# TECHNICAL NOTE

# SSA Space Weather Network Service Product Catalogue Summary


| | |
|---|---|
| **Prepared by** | **Edith Botek** |
| | **BIRA-IASB** |



| | |
|---|---|
| **Reference** | **SSA-SWE-SSCC-TN-0011** |
| **Issue/Revision** | **5.1** |
| **Date of Issue** | **05/09/2017** |
| **Status** | **Approved** |


European Space Agency
Agence spatiale européenne

# APPROVAL

| | |
|---|---|
| **Title** SSA Space Weather Network Service Product Catalogue Summary | |
| **Issue Number** 5 | **Revision Number** 1 |
| **Author** Edith Botek | **Date** 05/09/2017 |
| **Approved By** | **Date of Approval** |
| SSA-SWE-P3SWE1 Project Manager: Erwin De Donder<br><br>Technical Officer: Alexi Glover | Erwin De Donder Digitally signed by Erwin De Donder DN: cn=Erwin De Donder, o=BIRA-IASB, ou=Space Weather, email=erwin.dedonder@aeronomie.be, c=BE Date: 2017.10.03 22:31:35 +02'00'<br><br>Alexi Glover Digitally signed by Alexi Glover DN: cn=Alexi Glover, o=ESA, ou=OPS-L, email=alexi.glover@esa.int, c=DE Date: 2017.10.10 14:44:20 +02'00' |

# CHANGE LOG

| Reason for change | Issue Nr. | Revision Number | Date |
|---|---|---|---|
| Initial release added in SWE Portal 2.2.0: http://swe.ssa.esa.int/release-notes-2.2.0 | 1 | 1 | 13 Sep 2016 |
| Updated for SWE Portal 2.3.0: http://swe.ssa.esa.int/release-notes-2.3.0 | 2 | 1 | 20 Oct 2016 |
| Update for SWE Portal 2.5.0: http://swe.ssa.esa.int/release-notes-2.5.0 | 3 | 1 | 09 Feb 2017 |
| Update for SWE Portal 2.6.0: http://swe.ssa.esa.int/release-notes-2.6.0 | 4 | 1 | 28 Apr 2017 |
| Update for SWE Portal 2.7.0: http://swe.ssa.esa.int/release-notes-2.7.0 | 5 | 1 | 05 Sep 2017 |

# CHANGE RECORD

| Issue Number 5 | Revision Number 1 | | |
|---|---|---|---|
| **Reason for change** | **Date** | **Pages** | **Paragraph(s)** |
| | | | |

# DISTRIBUTION

| Name/Organisational Unit |
|---|
| |

## Table of contents:

**PURPOSE OF THIS DOCUMENT** ..... **12**

**PART 1: SPACE WEATHER PRODUCTS** ..... **13**

**1 GEOMAGNETIC CONDITIONS PRODUCTS** ..... **14**

G.101 Magnetogrammes from North(west) Europe and Greenland ..... 15

G.102 Provisional K-indices from Northwest Europe ..... 15

G.103 Geomagnetic Activity index for auroral zone (AZ), last 33 days ..... 15

G.104 Geomagnetic Activity index for auroral zone (AZ), long term variation ..... 15

G.105 Provisional AA index ..... 16

G.106 Auroral alert and forecast service ..... 16

G.107 Quicklook Kp index (Nowcast Kp plot) ..... 16

G.108 Most recent definitive Kp index ..... 17

G.109 Kp and Ap index in tabular form ..... 17

G.110 Kp/Ap archive ..... 17

G.111 Maps for power and pipeline operators ..... 18

G.112 Table of modelled GIC ..... 18

G.113 Forecast of dB/dt ..... 18

G.114 PSP difference ..... 19

G.117 Day global forecast issued every 24 hours ..... 19

G.118 Short term (1 hour) Kp forecast ..... 19

G.119 Short term (1 hour) local geomagnetic forecast ..... 19

G.120 Real-time and historic geomagnetic activity plots and data files for geomagnetic surveying (Total field) ..... 20

G.121 Real-time and historic geomagnetic activity plots and data files for directional drilling (Total field, declination and inclination) 20

G.122 E-mail alerts for geomagnetic disturbances 20

G.123 Swarm Polar Electrojets (PEJ) 20

G.124 Swarm Field-Aligned Current (FAC) 20

G.125 Swarm Vector Magnetic Field (MAG) 21

**2 HELIOSPHERIC WEATHER PRODUCTS 22**

H.101a Solar Wind Near-Earth Forecasts 23

H.101b Forecast of solar wind high-speed streams (ESWF) 23

H.102a Near Real Time Solar Wind 23

H.103a CME Near-Earth Arrival Forecast 24

H.103b CME near-Earth arrival time predictions (Drag Based Model Tool) 24

H.105a Near Real Time Near-Earth Energetic Particles 24

H.106a Near-Earth Space Weather Alerts 25

H.106b Automated Near-Earth NRT Alerts (AWARE) 25

H.107a Solar wind Tailored Heliospheric 25

H.108a CME Tailored Heliospheric arrival predictions 26

H.110a Tailored Heliospheric Space Weather Alerts 26

H.112a Archive Product Assessment Report (HPARC-PAR) 26

H.113a Archive Product Browser (HPARC-PB) 26

H.114a AMDA 27

**3 IONOSPHERIC WEATHER PRODUCTS 28**

I.101 IMPC TEC map (Europe), current 30

I.102 IMPC TEC map (Europe), 1hr forecast 30

I.103a IMPC TEC map (Global), current 30

I.103b IMPC TEC map (Global), current, beta version (demo product not assigned to services) 31

I.104 IMPC TEC map (Global), 1hr forecast ..... 31
I.105a IMPC Equivalent slab thickness, Juliusruh ..... 31
I.105b IMPC Equivalent slab thickness, Pruhonice ..... 32
I.106a CBK Local scintillation indices S4 & SigmaPhi Hornsund ..... 32
I.106b IMPC Local scintillation indices S4 & SigmaPhi Kiruna ..... 32
I.106c IMPC Local scintillation indices S4 & SigmaPhi Neustrelitz ..... 32
I.106d IMPC Local scintillation indices S4 & SigmaPhi Tenerife ..... 33
I.106e IMPC Local scintillation indices S4 & SigmaPhi Toulouse ..... 33
I.107 RTIM VTEC maps (Northern Europe) ..... 33
I.108 RTIM GIVE maps (Northern Europe) ..... 33
I.109a RTIM ROTI maps (Northern Europe) ..... 34
I.109b RTIM ROTI@Ground maps (Fennoscandia) ..... 34
I.110a RTIM S4 maps (Northern Europe) ..... 34
I.110b RTIM SigmaPhi maps (Northern Europe) ..... 34
I.110c RTIM S4 maps (demo service, not assigned to services) ..... 35
I.110d RTIM SigmaPhi maps (demo service, not assigned to services) ..... 35
I.114 EIS European maps of foF2 long term predictions ..... 35
I.115 EIS Nowcast European maps of foF2 ..... 36
I.116 EIS Maps of forecasted foF2 over Europe for the next 24 hours ..... 36
I.117 EIS Near real-time TEC maps for the European region ..... 36
I.118 EIS Alerts for ionospheric disturbances in the European sector (based on the Alert Algorithm of the SWIF model) ..... 37
I.119 EIS Current ionospheric conditions at each ionosonde location ..... 37
I.120 EIS Forecasted foF2 values for the next 24 hours over each ionosonde ..... 37
I.121 ESA IONMON TEC maps ..... 38
I.122c ISM S4 and Err(S4) nowcast modelled maps ..... 38

I.122d ISM SigmaPhi and Err(SigmaPhi) nowcast modelled maps ..... 38
I.122e ISM TEC and Err(TEC) nowcast modelled maps ..... 38
I.122f ISM S4 and Err(S4) 6-hour forecast modelled maps ..... 39
I.122g ISM SigmaPhi and Err(SigmaPhi) 6-hour forecast modelled maps ..... 39
I.122i ISM S4 and Err(S4) nowcast modelled values at a given location ..... 39
I.122j ISM SigmaPhi and Err(SigmaPhi) nowcast modelled values at a given location ..... 40
I.122k ISM TEC and Err(TEC) nowcast modelled values at a given location ..... 40
I.122l ISM S4 and Err(S4) 6h forecast modelled values at a given location ..... 40
I.122m ISM SigmaPhi and Err(SigmaPhi) 6h forecast modelled values at a given location ..... 40
I.122o ISM S4 observed map as quality data for ISM S4 nowcast modelled maps ..... 41
I.122p ISM SigmaPhi observed map as a quality data for ISM SigmaPhi nowcast modelled maps ..... 41
I.123a MONITOR:SISTED ..... 41
I.123b MONITOR:GSFLAI ..... 42
I.124 IMPC mean ROTI maps for Europe ..... 42
I.125a SGIArv R - Daily Total Sunspot Number, archive ..... 42
I.125b SGIArv F10.7 index (measured, adjusted to 1AU, and URSI F10.7), archive ..... 43
I.125c SGIArv S10.7 index, archive ..... 43
I.125d SGIArv M10.7 index, archive ..... 43
I.125e SGIArv Y10.7 index, archive ..... 44
I.125f SGIArv F30 index (absolute), archive ..... 44
I.126a SGIArv Ap index (definitive), archive ..... 44
I.126b SGIArv Kp index (definitive), archive ..... 45
I.126c SGIArv Dst index (provisional and final), archive ..... 45
I.126d SGIArv IG12 index (provisional and final), archive ..... 45
I.126e SGIArv IMF (Bx_GSE, By_GSE, Bz_GSE, |B|_GSE), archive ..... 46
I.126f SGIArv Aa index(daily), archive ..... 46

I.127 RESOSS ROTI at ground time series (selected locations in northern Europe) ..... 46
I.128 Swarm Rate Of change of TEC (ROT) ..... 46
I.129 Swarm Total Electron Content (TEC) ..... 47
I.130 Swarm Electron Density (Ne) ..... 47
I.131 Swarm Ionospheric Bubble Index (IBI) ..... 47
**4 SPACE RADIATION PRODUCTS ..... 49**
R.101 Radiation exposure estimation at aircraft altitude (AVIDOS 2.0) ..... 51
R.102 Ground Level Enhancement (GLE) Alert service ..... 51
R.103 Space Environment Information System (SPENVIS) ..... 52
R.104 Space Environment Data System (SEDAT) ..... 52
R.106 Space Environment System for Mission Operations (SEISOP) [UNDER MAINTENANCE] ..... 52
R.107 European Debris Impact Database (EDID) ..... 53
R.108 Multi-station Neutron Monitor data ..... 53
R.109 PROBA-V/EPT electron flux spectra time series ..... 54
R.110 PROBA-V/EPT proton flux spectra time series ..... 54
R.111 PROBA-V/EPT helium flux spectra time series ..... 54
R.112 PROBA-V/EPT electron flux geographical maps ..... 55
R.113 PROBA-V/EPT proton flux geographical maps ..... 55
R.114 PROBA-V/EPT helium flux geographical maps ..... 55
R.115 PROBA-V/EPT auroral electron energy spectrum characterization ..... 55
R.116 PROBA-V/EPT SAA proton energy spectrum characterization ..... 56
R.117 PROBA-V/EPT SAA helium energy spectrum characterization ..... 56
R.118 PROBA-1/SREM radiation rates ..... 56
R.119 Integral/SREM radiation rates ..... 57
R.120 Rosetta/SREM radiation rates ..... 57
R.121 Herschel/SREM radiation rates ..... 57

