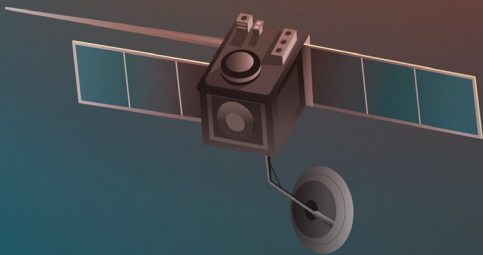


THE ESA SPACE WEATHER SERVICE NETWORK & YOU



The European Space Agency's (ESA) Space Weather (SWE) Service Network is now expanding the scope of its end user engagement activities and is providing more ways for users of our targeted pre-operational services to get involved. Keep reading to find out how to work with us, become a part of our community and help steer the direction of future developments!

SPACE WEATHER AND ESA

The effects of space weather are observed in a wide variety of domains spanning from space to the ground; from spacecraft operations through to power system distribution and everything in between. In space this may be seen in the degradation of spacecraft communications, performance, reliability, and lifetime or even increased risk to human health on human spaceflight. On the ground we may expect damage to aircraft electronics, enhanced radiation doses for air passengers and crew, disruption to power distribution networks and pipelines and degradation of HF radio communications. These critical areas where space weather can impact economically vital infrastructure makes monitoring the risk of space hazards increasingly important.

ESA's Space Safety Programme (S2P) aims at mitigating and preventing the effects of hazards from space, protecting our 'Pale Blue Dot', its inhabitants, and our vital infrastructure – like satellites in orbit and power grids on the ground – on which we have become so dependent. As part of the Programme, the Space Weather Office is responsible for the development of a space weather system with the objective to achieve better protection for Europe against the adverse impacts of solar activity. The key elements of this space weather system are ground-based and spaceborne measurement systems, data systems and the ESA Space Weather Service Network, which is being developed to provide timely and reliable space weather information to users (you!) by utilising and building on the wealth of high-quality expertise and assets we have available in Europe.

Developing timely and reliable space weather



EXPERT CENTRES FOCUS ON FIVE MAIN
AREAS FROM THE SUN TO EARTH

- SOLAR WEATHER
- HELIOSPHERIC WEATHER
- IONOSPHERIC WEATHER
- SPACE RADIATION
- GEOMAGNETIC CONDITIONS



THE ESA SPACE WEATHER SERVICE NETWORK

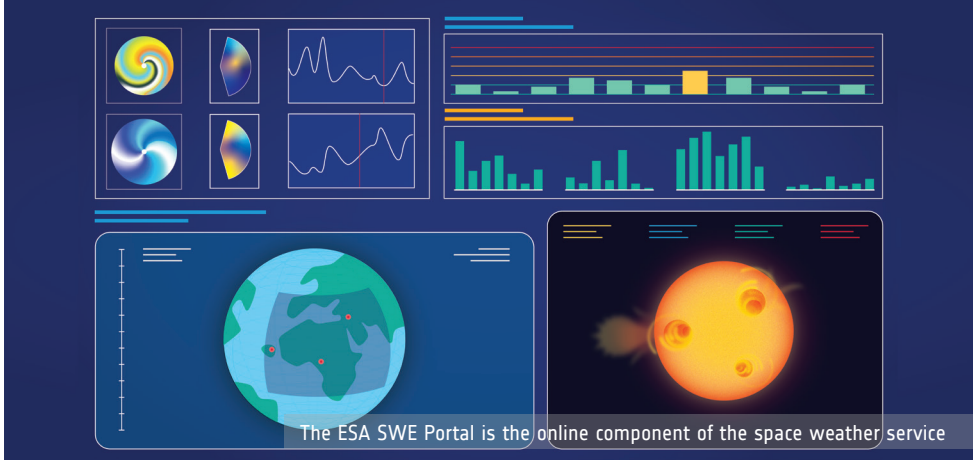
The ESA SWE Service Network is implemented through a network of Expert Service Centres (ESCs) and ESA's SSA Space Weather Coordination Centre (SSCC). Expert Groups participating in the ESCs are located across Europe at more than 40 participating institutes and organisations. ESCs each focus on a specific domain within the space weather field. The Expert Groups (EGs), which together constitute the ESCs, host the detailed scientific and technical expertise and the technical assets required for processing data and providing space weather services to customers.

The SSCC hosts a Space Weather Helpdesk with operators available to respond to queries related to SWE services or space weather conditions in general. Service users can contact the Helpdesk by email at helpdesk.swe@esa.int or by phone at +32-2-7903-913 during local office hours. The SSCC is located at the Space Pole in Brussels, Belgium. In addition, the SSCC regularly posts news and updates about the network in Twitter via [@esaspaceweather](https://twitter.com/esaspaceweather) (www.twitter.com/esaspaceweather).

The ESA Space Weather Office, located at ESA's European Space Operations Centre (ESOC), Darmstadt, Germany, is coordinating development of new applications and the enhancement of space weather systems to improve services for owners/operators of infrastructure in space and on the ground.

