) providing TEC maps;
- the Space Weather Data Browsing and Analysis (SWE Data) provides access to space weather environment data.

This service page is curated by the ESC Space Radiation. For further information, please contact **SSCC Help-desk**.

Service Matrix

Acronym	Name	P2-SWE-I NR2	P2-SWE-I NR3
SCD/arv	Environment specification: data archive	x	
SCD/pst	Post event analysis for satellite designers	x	
SCD/pla	Space Weather in the Solar System	x	
SCO/orb	In-orbit environment and effects monitoring	x	
SCO/pla	Space Weather in the Solar System	x	
SCH/pst	Cumulative crew radiation exposure	x	
TIO/tcr	Near real-time TEC maps	x	
TIO/tcf	Forecast TEC maps	x	
TIO/qua	Quality assessment of ionospheric correction		x
TIO/sci	Near real-time ionospheric scintillation maps	x	
TIO/for	Monitoring and forecast of ionospheric disturbances	x	
SST/atm	Atmospheric estimates for drag calculations		x
SST/arv	Archive of geomagnetic and solar indices for drag calculation	x	
SST/for	Forecast of geomagnetic and solar indices for drag calculation		x
SST/ion	Nowcast of ionospheric group delay		
NSO/air	Service to airlines	x	
NSO/res	Service to resource exploitation system operators	x	
NSO/tou	Service to auroral tourism sector		x
NSO/pow	Service to power systems operators	x	
NSO/ppl	Service to pipeline operators		x
GEN/lst	Latest data guaranteed service	x	
GEN/for	Space weather nowcast and forecast products (daily, weekly)	x	
GEN/alm	Event based alarms	x	
GEN/mod	Virtual space weather modelling system		X
		17 (preliminay)	23 (preliminary)

Common procedures and Standards

- Federated network requires understanding of a heterogeneous system
  - Airbus providing external review and perspective on network operation and availability
  - Initial availability results indicate 98% (close to 99% target)

- Within SSA Period 2:
  - Common templates as a means for reporting and information exchange
  - Common requirements for product acceptance testing
    - 80 products deployed with consistent approach during 2016
  - Shadow SLA
    - Template provided by Airbus
    - ESCs implementing associated monitoring procedures
    - First results expected April 2017

Development & Looking forward

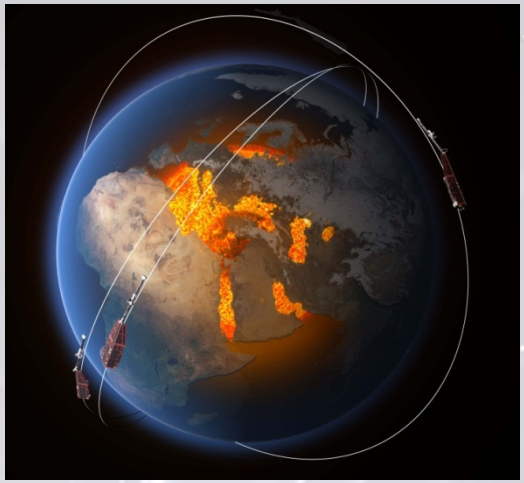
ESCs Thematic Workshops

ESA/ESOC, Darmstadt

10-12 May 2016

- Thematic focus
- 70 participants, from 18 member states
- 32 sessions (incl. 8 inter-ESC sessions)
- Focus on:
  - New & in development products
  - External assets/new external development
  - Inter-ESC product linkages
- Key inputs:
  - Definition & development plans
  - SWE Rmap recommendations

Network participation and expansion



- Current total of >30 teams spread across all 5 ESCs
- > 140 products expected as a result of P2 developments

- Additional targeted service developments:
  - P2-SWE-XIII KO in November 2016
  - P2-SWE-XXIV Q1/2017
- Looking towards Period 3:
  - identify key assets/expertise/development requirements
  - Roadmap review & update
  - Targeted development
  - Development of SWE Network as a system

THANK YOU

swe.ssa.esa.int
www.esa.int

European Space Agency