R.122 Planck/SREM radiation rates ..... 57

R.128 Very high-energy Solar Energetic Particle environment mission specification: proton fluence .. 58

R.129 Very high-energy Solar Energetic Particle environment mission specification: proton peak flux ..... 58

R.130 Solar Energetic Particle event catalogue: high-energy solar proton events ..... 58

R.131 Electron Population Model (GEO) ..... 58

R.132 Electron Population Model (MEO) ..... 59

R.134 The COMESEP Alert System ..... 59

R.136 SWIFF Plasmasphere Model (SPM) ..... 59

**5 SOLAR WEATHER PRODUCTS ..... 61**

S.101 Proba2/SWAP images ..... 62

S.101c Proba2/SWAP active region annotated image ..... 62

S.102 PROBA2/LYRA ..... 62

S.103 SIDC/USET Halpha Solar images ..... 63

S.104 SIDC/USET White light Solar images ..... 63

S.105a SIDC Humain Callisto Solar Radio Spectrograms ..... 63

S.105b eCallisto ..... 64

S.105c SIDC automated Solar radio burst detections ..... 64

S.106 SDO/AIA Solar EUV images ..... 64

S.107a KH Halpha (also containing S107b) ..... 65

S.107c KH flare & filament detections ..... 65

S.107d KH flare email ..... 65

S.107e KH White light ..... 65

S.108 SIDC/SILSO International Sunspot Number ..... 66

S.109a SIDC Solar F10.7 radio flux forecast ..... 66

S.109b SIDC solar flare forecast ..... 66

S.110 SIDC Daily Space Weather Bulletin ..... 67
S.111 SIDC/CACTus Automated CME detection ..... 67
S.112 SIDC fast alerts ..... 67
S.112a SIDC Solar GOES-flare alert ..... 68
S.112b SIDC/CACTus Automated halo CME alert ..... 68
S.112z SIDC Human operator alert moderation ..... 68
S.113 SIDC all quiet alert ..... 68
S.121 Latest Catania continuum image ..... 69
S.122 Latest Catania Halpha image ..... 69
S.123a USSPS from Catania ..... 69
S.124 Athens Effective Solar Flare Forecasting (A-EFFort) ..... 70
**PART 2: EXPERT GROUPS ..... 71**
**1 ATHENS NEUTRON MONITOR STATION (ANEMOS), NKU ATHENS ..... 74**
**2 BIRA-IASB SPACE WEATHER SERVICES ..... 74**
**3 CATANIA ASTROPHYSICAL OBSERVATORY (INAF) ..... 75**
**4 CENTER FOR SPACE RADIATIONS (CSR) ..... 75**
**5 CENTRE DE DONNÉES DE LA PHYSIQUE DES PLASMAS (CDPP) ..... 76**
**6 COLLECTE LOCALISATION SATELLITES (CLS) ..... 76**
**7 FINNISH METEOROLOGICAL INSTITUTE (FMI) ..... 77**
**8 HELMHOLTZ-CENTRE POTSDAM (GFZ) ..... 77**
**9 HOSTED BY THE SWE DATA CENTRE ..... 78**
**10 INSTITUTE OF 4D-TECHNOLOGIES (FHNW) ..... 78**
**11 IONOSPHERE MONITORING AND PREDICTION CENTER (IMPC) ..... 79**
**12 KANZELHÖHE OBSERVATORY (KSO) ..... 79**
**13 MULLARD SPACE SCIENCE LABORATORY (UCL) ..... 80**
**14 NATIONAL OBSERVATORY OF ATHENS (NOA) ..... 80**

**15 NORWEGIAN MAPPING AUTHORITY (NMA) ..... 81**

**16 PAUL BUEHLER ..... 81**

**17 RAL SPACE (STFC) ..... 82**

**18 RESEARCH CENTER FOR ASTRONOMY AND APPLIED MATHEMATICS (RCAAM) ..... 82**

**19 SEIBERSDORF LABORATORIES ..... 83**

**20 SOLAR INFLUENCES DATA ANALYSIS CENTER (SIDC) ..... 83**

**21 SPACE RESEARCH CENTRE (SRC) ..... 84**

**22 SPACE RESEARCH LABORATORY, DEPARTMENT OF PHYSICS AND ASTRONOMY, UNIVERSITY OF TURKU ..... 84**

**23 SWEDISH INSTITUTE OF SPACE PHYSICS (IRF) ..... 85**

**24 TECHNICAL UNIVERSITY OF DENMARK (DTU) ..... 85**

**25 TROMSØ GEOPHYSICAL OBSERVATORY (TGO) ..... 86**

**26 UK MET OFFICE (MET) ..... 86**

**27 UNIVERSITY OF GRAZ (UNIGRAZ), INSTITUTE OF PHYSICS ..... 87**

## Purpose of this document

The purpose of this document is to list the Space Weather data products available through the ESA SSA Space Weather Portal.

The SSA Space Weather Portal provides the main online entry point to the ESA SSA Space Weather Service Network and consequently gives access to a range of space weather products and applications for the eight SWE Service Domains ('Spacecraft design', 'Spacecraft operation', 'Human spaceflight', 'Launch operation', 'Transionospheric radio communications', 'SSA surveillance & tracking', 'Non-space system operation', 'General Data Service') and links all elements of the Space Weather Service Network, including the five Expert Service Centres.

In this document, details of each SWE data product currently available are presented as well as contact information of their provider. Note that this document does not list all Expert Groups participating in each of the Expert Centres with products in development. For this information, the reader is referred to the ESC pages available via the SSA SWE portal (http://swe.ssa.esa.int). Only groups actively providing products are listed in this document. The document will be updated following each new product deployment.

This document has been prepared by the SSA Space Weather Coordination Centre (SSCC).

Part 1 of this document lists the Space Weather data products available on the SWE Portal.

Part 2 describes the Expert Groups providing these products.

# Part 1: Space weather products

The first part of this document presents the Space Weather federated products available through the ESA SSA Space Weather Network.

The products are classified per Expert Service Centre (ESC) and Expert Group. The different ESC's and contributing number of Expert Groups currently providing SWE data products are:

| | **Number of Expert Groups** | Number of **SWE data products** |
|---|---|---|
| Geomagnetic conditions | 5 | 23 |
| Heliospheric weather | 5 | 14 |
| Ionospheric weather | 8 | 60 |
| Solar weather | 5 | 27 |
| Space radiation | 8 | 28 |

The expert groups referred to here are only those which are currently providing products, and not an exhaustive list of all EGs affiliated with each Expert Service Centre.

One chapter is dedicated per Expert Service Centre. It includes a short description of the Centre (coordinator, point of contacts and members) and a detailed description of the products grouped by product provider.

The details of each product provider are gathered in Part 2.

# 1 Geomagnetic conditions products

***ESC Coordinator***

*Daniel Martini, TGO*

***Expert groups***

**Finnish Meteorological Institute (FMI)**

*G.101 Magnetogrammes from North(west) Europe and Greenland*
*G.106 Auroral alert and forecast service*
*G.111 Maps for power and pipeline operators*
*G.112 Table of modelled GIC*
*G.114 PSP difference*

**Helmholtz-centre Potsdam (GFZ)**

*G.107 Quicklook Kp index (Nowcast Kp plot)*
*G.108 Most recent definitive Kp index*
*G.109 Kp and Ap index in tabular form*
*G.110 Kp/Ap archive*
*G.123 Swarm Polar Electrojets (PEJ)*
*G.124 Swarm Field-Aligned Current (FAC)*
*G.125 Swarm Vector Magnetic Field (MAG)*

**Solar Influences Data analysis Center (SIDC)**

*G.105 Provisional AA index*

**Swedish Institute of Space Physics (IRF)**

*G.113 Forecast of dB/dt*

**Tromsø Geophysical Observatory (TGO)**

*G.102 Provisional K-indices from Northwest Europe*
*G.103 Geomagnetic Activity index for auroral zone (AZ), last 33 days*
*G.104 Geomagnetic Activity index for auroral zone (AZ), long term variation*
*G.117 Day global forecast issued every 24 hours*
*G.118 Short term (1 hour) Kp forecast*
*G.119 Short term (1 hour) local geomagnetic forecast*
*G.120 Real-time and historic geomagnetic activity plots and data files for geomagnetic surveying (Total field)*
*G.121 Real-time and historic geomagnetic activity plots and data files for directional drilling (Total field, declination and inclination)*
*G.122 E-mail alerts for geomagnetic disturbances*

## G.101 Magnetogrammes from North(west) Europe and Greenland

***Description***

This display shows the magnetic condition in northwest Europe during the previous 24 hours in the form of time series - magnetogrammes - from 10 observing stations. They range from Svalbard and Tromsø in the auroral zone to mid-latitude in Denmark.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/fmi-federated

## G.102 Provisional K-indices from Northwest Europe

***Description***

In this figure we present last week's local K-index at four stations. The stations are Ny-Ålesund (NAL) and Tromsø (TRO) in the auroral zone, Dombås (DOB) at subauroral latitude and Brorfelde (BFE) at magnetic mid-latitude.

***Provider***

*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/tgo-federated

## G.103 Geomagnetic Activity index for auroral zone (AZ), last 33 days

***Description***

This figure tells the geomagnetic activity as observed from Tromsø (in the auroral zone) during the last 33 days. As a measure of activity we have used an index describing the average deviation of the horizontal field component from its normal value.

***Provider***

*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/tgo-federated

## G.104 Geomagnetic Activity index for auroral zone (AZ), long term variation

***Description***

In this plot we see the magnetic activity back to 1987, i.e. during the previous two solar cycles. The activity measure is the AZ-index.