Expert Service Centres monitor and forecast

- **Solar Weather:** solar activity from the photosphere to the hot corona
- **Heliospheric Weather:** changing conditions in interplanetary space
- **Space Radiation:** space particle radiation and its effects
- **Ionospheric Weather:** ionospheric and upper atmospheric conditions at Earth
- **Geomagnetic Conditions:** varying conditions in Earth's magnetosphere



DELIVERING CRITICAL INFORMATION

Space weather user communities

The Space Safety Programme actively addresses space weather service users in the following domains with targeted service developments that aim to address the needs of these groups for accurate and timely space weather information:

- **Spacecraft Designers**
- **Spacecraft Operators**
- **Human Spaceflight Mission Operators**
- **GNSS System Users**
- **Communication System Users and Operators**
- **Space Surveillance and Tracking Services**
- **Power System Operators**
- **Pipeline Operators**
- **Airlines and Aerospace Sector including Regulatory Authorities**
- **Resource Exploration**
- **Auroral Tourism Sector**

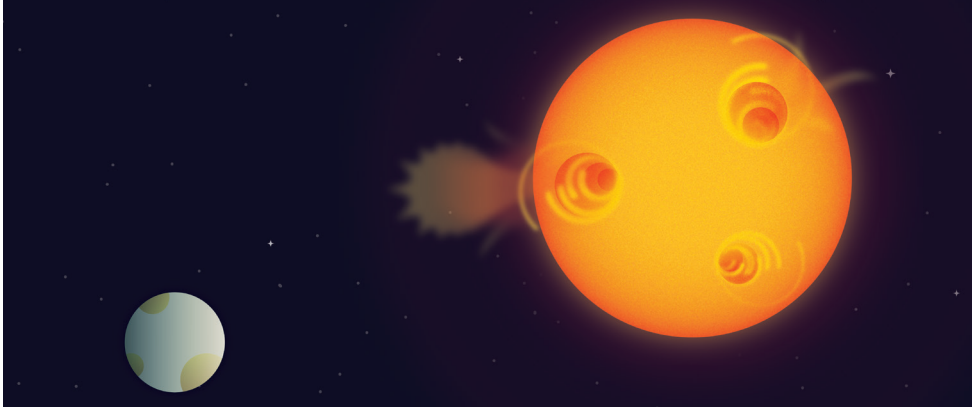
Space weather user communities



The ESA Space Weather Portal

The ESA SWE Portal is the online component of the space weather service and offers access to 29 user-tailored services targeting the above-mentioned domains and building on more than 200 individual products and tools (<https://swe.ssa.esa.int>). At the first level, users are greeted with a variety of graphs, graphics, maps and observations of the Sun portraying the current conditions in space, from data on the interplanetary medium, the solar wind and – closer to home – Earth's atmosphere and geomagnetic environment. User-friendly features such as tiles, widgets and dashboards are implemented to improve the experience and help users navigate the wealth of information provided.

The site then focusses on 12 areas or service 'domains' where products, tools, alerts and user support are gathered according to their specific needs, presented in quick-look dashboards and further organised into dedicated services. Many of the products and tools accessed via the portal can be used independently, but bringing them together and grouping them into user-driven services provides a complete picture of ongoing and upcoming space weather conditions relevant for a particular user group based on state-of-the-art scientific results and expert analysis. Through the SWE Helpdesk, users additionally have the opportunity to access a wealth of space weather expertise and support from Service Network participants who are available to provide expert support and guidance in both using the services themselves and on space weather conditions and impacts in general.



BUILDING SPACE WEATHER SERVICES

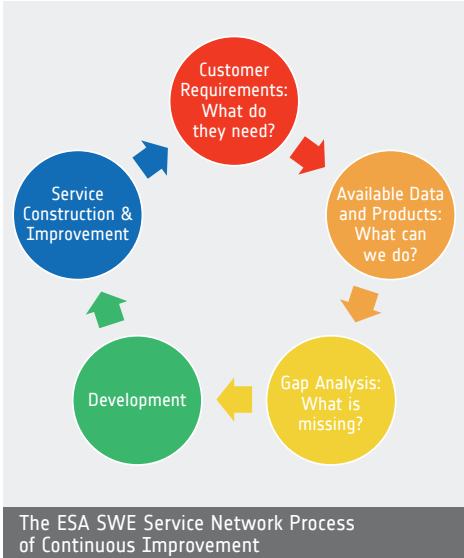
The focus and emphasis the ESA SWE Service Network places on targeted end user services highlights the importance of building and establishing relationships with users across all domains. The network operates on a philosophy of continuous improvement to ensure we are providing the most useful services that adequately capture the up-to-date requirements of all users. For this to happen, users are regularly consulted in a variety of ways to provide feedback on current capabilities and recommendations for future evolution. There are a number of ways in which users currently engage with the ESA SWE Service Network.