***Provider***

*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/tgo-federated

## G.105 Provisional AA index

***Description***

PROVISIONAL AA INDICES from the SIDC (RWC-Belgium), based on K indices from Hartland (UK) and Canberra (Australia)

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-G105-federated

## G.106 Auroral alert and forecast service

***Description***

The estimated present auroral oval and expected location of the oval up to 12 hours from the present are shown for Finland and Norway.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/fmi-federated

## G.107 Quicklook Kp index (Nowcast Kp plot)

***Description***

This product shows the 3-hourly nowcast Kp index of global geomagnetic activity during the present UTC day as a bar plot. The height of the bar(s) corresponds to the index value (0 to 9) and the colour represents the geomagnetic activity level (low - green (Kp < 3.3), intermediate - yellow (3 < Kp < 6.3), high - red (Kp > 6)). A smaller version of this plot is given for the preceding 6 days. The nowcast Kp values are calculated at GFZ from near real-time geomagnetic observatory data provided by the contributing observatories. Nowcast values of Kp are typically made available at the end of the measurement interval.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-kp-federated

## G.108 Most recent definitive Kp index

***Description***

This product, the so-called musical diagram, shows a plot of the 3-hourly definitive Kp index of global geomagnetic activity during approximately 5 recent solar rotations. A key at the bottom of the plot provides an explanation on how to read it and solar rotation numbers as well as UTC days are indicated in the plot. The definitive Kp is calculated from K values provided by the contributing observatories. This figure is typically produced with a lag time of one to four weeks, as K values from contributing observatories become available. The contributing observatories report these K values in half-monthly intervals with typical delay times of one or two weeks after each half-monthly interval.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-kp-federated

## G.109 Kp and Ap index in tabular form

***Description***

This product shows a table of the nowcast Kp, ap and Ap index of global geomagnetic activity for the present day and the preceding 14 days. Kp and ap are 3-hourly indices, whereas Ap is a daily index. The index values are given in one line per day. Non-existing values are indicated by 'nan'. Below the table, there are links to two downloadable ASCII-files representing the same information. One file gives Kp (in steps of 0.3 or 0.4 from 0 to 9), ap, and Ap and indicates missing values as 'nan'. The other file gives Kp*10 (in steps of 3 or 4 from 0 to 90), ap and Ap and has 99 and 999 as missing data indicator. ap values are derived from Kp. Ap is the daily average of ap. The nowcast Kp values are calculated at GFZ from near real-time geomagnetic observatory data provided by the contributing observatories. Nowcast values of Kp are typically made available at the end of the measurement interval.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-kp-federated

## G.110 Kp/Ap archive

***Description***

In this product yearly files of the definitive Kp, ap and Ap index are given back to 1932. The index values are given in one line per day. Non-existing values are indicated by 'nan'. Next to the

table, there are links to two downloadable ASCII-files representing the same information. One file gives Kp (in steps of 0.3 or 0.4 from 0 to 9), ap, and Ap and indicates missing values as 'nan'. The other file gives Kp*10 (in steps of 3 or 4 from 0 to 90), ap and Ap and has 99 and 999 as missing data indicator. ap values are derived from Kp. Ap is the daily average of ap. The definitive Kp is calculated from K values provided by the contributing observatories. The files are typically updated with a lag time of one to four weeks, as K values from contributing observatories become available. The contributing observatories report these K values in half-monthly intervals with typical delay times of one or two weeks after each half-monthly interval.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-kp-federated

## G.111 Maps for power and pipeline operators

***Description***

The electric field on the ground and geomagnetically induced currents are modelled taking geomagnetic records as inputs. GIC are shown for the Finnish and Norwegian power grids.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/fmi-federated

## G.112 Table of modelled GIC

***Description***

Text files of the modelled GIC in the Finnish and Norwegian power grids during the latest 24 hours, and similarly for the Finnish natural gas pipeline.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/fmi-federated

## G.113 Forecast of dB/dt

***Description***

Forecast of the maximum |dB/dt| for the coming 30 minutes.

***Provider***

*Swedish Institute of Space Physics (IRF)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/irf-federated

## G.114 PSP difference

***Description***

Measured and modelled GIC in the Finnish natural gas pipeline.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/fmi-federated

## G.117 Day global forecast issued every 24 hours

***Description***

Next 27-day forecast of the Ap index, produced with ARIMA algorithm.

***Provider***

*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/tgo-federated

## G.118 Short term (1 hour) Kp forecast

***Description***

Predicted hourly Kp values for last 24 hours and next ~1 hour

***Provider***

*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/tgo-federated

## G.119 Short term (1 hour) local geomagnetic forecast

***Description***

Local geomagnetic forecasts and overview for Ny-Ålesund, Tromsø and Dombås for Horizontal component, Inclination, Declination and total field.

***Provider***

*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/tgo-federated

## G.120 Real-time and historic geomagnetic activity plots and data files for geomagnetic surveying (Total field)

## G.121 Real-time and historic geomagnetic activity plots and data files for directional drilling (Total field, declination and inclination)

## G.122 E-mail alerts for geomagnetic disturbances

***Description***
Real-time and historic geomagnetic activity plots and data files for geomagnetic surveying (Total field, declination and inclination) based on data from selected stations in Norwegian magnetometer network. Ionospheric conditions plots including 2D Maps of ROTI, TEC, S4 and SigmaPhi. Time series of ROTI for a selection of sites.

***Provider***
*Tromsø Geophysical Observatory (TGO)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/resoss-federated

## G.123 Swarm Polar Electrojets (PEJ)

***Description***
The location of the Polar Electrojet (PEJ) is determined from magnetic measurements by the Swarm satellites. This product gives the possibility for studying the evolution of PEJ during geomagnetic quiet times and geomagnetic storms, in particular their migration from high- to mid-latitudes.

***Provider***
*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/potsdam-federated

## G.124 Swarm Field-Aligned Current (FAC)

***Description***
Swarm satellites provide the Field-Aligned Currents (FACs), which play an important role in magnetosphere-ionosphere interactions. They are the main mechanism of energy coupling from solar wind into high-latitude upper atmosphere. As FAC acts as connector between the

magnetosphere and ionosphere at high latitudes, exact information an FACs can help to give constraints on many physical parameters: e.g., ionospheric conductivity.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/potsdam-federated

## G.125 Swarm Vector Magnetic Field (MAG)

***Description***

Swarm satellites provide vector measurements of the magnetic field and the magnetic field intensity. Swarm MAG is provided as Level 1b (L1b) data product with a 1Hz cadence by ESA's Earth's Observation program. The data are provided in daily files in CDF format (Swarm L1b product format). The product names are MAGx_LR_1B, with x=A, B, C for the 3 satellites respectively.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/potsdam-federated

# 2 Heliospheric weather products

***ESC Coordinator***

*Chris Perry, STFC-RAL Space*

***Expert groups***

**Centre de Données de la Physique des Plasmas (CDPP)**
***H.114a AMDA***

**RAL Space (STFC)**
***H.112a Archive Product Assessment Report (HPARC-PAR)***
***H.113a Archive Product Browser (HPARC-PB)***

**University of Graz (UNIGRAZ), Institute of Physics**
***H.101b Forecast of solar wind high-speed streams (ESWF)***
***H.103b CME near-Earth arrival time predictions (Drag Based Model Tool)***

**UK Met Office (MET)**
***H.101a Solar Wind Near-Earth Forecasts***
***H.102a Near Real Time Solar Wind***
***H.103a CME Near-Earth Arrival Forecast***
***H.105a Near Real Time Near-Earth Energetic Particles***
***H.106a Near-Earth Space Weather Alerts***
***H.107a Solar wind Tailored Heliospheric***
***H.108a CME Tailored Heliospheric arrival predictions***
***H.110a Tailored Heliospheric Space Weather Alerts***

**Technical University of Denmark (DTU)**
***H.106b Automated Near-Earth NRT Alerts (AWARE)***

## H.101a Solar Wind Near-Earth Forecasts

***Description***

The Solar Wind Near-Earth forecasts are produced by Met Office Space Weather Operations Centre (MOSWOC) forecasters using the WSA-Enlil Model and SOHO LASCO coronagraph images. Displayed is an mp4 movie of theWSA-Enlil model output for Earth, any forecaster derived CME parameters that are active during the WSA-Enlil run period (two days prior and five days subsequent to the model run time) and a forecaster commentary. The WSA-Enlil movie presents output for forecast solar wind number density (top row) and velocity (bottom row).

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-selwe-federated

## H.101b Forecast of solar wind high-speed streams (ESWF)

***Description***

The ESWF is based on an empirical relation linking the area of coronal holes observed in remote sensing EUV data and high speed streams measured at Earth after about 4 days (see Vršnak, Temmer, Veronig, 2007). The service provides the extracted areas from EUV (NASA SDO/AIA 193 A) image data, as well as a graphical output of the forecasted solar wind speed at L1 for three different time-ranges. The service product is updated automatically every hour, with a delay of 2 hours to real-time, and compared to actual L1 in-situ measurements (ACE/DSCOVR).

***Provider***

*University of Graz (UNIGRAZ), Institute of Physics*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/graz-eswf-federated

## H.102a Near Real Time Solar Wind

***Description***

This product is a graphical near real time representation of the observational data available from the DSCOVR (previously ACE) satellite. This includes: * Bulk Wind Speed; * Proton Density; * Proton Temperature; * IMF Bx, By, Bz, Bt.

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-selwe-federated

## H.103a CME Near-Earth Arrival Forecast

***Description***

Based on the forecaster analysis of the WSA-Enlil Model the CME arrival time will be referenced within the forecaster commentary. The role of the forecaster commentary is to condense the complex input data sources, current and forecast environmental conditions into a succinct expert analysis of solar wind conditions including any forecast CMEs, which is delivered in clear and understandable language tailored to Met Office customer needs. Notifications will also appear at the top of the web page at different stages of the CME's transit to Earth.

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-selwe-federated

## H.103b CME near-Earth arrival time predictions (Drag Based Model Tool)

***Description***

The drag-based model (DBM) tool provides predictions of the interplanetary coronal mass ejection (ICME) travel and its arrival at an arbitrary ecliptic-plane location or at already listed planets and satellites in ecliptic-plane orbits. Calculations are based on the assumption that the dominant force in the heliospheric dynamics of ICMEs is the magnetohydrodynamical (MHD) equivalent of the aerodynamic drag (see Vršnak et al., 2013, and references therein). The background solar wind is based on the assumption to be quasi-stationary, isotropic, and having a constant speed w (Vršnak and Žic, 2007). From these approximations follows that the drag-parameter γ is constant as well. Basically, for a given set of input parameters the model provides the ICME Sun-'target' transit time, the arrival time, and the impact speed (Vršnak and Žic, 2007).

***Provider***

*University of Graz (UNIGRAZ), Institute of Physics*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/graz-dbm-federated

## H.105a Near Real Time Near-Earth Energetic Particles

***Description***

This product is a graphical representation of the observational data available from the NOAA GOES satellites. Latest available proton flux data, in three cumulative bands, >10 MeV, >50 MeV and >100 MeV and electron flux data in two bands, >0.8 MeV and >2 MeV from GOES 13 and 15 is displayed and updated every minute.

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-selwe-federated

## H.106a Near-Earth Space Weather Alerts

***Description***

This product is generated by Met Office Space Weather Operations Centre (MOSWOC) forecaster based on all available data and model output. It describes all notifications (alerts, watches, and warnings) issued including: * Radio Blackout Alerts; * Geomagnetic Watches, * Warnings & Alerts; * Proton Flux Warnings, * Alerts; Electron Flux Warnings, Alerts.

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-selwe-federated

## H.106b Automated Near-Earth NRT Alerts (AWARE)

***Description***

The Near-Earth Near-Real-Time alert service (AWARE) product provides an automated detection and subsequent classification of solar wind disturbances arriving at the L1 point. Focus is on disturbances with a potential for creating geomagnetic storms. The service requires solar wind in situ plasma and magnetic field observations. These are currently provided in NRT directly from NOAA/NASA from the ACE SWEPAM and MAG instruments. Periods of significantly enhanced magnetic field are identified and classified according to their most likely cause, being either propagating ICMEs or high speed streams creating SIRs (including CIRs). In addition, significant interplanetary shocks are identified. Independently Kp is predicted 1-2h ahead based on the latest solar wind measurements.

***Provider***

*Technical University of Denmark (DTU)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/dtu-aware-federated

## H.107a Solar wind Tailored Heliospheric

***Description***

The Heliospheric forecasts are produced by Met Office Space Weather Operations Centre (MOSWOC) forecasters using the WSA-Enlil Model and SOHO LASCO coronagraph images. Displayed is an mp4 movie of theWSA-Enlil model output for the selected targets, any forecaster derived CME parameters that are active during the WSA-Enlil run period (two days prior and five days subsequent to the model run time) and a forecaster commentary. The WSA-Enlil movie presents output for forecast solar wind number density (top row) and speed (bottom row).

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-helswe-federated

## H.108a CME Tailored Heliospheric arrival predictions

***Description***

The expected arrival time of any target directed CMEs are reported in the forecaster commentary displayed below the H.107a model output and CME input list.

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-helswe-federated

## H.110a Tailored Heliospheric Space Weather Alerts

***Description***

Space weather alerts (notifications) are provided as part of the forecaster commentary section (i.e. in conjunction with H.108a). Notifications are currently limited to assessment of high speed streams based on the H.107a heliospheric model output.

***Provider***

*UK Met Office (MET)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/metoffice-helswe-federated

## H.112a Archive Product Assessment Report (HPARC-PAR)

***Description***

The H-ESC Product Assessment Report provides a monthly overview of the events identified during the interval and the accuracy with which they could be determined. Initially this activity is focused on CME arrival and solar wind speed forecasts.

***Provider***

*RAL Space (STFC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ral-federated

## H.113a Archive Product Browser (HPARC-PB)

***Description***

The H-ESC Archive Product Browser provides access to a sub-set of the forecast, NRT and alert products made available by the Expert Groups within the H-ESC consortium. The main purpose is to provide access to historical information in support of event analysis, case studies, design work and the development of operational procedures based on realistic product timelines.

***Provider***

*RAL Space (STFC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ral-federated

## H.114a AMDA

***Description***

The Automated Multi Dataset Analysis tool provides in-situ plasma data obtained in planetary environments by spacecraft measurements and modeled / simulated data. Advanced functionalities such as visualization, data mining and statistics are also offered together with interoperability with other data centres.

***Provider***

*Centre de Données de la Physique des Plasmas (CDPP)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/cdpp-amda-federated

# 3 Ionospheric weather products

***ESC Coordinator***

*Claudia Borries, DLR*

***Expert groups***

**Collecte Localisation Satellites (CLS)**

*I.122c ISM S4 and Err(S4) nowcast modelled maps*
*I.122d ISM SigmaPhi and Err(SigmaPhi) nowcast modelled maps*
*I.122e ISM TEC and Err(TEC) nowcast modelled maps*
*I.122f ISM S4 and Err(S4) 6-hour forecast modelled maps*
*I.122g ISM SigmaPhi and Err(SigmaPhi) 6-hour forecast modelled maps*
*I.122i ISM S4 and Err(S4) nowcast modelled values at a given location*
*I.122j ISM SigmaPhi and Err(SigmaPhi) nowcast modelled values at a given location*
*I.122k ISM TEC and Err(TEC) nowcast modelled values at a given location*
*I.122l ISM S4 and Err(S4) 6h forecast modelled values at a given location*
*I.122m ISM SigmaPhi and Err(SigmaPhi) 6h forecast modelled values at a given location*
*I.122o ISM S4 observed map as quality data for ISM S4 nowcast modelled maps*
*I.122p ISM SigmaPhi observed map as a quality data for ISM SigmaPhi nowcast modelled maps*

**Hosted by the SWE Data Centre**

*I.121 ESA IONMON TEC maps*

**Norwegian Mapping Authority (NMA)**

*I.107 RTIM VTEC maps (Northern Europe)*
*I.108 RTIM GIVE maps (Northern Europe)*
*I.109a RTIM ROTI maps (Northern Europe)*
*I.109b RTIM ROTI@Ground maps (Fennoscandia)*
*I.110a RTIM S4 maps (Northern Europe)*
*I.110b RTIM SigmaPhi maps (Northern Europe)*
*I.110c RTIM S4 maps (demo service, not assigned to services)*
*I.110d RTIM SigmaPhi maps (demo service, not assigned to services)*
*I.127 RESOSS ROTI at ground time series (selected locations in northern Europe)*

**Finnish Meteorological Institute (FMI)**

*I.123a MONITOR:SISTED*
*I.123b MONITOR:GSFLAI*

**Helmholtz-centre Potsdam (GFZ)**

*I.128 Swarm Rate Of change of TEC (ROT)*
*I.129 Swarm Total Electron Content (TEC)*
*I.130 Swarm Electron Density (Ne)*
*I.131 Swarm Ionospheric Bubble Index (IBI)*

**National Observatory of Athens (NOA)**

*I.114 EIS European maps of foF2 long term predictions*
*I.115 EIS Nowcast European maps of foF2*
*I.116 EIS Maps of forecasted foF2 over Europe for the next 24 hours*
*I.117 EIS Near real-time TEC maps for the European region*
*I.118 EIS Alerts for ionospheric disturbances in the European sector (based on the Alert Algorithm of the SWIF model)*
*I.119 EIS Current ionospheric conditions at each ionosonde location*
*I.120 EIS Forecasted foF2 values for the next 24 hours over each ionosonde*

**Space Research Centre (SRC)**

*I.125a SGIArv R - Daily Total Sunspot Number, archive*
*I.125b SGIArv F10.7 index (measured, adjusted to 1AU, and URSI F10.7), archive*
*I.125c SGIArv S10.7 index, archive*
*I.125d SGIArv M10.7 index, archive*
*I.125e SGIArv Y10.7 index, archive*
*I.125f SGIArv F30 index (absolute), archive*
*I.126a SGIArv Ap index (definitive), archive*
*I.126b SGIArv Kp index (definitive), archive*
*I.126c SGIArv Dst index (provisional and final), archive*
*I.126d SGIArv IG12 index (provisional and final), archive*
*I.126e SGIArv IMF (Bx_GSE, By_GSE, Bz_GSE, |B|_GSE), archive*
*I.126f SGIArv Aa index(daily), archive*

**Ionosphere Monitoring and Prediction Center (IMPC)**

*I.101 IMPC TEC map (Europe), current*
*I.102 IMPC TEC map (Europe), 1hr forecast*
*I.103a IMPC TEC map (Global), current*
*I.103b IMPC TEC map (Global), current, beta version (demo product not assigned to services)*
*I.104 IMPC TEC map (Global), 1hr forecast*
*I.105a IMPC Equivalent slab thickness, Juliusruh*
*I.105b IMPC Equivalent slab thickness, Pruhonice*
*I.106a CBK Local scintillation indices S4 & SigmaPhi Hornsund*
*I.106b IMPC Local scintillation indices S4 & SigmaPhi Kiruna*
*I.106c IMPC Local scintillation indices S4 & SigmaPhi Neustrelitz*
*I.106d IMPC Local scintillation indices S4 & SigmaPhi Tenerife*
*I.106e IMPC Local scintillation indices S4 & SigmaPhi Toulouse*
*I.124 IMPC mean ROTI maps for Europe*

## I.101 IMPC TEC map (Europe), current

***Description***

DLR's TEC maps for the European region provide information about vertical TEC (VTEC) derived from groundbased GNSS measurements with a latency of not more than 5 minutes and an update rate of 15 minutes. The maps cover the region between 30°N - 72°N and 30°W - 50°E with 2° in latitudes and 2° in longitude spatial resolution.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.102 IMPC TEC map (Europe), 1hr forecast

***Description***

DLR's 1 hour forecast TEC maps for Europe provide information about the vertical TEC (VTEC) one hour ahead with a latency of not more than 5 minutes and an update rate of 15 minutes. The maps cover the European region between 30°N - 72°N and 30°W - 50°E with 2° in latitudes and 2° in longitude spatial resolution. The one hour forecast is calculated as a sum of the actual European TEC map and a weighted sum of the temporal TEC gradient of the previous hour and the temporal gradient of the previous day at the same time.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.103a IMPC TEC map (Global), current

***Description***

DLR's global TEC maps provide information about vertical TEC (VTEC) derived from groundbased GNSS measurements with a latency of not more than 5 minutes and an update rate of 15 minutes. The maps have a global coverage with 2.5° in latitudes and 5° in longitude spatial resolution.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.103b IMPC TEC map (Global), current, beta version (demo product not assigned to services)

***Description***

DLR's global TEC maps provide information about vertical TEC (VTEC) derived from groundbased GNSS measurements with a latency of not more than 5 minutes and an update rate of 15 minutes. This version of the global TEC maps is a beta version, which benefits from a new GNSS pre-processing resulting in a much better data coverage than the recent version. Please consider, the validation of this product has not been completed so far.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.104 IMPC TEC map (Global), 1hr forecast

***Description***

DLR's 1 hour forecast global TEC maps provide information about the vertical TEC (VTEC) one hour ahead with a latency of not more than 5 minutes and an update rate of 15 minutes. The maps have a global coverage with 2.5° in latitudes and 5° in longitude spatial resolution. The one hour forecast is calculated as a sum of the actual global TEC map and a weighted sum of the temporal TEC gradient of the previous hour and the temporal gradient of the previous day at the same time.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.105a IMPC Equivalent slab thickness, Juliusruh