Targeted end user campaigns

The ESA SWE Service Network has a well-established programme of tailored end user campaigns in a number of high-priority domains. From Spacecraft Operations or Aviation to GNSS users these campaigns typically comprise tailored bulletins, dashboards and training all developed together one-on-one with the team. This involves establishing a bulletin format, content and delivery schedule by combining and tailoring the most relevant space weather information and providing it to the end user contact point(s) on a pre-agreed schedule. This type of campaign is intended to provide timely, useful information for a specific user/domain and at the same time provide us with valuable feedback on how our products and information are used. User feedback is regularly taken on board in the context of on-going developments and is typically implemented on future ESA SWE portal upgrades!

Targeted applications and product developments

The Space Safety programme actively develops both products and interactive tools (applications) and a key part of this development is engaging with target users early in the development cycle in order to refine the target use-cases being addressed. This is followed up later in the development process by running test campaigns with the targeted service users to discuss progress and further development needs. For all ESA SWE Service Network projects it is important that use cases and requirements for development are refined in order to ensure the outcome meets the needs of the community.



Dedicated training courses

We understand that the level of space weather knowledge can differ greatly between and even within the same user domain and part of our mission is to increase awareness of space weather and provide tools and resources to help users get the most out of our services. To achieve this objective the ESA SWE Service Network offers dedicated courses both on-site for individual teams as well as periodic webinars accessible to all to provide training for all levels.

Organisation of a dedicated training session first involves an initial preparation phase where a tailored course is built up by working with a user representative to understand the team's level of space weather background and knowledge of space weather effects.

- an introduction to space weather within the specific user domain
- an introduction to the ESA SWE Portal services
- Hands-on session introducing key products and tools
- interactive use-case scenario work-throughs

A presentation by the end user is also encouraged to discuss their requirements and to facilitate a two-way conversation -- this helps the ESA SWE Service Network understand the views and experiences of working with space weather from the end users' perspective.

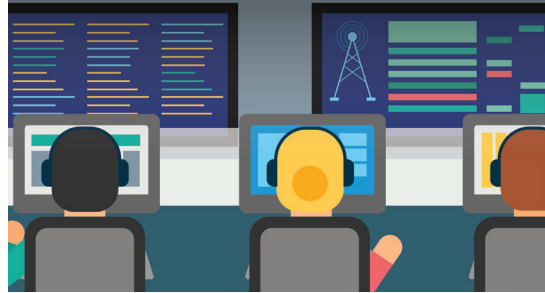
In addition, online webinars are available periodically throughout the year to registered users and typically provide introductions to the ESA SWE Service Network and how to navigate the online web portal in order to provide the greatest value. Advertisements for these events are sent via the SSCC Helpdesk to registered portal users and via the @esaspaceweather Twitter account.

Web portal and helpdesk surveys

Feedback on the ESA SWE Services can be submitted via dedicated surveys, which are published periodically on the portal, and also after any interaction with the SSCC Helpdesk via a link in the messages you receive. Registered users may be invited to participate in dedicated surveys related to the user experience of the online web portal with feedback reviewed and fed into on-going developments, as necessary. As the first port of call for user support, the SSCC



End users across all domains are regularly consulted



Helpdesk regularly reviews their level of service and all users who interact with the Helpdesk are offered the opportunity to rate their experience and leave specific feedback.

SWESNET PROJECT ROLES FOR END USERS

SWESNET is a new, two-year, ESA Space Safety Programme-funded pre-operational and development project led by BIRA/BUSOC, and carried out by a consortium of more than 50 institutes, organisations and industry which will continue the pre-operation and development of the SSCC and ESCs for this period. Within the scope of this project, the project team are able to offer new roles for end users as described below.

User Representative

This is a great way to get involved and begin to build relationships with the ESA SWE Service Network. Within this role the focus will be on you becoming a key point of contact regarding the user experience of the ESA SWE Service Portal. If you take on this role, you will be asked to participate in:

- Tailored surveys to provide feedback on ESA SWE Services



ADDITIONAL INFORMATION

ESA SWE Service Portal

<https://swe.ssa.esa.int/>

ESA SWE Service Portal Registration

<https://swe.ssa.esa.int/registration>

ESA

<https://www.esa.int>

Follow us on Twitter

@esaspaceweather

All images credit: ESA.

You may also choose to receive information about, and participate in, any of the upcoming workshops and relevant end user meetings -- we would love to meet you there!

Additional opportunities may include:

- Annual user workshops
- Annual ESA SWE Service Network review meetings
- Dedicated meetings taking place at conferences as necessary
- In-person visits from ESA SWE Service Network representatives
- Tailored surveys to provide feedback on ESA SWE web portal services

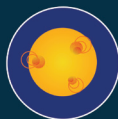
Many of these offer a unique opportunity to become a crucial member of the ESA Space Weather Service Network community and to help steer the direction of future developments.

To register your interest or find out more information, please contact the SSCC Helpdesk. We look forward to hearing from you!

SSCC Helpdesk

helpdesk.swe@esa.int

office hours: Monday to Friday, 9:00 - 17:00 (CET)



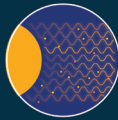
SOLAR
WEATHER



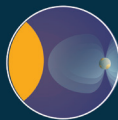
HELIOSPHERIC
WEATHER



IONOSPHERIC
WEATHER



SPACE
RADIATION



GEOMAGNETIC
CONDITIONS