***Description***

The equivalent slab thickness is a measure of the width of the shape of the vertical electron density profile of the ionosphere. The equivalent slab thickness is defined by the ratio of the total electron content (TEC) and the peak electron density of the local ionosphere. Local equivalent slab thickness information is provided based on vertical sounding data of the Juliusruh/Germany (JR055) ionosonde station, updated every 15 minutes.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.105b IMPC Equivalent slab thickness, Pruhonice

***Description***

The equivalent slab thickness is a measure of the width of the shape of the vertical electron density profile of the ionosphere. The equivalent slab thickness is defined by the ratio of the total electron content (TEC) and the peak electron density of the local ionosphere. Local equivalent slab thickness information is provided based on vertical sounding data of the Pruhonice/Czech Republic (PQ052) ionosonde station, updated every 15 minutes.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.106a CBK Local scintillation indices S4 & SigmaPhi Hornsund

***Description***

Scintillation indices S4 and SigmaPhi describing the amplitude/ intensity and the phase fluctuation of a received signal for the GNSS high-rate receiver in Hornsund/Norway

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.106b IMPC Local scintillation indices S4 & SigmaPhi Kiruna

***Description***

Scintillation indices S4 and SigmaPhi describing the amplitude/ intensity and the phase fluctuation of a received signal for the GNSS high-rate receiver in Kiruna/Sweden

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.106c IMPC Local scintillation indices S4 & SigmaPhi Neustrelitz

***Description***

Scintillation indices S4 and SigmaPhi describing the amplitude/ intensity and the phase fluctuation of a received signal for the GNSS high-rate receiver in Neustrelitz/Germany

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.106d IMPC Local scintillation indices S4 & SigmaPhi Tenerife

***Description***

Scintillation indices S4 and SigmaPhi describing the amplitude/ intensity and the phase fluctuation of a received signal for the GNSS high-rate receiver in Tenerife - Laguna/Spain

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.106e IMPC Local scintillation indices S4 & SigmaPhi Toulouse

***Description***

Scintillation indices S4 and SigmaPhi describing the amplitude/ intensity and the phase fluctuation of a received signal for the GNSS high-rate receiver in Toulouse/France

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.107 RTIM VTEC maps (Northern Europe)

***Description***

Map of vertical TEC for Northern Europe

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.108 RTIM GIVE maps (Northern Europe)

***Description***

Map of Grid Ionospheric Vertical Error for Northern Europe

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.109a RTIM ROTI maps (Northern Europe)

***Description***

Map of the ionospheric disturbance index Rate Of change of TEC Index for Northern Europe

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.109b RTIM ROTI@Ground maps (Fennoscandia)

***Description***

Map of the ionospheric disturbance index Rate Of change of TEC Index, as received at ground level for Northern Europe and Greenland

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.110a RTIM S4 maps (Northern Europe)

***Description***

Map of the S4 scintillation index (Northern Europe, plots and data files based on 50Hz receivers)

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.110b RTIM SigmaPhi maps (Northern Europe)

***Description***

Map of SigmaPhi scintillation index (Northern Europe, plots and data files based on 50Hz receivers)

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.110c RTIM S4 maps (demo service, not assigned to services)

***Description***

Expanded scintillation maps, including data from additional scintillation receivers which cannot be included in the real-time service. The maps are produced as they would look if the scintillation data from the additional receivers were received in real-time.

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.110d RTIM SigmaPhi maps (demo service, not assigned to services)

***Description***

Expanded scintillation maps, including data from additional scintillation receivers which cannot be included in the real-time service. The maps are produced as they would look if the scintillation data from the additional receivers were received in real-time.

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/rtim-federated

## I.114 EIS European maps of foF2 long term predictions

***Description***

The long term prediction map of fof2 for the whole European region for the current and the following 2 months, developed with data from 10 ionospheric stations, based on the SIRM/CCIR mapping routine.

***Provider***

*National Observatory of Athens (NOA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/dias-federated

## I.115 EIS Nowcast European maps of foF2

***Description***

The real time map of fof2 for the whole European region, developed with data from 10 ionospheric stations, based on the SIRMUP mapping routine. The map is made available with a latency of 20 min every hour in both ASCII and PNG formats.

***Provider***

*National Observatory of Athens (NOA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/dias-federated

## I.116 EIS Maps of forecasted foF2 over Europe for the next 24 hours

***Description***

The maps over Europe (latitude from 34 to 80 deg) of the foF2 parameter, for the next 24 hours, calculated with the SWIF forecast model and mapped using the real-time updated SIRMUP method with background models the SIRM (for mid latitudes) and the CCIR (for the high latitudes). The maps are made available with a latency of 20 min every hour in both ASCII and PNG formats.

***Provider***

*National Observatory of Athens (NOA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/dias-federated

## I.117 EIS Near real-time TEC maps for the European region

***Description***

Four different maps are produced for the European region each 15 min of the hour: the map of the integrated electron density from 90km to hmF2 (bottomside TEC), the map of the integrated electron density from hmF2 to the transition height (topside TEC), the map of the integrated electron density from the transition height to 20,000km (Plasmaspheric TEC) and the map of the integrated electron density from 90 km to 20,000 km (TEC). The mapped area extends from -10 W to 40 E in longitude and from 34 N to 60 N in latitude, and the spatial resolution of the maps is 1x1. The product is based on the 3D electron density grids that are calculated using TaD model (Belehaki et al., 2012; Kutiev et al., 2012) in DIAS system. The maps are made available with a latency of 30 min in both ASCII and PNG formats.

***Provider***

*National Observatory of Athens (NOA)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/dias-federated

## I.118 EIS Alerts for ionospheric disturbances in the European sector (based on the Alert Algorithm of the SWIF model)

***Description***
The EIS Ionospheric Alerts are calculated in the DIAS backend, and are based on the implementation of the Solar Wind driven autoregression model for Ionospheric short-term Forecast (SWIF).

***Provider***
*National Observatory of Athens (NOA)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/dias-federated

## I.119 EIS Current ionospheric conditions at each ionosonde location

***Description***
A map of Europe that presents the current level of ionospheric activity, expressed as the deviation of the observed foF2 parameter in respect to the running 30 days median. The color code (green-orange-red) corresponds to the ionospheric disturbance level (quiet - disturbed - extremely disturbed). The maps are made available with a latency of 15 min in both ASCII and PNG formats.

***Provider***
*National Observatory of Athens (NOA)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/dias-federated

## I.120 EIS Forecasted foF2 values for the next 24 hours over each ionosonde

***Description***
A map of Europe that presents the current level of ionospheric activity, expressed as the deviation of the observed foF2 parameter in respect to the running 30 days median. The color code (green-orange-red) corresponds to the ionospheric disturbance level (quiet - disturbed - extremely disturbed). The maps are made available with a latency of 15 min in both ASCII and PNG formats.

***Provider***
*National Observatory of Athens (NOA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/dias-federated

## I.121 ESA IONMON TEC maps

***Description***

The Ionosphere Monitoring Facility (IONMON, v2) is currently under development at ESA/ESOC and uses an analytic function approach to describe ionospheric structures by means of vertical profile functions combined with horizontal surface functions.

***Provider***

*Hosted by the SWE Data Centre*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ionmon

## I.122c ISM S4 and Err(S4) nowcast modelled maps

***Description***

Near Real Time (nowcast) worldwide and continental map and error map of amplitude scintillation index, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122d ISM SigmaPhi and Err(SigmaPhi) nowcast modelled maps

***Description***

Near Real Time (nowcast) worldwide and continental map and error map of phase scintillation index, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122e ISM TEC and Err(TEC) nowcast modelled maps

***Description***

Near Real Time (nowcast) worldwide and continental map and error map of Total Electron Content, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122f ISM S4 and Err(S4) 6-hour forecast modelled maps

***Description***

6 hour forecast worldwide and continental maps and error maps of amplitude scintillation index, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122g ISM SigmaPhi and Err(SigmaPhi) 6-hour forecast modelled maps

***Description***

6 hour forecast worldwide and continental maps and error maps of phase scintillation index, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122i ISM S4 and Err(S4) nowcast modelled values at a given location

***Description***

Near Real Time (nowcast) values of amplitude scintillation index at a given location, and its associated error, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122j ISM SigmaPhi and Err(SigmaPhi) nowcast modelled values at a given location

***Description***

Near Real Time (nowcast) values of phase scintillation index at a given location, and its associated error, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122k ISM TEC and Err(TEC) nowcast modelled values at a given location

***Description***

Near Real Time (nowcast) values of Total Electron Content at a given location, and its associated error, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122l ISM S4 and Err(S4) 6h forecast modelled values at a given location

***Description***

6 hours graph of amplitude scintillation index at a given location, and its associated error, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122m ISM SigmaPhi and Err(SigmaPhi) 6h forecast modelled values at a given location

***Description***

6 hours graph of phase scintillation index at a given location, and its associated error, based on GISM model and assimilated data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS)

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122o ISM S4 observed map as quality data for ISM S4 nowcast modelled maps

***Description***

Observed level of amplitude scintillation at the ionospheric pierce points, based on data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS). ISM S4 observed map as a quality data for ISM S4 nowcast modelled maps

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.122p ISM SigmaPhi observed map as a quality data for ISM SigmaPhi nowcast modelled maps

***Description***

Observed level of phase scintillation at the ionospheric pierce points, based on data from dedicated scintillation receivers (MONITOR) and geodetic GNSS receivers (IGS, SOPAC, CORS). ISM SigmaPhi observed map as a quality data for ISM SigmaPhi nowcast modelled maps

***Provider***

*Collecte Localisation Satellites (CLS)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ism-public

## I.123a MONITOR:SISTED

***Description***

Sunlit Ionosphere Sudden TEC Enhancement Detector (SISTED) is monitoring simultaneous sudden enhancements in the ionospheric Total Electron Content using the drift rate of the ionospheric carrier phase product (LI) which can be derived from the GNSS signal. The drift rate is used to generate a set of three Impact Parameters (IP). An IP tells (in %) how many satellite-

receiver pairs are affected by abrupt over ionization. Sudden TEC enhancements can be associated with Solar Flare activity. SISTED has been developed in the framework of the ESA MONITOR project.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/upc-fmi-federated

## I.123b MONITOR:GSFLAI

***Description***

GNSS Solar Flare Indicator (GSFLAI) is based on the impact of ionospheric electron content as response to solar flare activity. The ionospheric response appears as a change in Vertical TEC whose time derivative has a linear dependency on the cosine of Solar Zenith Angle. This relationship can be used to create a proxy for the time derivative of Solar EUV flux (in the spectral band of 21-34 nm). The GSFLAI proxy for EUV flux rate is accurate particularly during moderate and strong activity. GSFLAI has been developed in the framework of the ESA MONITOR project.

***Provider***

*Finnish Meteorological Institute (FMI)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/upc-fmi-federated

## I.124 IMPC mean ROTI maps for Europe

***Description***

DLR's mean Rate of change of TEC index (ROTI) maps provide information about current temporal ionospheric irregularities for the European region. The Rate of TEC index (ROTI) is defined as standard deviation of the rate of TEC (ROT) assuming the ionosphere as a thin layer. ROTI is calculated from real-time data streams and associated to the ionospheric pierce points. The European map is overlaid with a grid and the averaged ROTI values for the preceeding minute falling in a certain tile are shown.

***Provider***

*Ionosphere Monitoring and Prediction Center (IMPC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/swaci-federated

## I.125a SGIArv R - Daily Total Sunspot Number, archive

***Description***

Daily total sunspot number derived by the formula: R= Ns + 10 * Ng, with Ns the number of spots and Ng the number of groups counted over the entire solar disk. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible R.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.125b SGIArv F10.7 index (measured, adjusted to 1AU, and URSI F10.7), archive

***Description***

The 10.7cm Solar Flux is a measurement of the integrated emission at 10.7cm wavelength from all sources present on the disc. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible measured, adjusted to 1AU and URSI F10.7.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.125c SGIArv S10.7 index, archive

***Description***

S10.7 index is an activity indicator of the integrated 26-34 nm solar irradiance measured by the Solar Extreme-ultraviolet Monitor (SEM) instrument on the NASA/ESA Solar and Heliospheric Observatory (SOHO) satellite. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible S10.7.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.125d SGIArv M10.7 index, archive

***Description***

The M10.7 index is derived from the Mg II core-to-wing ratio that originated from the NOAA series operational satellites, e.g., NOAA-16,-17,-18, which host the Solar Backscatter Ultraviolet

(SBUV) spectrometer. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible M10.7.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.125e SGIArv Y10.7 index, archive

***Description***

A composite solar index of the Xb10 index, Lyman-alpha emission and 81-day cantered smoothed F10.7. Xb10 index and is used to represent the daily energy that is deposited into the mesosphere and lower thermosphere. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible Y10.7.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.125f SGIArv F30 index (absolute), archive

***Description***

The F30 is the Solar Flux measured by the Nobeyama Radio Observatory, which performs daily measurements of the 30 cm radio flux on an operational 7/365 basis. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible F30.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.126a SGIArv Ap index (definitive), archive

***Description***

Planetary daily geomagnetic Ap index. Ap is derived from the Kp index by averaging the eight values of ap for each day. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible definitive daily Ap.

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/src-federated

## I.126b SGIArv Kp index (definitive), archive

***Description***
Planetary geomagnetic three-hour Kp index. Kp is obtained as the mean value of the disturbance levels in the two horizontal field components, observed at 13 selected, subauroral stations. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible definitive Kp.

***Provider***
*Space Research Centre (SRC)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/src-federated

## I.126c SGIArv Dst index (provisional and final), archive

***Description***
Dst: Disturbance storm time Index. Dst index is an index of magnetic activity derived from a network of near-equatorial geomagnetic observatories that measure the intensity of the globally symmetrical equatorial electrojet. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible final Dst index and provisional Dst index.

***Provider***
*Space Research Centre (SRC)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/src-federated

## I.126d SGIArv IG12 index (provisional and final), archive

***Description***
The IG index of solar activity are derived from the monthly median noon foF2 data available from the following thirteen ionospheric observatories. IG12 is 12-month-running mean of the ionospheric IG index. The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible final and provisional IG12 index.

***Provider***
*Space Research Centre (SRC)*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/src-federated

## I.126e SGIArv IMF (Bx_GSE, By_GSE, Bz_GSE, |B|_GSE), archive

***Description***

Interplanetary magnetic field (IMF) magnetometer measurements (total field and three components) from ACE satellite: The archive of solar and geomagnetic activity indices used in atmosphere models provides automatically accessible

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.126f SGIArv Aa index(daily), archive

***Description***

The daily Aa index is the daily average of eight aa values. Index Aa is derived from the K indices measured at two antipodal observatories. Past values of geomagnetic activity indices used in atmosphere models

***Provider***

*Space Research Centre (SRC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/src-federated

## I.127 RESOSS ROTI at ground time series (selected locations in northern Europe)

***Description***

Time series of observed ROTI, averaged over all satellites observed at the time of measurement, for a specified ground receiver location.

***Provider***

*Norwegian Mapping Authority (NMA)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/resoss-federated

## I.128 Swarm Rate Of change of TEC (ROT)

***Description***

Swarm Rate Of change of TEC is derived from Swarm Total Electron Content, which provides integrated electron density along the line of sight of a GPS ray received at the Swarm satellites (A, B, and C). The new Swarm ROT product plots are combined with the existing Swarm product

plots, TEC, electron density (Ne), and Ionospheric Bubble Index (IBI). ROT data are continuously provided with a 1 Hz cadence.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-sua-federated

## I.129 Swarm Total Electron Content (TEC)

***Description***

Swarm Total Electron Content provides integrated electron density along the line of sight of a GPS ray received at the Swarm satellites (A, B, and C). Each of the Swarm satellite receives up to 8 GPS satellite signals simultaneously; therefore, multiple TEC observations at the same coordinated universal time (UTC) are possible. TEC data are continuously provided for each received GPS satellite with a 1 Hz cadence.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-sua-federated

## I.130 Swarm Electron Density (Ne)

***Description***

Swarm electron density (Ne) is the in situ measured parameter derived from the Langmuir Probe on-board of the Swarm satellites (A, B, and C). Ne data are continuously provided with a 2 Hz cadence.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-sua-federated

## I.131 Swarm Ionospheric Bubble Index (IBI)

***Description***

Swarm Ionospheric Bubble Index (IBI) provides information on bubble climatology itself as well as on disturbance level of magnetic field data by combining electron density and magnetic field observations. Bubbles (low-latitude post-sunset plasma irregularities) are an intrinsic regular phenomenon in the F-region ionosphere that leaves severe plasma density gradients, magnetic

field variations and causes GPS signal scintillations. IBI data are continuously provided with a 1 Hz cadence.

***Provider***

*Helmholtz-centre Potsdam (GFZ)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/gfz-sua-federated

# 4 Space radiation products

***ESC Coordinator***

*Norma Crosby, BIRA-IASB*

***Expert groups***

**Athens Neutron Monitor Station (ANeMoS), NKU Athens**

***R.102 Ground Level Enhacement (GLE) Alert service***

***R.108 Multi-station Neutron Monitor data***

**Hosted by the SWE Data Centre**

***R.104 Space Environment Data System (SEDAT)***

***R.106 Space Environment System for Mission Operations (SEISOP) [UNDER MAINTENANCE]***

***R.107 European Debris Impact Database (EDID)***

**Mullard Space Science Laboratory (UCL)**

***R.131 Electron Population Model (GEO)***

***R.132 Electron Population Model (MEO)***

**Center for Space Radiations (CSR)**

***R.109 PROBA-V/EPT electron flux spectra time series***

***R.110 PROBA-V/EPT proton flux spectra time series***

***R.111 PROBA-V/EPT helium flux spectra time series***

***R.112 PROBA-V/EPT electron flux geographical maps***

***R.113 PROBA-V/EPT proton flux geographical maps***

***R.114 PROBA-V/EPT helium flux geographical maps***

***R.115 PROBA-V/EPT auroral electron energy spectrum characterization***

***R.116 PROBA-V/EPT SAA proton energy spectrum characterization***

***R.117 PROBA-V/EPT SAA helium energy spectrum characterization***

**Space Research Laboratory, Department of Physics and Astronomy, University of Turku**

***R.128 Very high-energy Solar Energetic Particle environment mission specification: proton fluence***

***R.129 Very high-energy Solar Energetic Particle environment mission specification: proton peak flux***

***R.130 Solar Energetic Particle event catalogue: high-energy solar proton events***

**Seibersdorf Laboratories**

***R.101 Radiation exposure estimation at aircraft altitude (AVIDOS 2.0)***

**Paul Buehler**

***R.118 PROBA-1/SREM radiation rates***

***R.119 Integral/SREM radiation rates***

***R.120 Rosetta/SREM radiation rates***

*R.121 Herschel/SREM radiation rates*
*R.122 Planck/SREM radiation rates*

**BIRA-IASB Space Weather Services**
*R.103 Space Environment Information System (SPENVIS)*
*R.134 The COMESEP Alert System*
*R.136 SWIFF Plasmasphere Model (SPM)*

## R.101 Radiation exposure estimation at aircraft altitude (AVIDOS 2.0)

***Description***

AVIDOS is an informational and educational software for the assessment of the radiation dose exposure caused by galactic and solar cosmic rays during flights. AVIDOS can assess radiation dose due to solar cosmic rays that are produced at or near the Sun during solar storms. It assumes a pessimistic and an optimistic scenarios resulting in a range of route doses for a flight performed during a solar storm. The code employs a multiparameter model built upon simulations of cosmic radiation exposure done using the FLUKA Monte Carlo code. It calculates both ambient dose equivalent H*(10) and effective dose E for flight routes over the whole world at typically used altitudes and for the full range of solar activity. The dose assessment procedure using AVIDOS is accredited by the Austrian office for accreditation according to European regulations and is valid in the whole Europe. AVIDOS took part in an international comparison of different codes assessing radiation exposure of aircraft crew where a fully satisfactory agreement between codes has been found.

***Provider***

*Seibersdorf Laboratories*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/avidos-federated

## R.102 Ground Level Enhancement (GLE) Alert service

***Description***

High resolution real time data from the Neutron Monitor Database (NMDB) are being used as seeders of the GLE Alert Plus. When large Solar Energetic Particle (SEP) events with sufficient energy (>500 MeV) and intensity hit the Earth's atmosphere, a ground-based neutron monitor (NM) records an intensity increase of secondary neutrons, resulting in a ground level enhancement (GLE) event. Given the high energy that is necessary for the detection of a GLE by a NM, it is evident that NM stations will register extreme SEP (GLE) events rather promptly. GLE observations by NM stations make it possible to establish a warning signal on the arrival of lower and mid energy charged particles that can damage satellite's electronics and also pose a radiation threat to astronauts and air crews. The early detection of an Earth-directed solar cosmic ray event (GLE) by NM stations provides a good chance of preventive SEP-flux monitoring, leading to an Alert with a very low probability of false alarm. GLE Alert Plus monitors the recordings of each NM station providing data to NMDB. For every minute, it calculates the moving average of the previous hour and the threshold that represents the upper limit for which the NM station is considered to be at 'Quiet' mode, for every NM. If three consecutive 1-min measurements exceed this threshold, the particular NM station is considered to be at a 'Station Alert' mode and an elapsed time window of 15 min is being triggered. In case three NM stations, independently of each other enter the 'Station Alert' mode within the aforementioned time window a General 'GLE Alert' is being marked and an Alert is issued.

***Provider***

*Athens Neutron Monitor Station (ANeMoS), NKU Athens*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/anemos-federated

## R.103 Space Environment Information System (SPENVIS)

***Description***

SPENVIS (Space Environment Information System) is a web-based interface for assessing the space environment and its effects on spacecraft systems and crews. The system is used for mission analysis and planning. SPENVIS includes several empirical models of the space environment covering mainly cosmic rays, solar energetic particles, the natural radiation belts, magnetic fields, space plasmas and the upper atmosphere. A range of engineering models are also available to help assess the effects of the space environment on spacecraft such as surface and internal charging, energy deposition, solar cell damage and SEU rates. Usually these later models take their inputs from the empirical models present in SPENVIS. The system also includes extensive background information on the space environment, the environment models and the related standards.

***Provider***

*BIRA-IASB Space Weather Services*

***Portal Entry point***

https://spenvis.ssa-swe.eu/ssa_intro_first.php

## R.104 Space Environment Data System (SEDAT)

***Description***

SEDAT is a tool for the engineering analysis of spacecraft charged particle environments. The facility provides access to the ODI database containing a large and comprehensive set of data about that environment as measured in-situ by a number of space missions. The user can select a set of space environment data appropriate to the engineering problem under study. SEDAT also offers a set of software tools, which can operate on the data retrieved from the database. These tools allow the user to carry out a wide range of engineering analyses. SEDAT is using a GUI written in Java.

***Provider***

*Hosted by the SWE Data Centre*

***Portal Entry point***

http://ssa-be-vm-fe-05p.ssa.esa.int/sedat/sedatsystem.php

## R.106 Space Environment System for Mission Operations (SEISOP) [UNDER MAINTENANCE]

***Description***

The SEISOP system provides an interface tailored towards spacecraft operators allowing comparison of space environment information with spacecraft housekeeping data. The combination of these different data types enables advanced correlation and analysis, for a better understanding of how Space Weather effects impact the status and health of the operator's spacecraft. In addition to presenting data originating from diverse external data providers, SEISOP provides several built-in Space Weather models for near-real-time forecasting of Space Weather events and alerting.

***Provider***

*Hosted by the SWE Data Centre*

***Portal Entry point***

http://swe.ssa.esa.int/space-radiation#

## R.107 European Debris Impact Database (EDID)

***Description***

EDID provides automated data processing and dissemination functions for measurements retrieved from European debris and meteoroids impact detectors. It covers impacts from the DEBIE-1, DEBIE-2 and GORID detectors. Users can access more than 3,000,000 debris and micro-meteoroid event records plus sensor and spacecraft housekeeping data via a user-friendly web interface. Filters can be defined for each available parameter and be used for regular data retrieval.

***Provider***

*Hosted by the SWE Data Centre*

***Portal Entry point***

https://ssa-be-vm-fe-01p.ssa.esa.int/edid/member/debie1_query_sci.php

## R.108 Multi-station Neutron Monitor data

***Description***

A Web interface providing access to neutron monitor data from multiple stations has been implemented. The data can be depicted in plot, ascii and csv file format while the user can select the desired time resolution of the output. The interface has been developed in HTML and PHP in a modular manner in order to be easily maintained and extended in the future. It also uses CSS, AJAX techniques, javascripts, and has a dependence on the jQuery library. The interface connects to the NMDB slave server located at the Athens Neutron Monitor Station (A.Ne.Mo.S.)

***Provider***

*Athens Neutron Monitor Station (ANeMoS), NKU Athens*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/anemos-federated

The multiple stations are hosted by:

Almaty NM, Kazakhstan (AATB); Armenian NMs; Athens NM; Greece (ATHN); Bartol (University of Delaware) NMs; Doi Inthanon, Thailand (PSNM); Dourbes NM, Belgium (DRBS); ESOI-TAU, Israel (ESOI); Guadalajara, Spain (CALM); Kerguelen (KERG) and Terre Adelie (TERA) stations, France; Kiel, Germany (KIEL, KIEL2); Koldewey Station, Spitzbergen; Lomnicky stit, Slovakia (LMKS); Oulu, Finland (OULU); Plateau de Bure NM, France (BURE); RUSSIAN NMs; Rome, Italy (ROME); Swiss NMs; Zugspitze, Germany

## R.109 PROBA-V/EPT electron flux spectra time series

***Description***

Time series of electron flux spectra in the energy range 0.5-8 MeV as measured by the Energetic Particle Telescope (EPT) on board PROBA-V.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.110 PROBA-V/EPT proton flux spectra time series

***Description***

Time series of proton flux spectra in the energy range 10-248 MeV as measured by the Energetic Particle Telescope (EPT) on board PROBA-V.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.111 PROBA-V/EPT helium flux spectra time series

***Description***

Time series of helium flux spectra in the energy range 38-980 MeV as measured by the Energetic Particle Telescope (EPT) on board PROBA-V.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.112 PROBA-V/EPT electron flux geographical maps

***Description***

The weekly averaged electron flux in each energy channel in the energy range 0.5-8 MeV as measured by the Energetic Particle Telescope (EPT) on board PROBA-V are provided as a function of geographical position.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.113 PROBA-V/EPT proton flux geographical maps

***Description***

The weekly averaged proton flux in each energy channel in the energy range 9-300 MeV as measured by the Energetic Particle Telescope (EPT) on board PROBA-V are provided as a function of geographical position.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.114 PROBA-V/EPT helium flux geographical maps

***Description***

The weekly averaged helium flux in each energy channel in the energy range 38-980 MeV as measured by the Energetic Particle Telescope (EPT) on board PROBA-V are provided as a function of geographical position.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.115 PROBA-V/EPT auroral electron energy spectrum characterization

***Description***

Energy spectrum characterization of the auroral electrons in the energy range 0.5-8 MeV based on PROBA-V/EPT measurements. Auroral electrons are selected based on geographic

coordinates (southern hemisphere vs northern hemisphere) and on L coordinates (L>3) and the resulting fluxes averaged over a time interval of a week.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.116 PROBA-V/EPT SAA proton energy spectrum characterization

***Description***

Energy spectrum characterization of the South Atlantic Anomaly (SAA) protons in the energy range 10-248 MeV based on PROBA-V/EPT measurements. ). For a predefined grid covering the SAA the proton spectra are averaged over a time interval of a week. They are subdivided into two categories: night data when EPT is looking eastwards and day data when EPT is looking eastwards.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.117 PROBA-V/EPT SAA helium energy spectrum characterization

***Description***

Energy spectrum characterization of the South Atlantic Anomaly (SAA) helium in the energy range 38-980 MeV based on PROBA-V/EPT measurements. ). For a predefined grid covering the SAA the helium spectra are averaged over a time interval of a week.

***Provider***

*Center for Space Radiations (CSR)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/csr-ept-federated

## R.118 PROBA-1/SREM radiation rates

***Description***

Daily radiation situation reports based on data from the PROBA-1/SREM instrument

***Provider***

*Paul Buehler*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/pb-srem-federated

## R.119 Integral/SREM radiation rates

***Description***
Daily radiation situation reports based on data from the Integral/SREM instrument

***Provider***
*Paul Buehler*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/pb-srem-federated

## R.120 Rosetta/SREM radiation rates

***Description***
Daily radiation situation reports based on data from the Rosetta/SREM instrument

***Provider***
*Paul Buehler*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/pb-srem-federated

## R.121 Herschel/SREM radiation rates

***Description***
Daily radiation situation reports based on data from the Herschel/SREM instrument

***Provider***
*Paul Buehler*

***Portal Entry point***
http://swe.ssa.esa.int/web/guest/pb-srem-federated

## R.122 Planck/SREM radiation rates

***Description***
Daily radiation situation reports based on data from the Planck/SREM instrument

***Provider***
*Paul Buehler*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/pb-srem-federated

## R.128 Very high-energy Solar Energetic Particle environment mission specification: proton fluence

***Description***

The very high-energy proton fluence in the near-Earth interplanetary space integrated over the mission for a user-specified mission length (0.5-7 years) and confidence level (e.g., 90, 95, 99%).

***Provider***

*Space Research Laboratory, Department of Physics and Astronomy, University of Turku*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/utu-srl-federated

## R.129 Very high-energy Solar Energetic Particle environment mission specification: proton peak flux

***Description***

The very high-energy proton peak flux in the near-Earth interplanetary space integrated over the mission for a user-specified mission length (0.5-7 years) and confidence level (e.g., 90, 95, 99%).

***Provider***

*Space Research Laboratory, Department of Physics and Astronomy, University of Turku*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/utu-srl-federated

## R.130 Solar Energetic Particle event catalogue: high-energy solar proton events

***Description***

A catalogue of high-energy solar proton events based on the observations in the 55-80 MeV energy channel of the SOHO/ERNE instrument.

***Provider***

*Space Research Laboratory, Department of Physics and Astronomy, University of Turku*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/utu-srl-federated

## R.131 Electron Population Model (GEO)

***Description***

Empirical model of the electron number flux of the 10 eV to 40 keV electrons at L=6-7 for different levels of solar wind velocity or geomagnetic activity. Number flux is provided in four local time sectors: 21-03 (night), 03-09 (dawn), 09-15 (day), 15-21 (dusk). Empirical model is based on the ESA Cluster II PEACE data.

***Provider***

*Mullard Space Science Laboratory (UCL)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/mssl-federated

## R.132 Electron Population Model (MEO)

***Description***

Empirical model of the electron number flux of the 10 eV to 40 keV electrons at L=4-6 for different levels of solar wind velocity or geomagnetic activity. Number flux is provided in four local time sectors: 21-03 (night), 03-09 (dawn), 09-15 (day), 15-21 (dusk). Empirical model is based on the ESA Cluster II PEACE data.

***Provider***

*Mullard Space Science Laboratory (UCL)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/mssl-federated

## R.134 The COMESEP Alert System

***Description***

The COMESEP (COronal Mass Ejections and Solar Energetic Particles: forecasting the space weather impact) project developed tools for forecasting geomagnetic storms and solar energetic particle (SEP) radiation storms, which were validated and implemented into an operational space weather alert system that runs without human intervention. When a solar flare or CME is automatically detected, the different modules of the system communicate in order to exchange information. The system displays alerts online and provides notifications for the space weather community.

***Provider***

*BIRA-IASB Space Weather Services*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/bira-comesep-federated

## R.136 SWIFF Plasmasphere Model (SPM)

***Description***

The 3D dynamic model of the plasmasphere is a semi-empirical model developed by the Solar Wind Division of the Royal Belgian Institute for Space Aeronomy. Based on physical mechanisms for plasmapause formation and trajectories of particles trapped in the Earth magnetic field, it provides the number density and the temperature of the electrons and protons inside and outside the plasmasphere, as well as the position of the plasmapause, as a function of the geomagnetic activity driven by the index Kp. During geomagnetic storms the plasmasphere is eroded and structures like plasma plumes and channels can appear. During quiet times the ionosphere refills the plasmasphere. Dynamic animations show the time evolution of the plasmasphere. The model is coupled to the International Reference Ionosphere (IRI) model to determine the number density and temperatures of the particles between 60 and 2000 km of altitude.

***Provider***

*BIRA-IASB Space Weather Services*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/bira-swiff-federated

# 5 Solar weather products

***ESC Coordinator***

*Jesse Andries, ROB*

***Expert groups***

**Kanzelhöhe Observatory (KSO)**

*S.107a KH Halpha (also containing S107b)*
*S.107c KH flare & filament detections*
*S.107d KH flare email*
*S.107e KH White light*

**Solar Influences Data analysis Center (SIDC)**

*S.101 Proba2/SWAP images*
*S.101c Proba2/SWAP active region annotated image*
*S.102 PROBA2/LYRA*
*S.103 SIDC/USET Halpha Solar images*
*S.104 SIDC/USET White light Solar images*
*S.105a SIDC Humain Callisto Solar Radio Spectrograms*
*S.105c SIDC automated Solar radio burst detections*
*S.106 SDO/AIA Solar EUV images*
*S.108 SIDC/SILSO International Sunspot Number*
*S.109a SIDC Solar F10.7 radio flux forecast*
*S.109b SIDC solar flare forecast*
*S.110 SIDC Daily Space Weather Bulletin*
*S.111 SIDC/CACTus Automated CME detection*
*S.112 SIDC fast alerts*
*S.112a SIDC Solar GOES-flare alert*
*S.112b SIDC/CACTus Automated halo CME alert*
*S.112z SIDC Human operator alert moderation*
*S.113 SIDC all quiet alert*

**Institute of 4D-Technologies (FHNW)**

*S.105b eCallisto*

**Catania Astrophysical Observatory (INAF)**

*S.121 Latest Catania continuum image*
*S.122 Latest Catania Halpha image*
*S.123a USSPS from Catania*

**Research Center for Astronomy and Applied Mathematics (RCAAM)**

*S.124 Athens Effective Solar Flare Forecasting (A-EFFort)*

## S.101 Proba2/SWAP images

***Description***

The SWAP instrument onboard the Proba2 spacecraft provides full disk solar EUV images in the 171 Angstrom bandpass. The latest level 0 quicklook image is uncalibrated and meant to monitor instrument status, while the media level image has undergone extensive calibration and image compression and enhancement processing to bring out the best of the image for Space Weather forecasting operations.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S101-federated

## S.101c Proba2/SWAP active region annotated image

***Description***

This service allows to combine sunspot group information from the Catania Observatory and active region information as distributed by NOAA (National Oceanic and Atmospheric Administration) with media level SWAP images. The service allows the user to browse back and forward in time using always the closest available observations and images.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S101c-federated

## S.102 PROBA2/LYRA

***Description***

The LYRA instrument onboard the Proba2 spacecraft registers UV and EUV irradiance using 4 different filters. Calibrated level 2 and level 3 (1 minute averaged) data is available in daily FITS-files as well as level 4 calibrated daily PNG plots. The Lyra Rescaled data provides rescaled values from the Aluminium and Zirconium channels which have been cross-calibrated with GOES X-ray data in order to provide a proxy for X-ray flare intensity. The rescaled data is available in daily TEXT files as well as daily PNG plots.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S102-federated

## S.103 SIDC/USET Halpha Solar images

***Description***

Halpha solar images are produced by the SIDC local observing facilities (Uccle Solar Equatorial Table). The CCD camera is a Qimaging Retiga 4000R. It has an inter-line transfer detector of 2048x2048 pixels. Each pixel is 7.5x7.5 micron. And the sensitive area is 15.6x15.6 mm. The H-alpha filter is made by Solar Spectrum. It has a nominal wavelength of 656.2808 nm and a bandwidth of 0.05 nm. The telescope is a Celestron 80 mm ED refractor. The images are provided in FITS files and quicklook PNGs.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S103-federated

## S.104 SIDC/USET White light Solar images

***Description***

Solar white light images are produced by the SIDC local observing facilities (Uccle Solar Equatorial Table). The CCD camera is a Qimaging Retiga 4000R. It has an inter-line transfer detector of 2048x2048 pixels. Each pixel is 7.5x7.5 micron. And the sensitive area is 15.6x15.6 mm. The telescope is a Lichtenknecker 150 mm diameter achromatic doublet refractor, equipped with full-aperture neutral-density filter with an attenuation of 100,000 (5 densities). The images are provided in FITS files and quicklook PNGs.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S104-federated

## S.105a SIDC Humain Callisto Solar Radio Spectrograms

***Description***

This page provides access to the radio spectrograms from the Callisto instrument installed in Humain (Belgium). The spectrometer is plugged to a Sun-tracking broadband antenna and is operated automatically from Brussels. The spectrum covers the band 45 - 440 MHz with 200 samples (frequencies) 4 times per second. The empty 'area' on the spectrum correspond to parts not covered intentionally to protect the instrument from high power emitters (e.g. FM band).

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S105a-federated

## S.105b eCallisto

***Description***

The CALLISTO spectrometer is a programmable heterodyne receiver built in the framework of IHY2007 and ISWI by former Radio and Plasma Physics Group (PI Christian Monstein) at ETH Zurich, Switzerland. The main applications are observation of solar radio bursts and RFI-monitoring for astronomical science, education and outreach. This product provides access to a world-wide collection of such spectrometers, called the eCallisto network. The product includes raw data and quicklook images.

***Provider***

*Institute of 4D-Technologies (FHNW)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/ecallisto-federated

## S.105c SIDC automated Solar radio burst detections

***Description***

The radio spectrograms obtained by the Callisto instrument installed in Humain (Belgium) are processed by an automated burst detection algorithm that analyses for each individual spectrum (vertical line, in time) its brightness distribution. A burst is detected when the brightness distribution varies significantly in time. The bursts are annotated on the quicklook images. Currently, the algorithm may still trigger false alerts (e.g. fast antenna motion at end and start of observations, lightning due to thunderstorms, strong interferences).

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S105c-federated

## S.106 SDO/AIA Solar EUV images

***Description***

The AIA instrument onboard the SDO spacecraft provides full disk images in several different UV and EUV wavelength bands. The SIDC redistributes AIA 1024 x 1024 pixels AIA quicklook images at a 3 minute cadence in near real time; 4096 by 4096 pixels AIA and HMI images in science quality at a 1 hour cadence; and videos for the last 24 hours of AIA images in all wavelengths for forecasting purposes.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S106-federated

## S.107a KH Halpha (also containing S107b)

***Description***

The webpage shows the latest H-alpha image and the latest hourly H-alpha movie, as component an archive of all images and daily movie is available.

***Provider***

*Kanzelhöhe Observatory (KSO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/kso-S107a-federated

## S.107c KH flare & filament detections

***Description***

The webpage shows the latest detected flares and an archive of all detected flares including flare movies is provided.

***Provider***

*Kanzelhöhe Observatory (KSO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/kso-S107c-federated

## S.107d KH flare email

***Description***

The webpage shows the latest email alert and an archive of all alert mails is provided. Subscription and unsubscription for email alerts is provided

***Provider***

*Kanzelhöhe Observatory (KSO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/kso-S107d-federated

## S.107e KH White light

***Description***

The webpage shows the latest White light image, as component an archive of all images is available

***Provider***

*Kanzelhöhe Observatory (KSO)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/kso-S107e-federated

## S.108 SIDC/SILSO International Sunspot Number

***Description***

The World Data Centre for the International Sunspot Number collects observations of sunspots from a network of about 85 observers around the world and produces the Daily International Sunspot Number and its monthly and yearly means (the time series extends back over several centuries). An Estimated Sunspot Number (EISN) is updated continuously in near real-time (5 minutes) up to the current day of the month. Provisional numbers for the past month are produced on the first day of each calendar month. A final update of the monthly provisional numbers is done after a delay of 3 months to establish the definitive Sunspot Numbers.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S108-federated

## S.109a SIDC Solar F10.7 radio flux forecast

***Description***

The forecaster on duty at the SIDC produces each day (nominal issue-time 12:30 UT) a forecast of the F10.7 radio flux as it is expected to be observed over the next 3 days (the day of issue included). The forecast is based on a combination of statistical techniques and expert judgement on the evolution of active regions on the solar disk including regions rotating onto or off the disk.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S109a-federated

## S.109b SIDC solar flare forecast

***Description***

The forecaster on duty at the SIDC produces each day (nominal issuetime 12:30 UT) a probabilistic forecast for the occurrence of X-ray flares over the next 24h time span. Probabilities are provided for flare classes C, M and X separately. A full disk as well as an active region specific forecast is provided where region identification schemes of both NOAA and

Catania Observatory are being considered. The forecast is based on a combination of statistical techniques based on the active region properties and expert judgement on the evolution of active regions on the solar disk including regions rotating onto or off the disk.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S109b-federated

## S.110 SIDC Daily Space Weather Bulletin

***Description***

The forecaster on duty at the SIDC produces each day (nominal issue-time 12:30UT) a daily bulletin of Solar and Space Weather. The bulletin includes a summary of the observed activity over the past 24h, as well as an outlook on the activity for the next days.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S110-federated

## S.111 SIDC/CACTus Automated CME detection

***Description***

CACTus is a software routine that autonomously detects coronal mass ejections (CMEs) in image sequences from SOHO/LASCO. The output is a list of events, similar to the classic catalogues, with principle angle, angular width and velocity estimation for each CME.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S111-federated

## S.112 SIDC fast alerts

***Description***

Halo CME detection alert from the SIDC/RWC Belgium

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-federated

## S.112a SIDC Solar GOES-flare alert

***Description***

The SIDC data processing pipeline analyses incoming GOES X-ray data in near real time and reports on the occurrence of X-ray flares of Classes M5 and up.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S112a-federated

## S.112b SIDC/CACTus Automated halo CME alert

***Description***

The SIDC data processing pipeline analyses the outcome of the near real time runs of the CACTus package and alerts for the occurrence of CMEs with an angular width of over 150 degrees.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S112b-federated

## S.112z SIDC Human operator alert moderation

***Description***

The forecaster on duty at the SIDC observes and processes all relevant Space Weather data, including automated feature alert processes. Based on his/her observations the forecaster on duty triggers alerts where automated processes have failed or are late and follows up and provides complementary information on the automated alerts.

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S112z-federated

## S.113 SIDC all quiet alert

***Description***

Based on the Space Weather forecasts produced by the forecaster on duty at the SIDC, periods when the overall Space Weather conditions are expected to be or remain exceptionally quiet are marked as 'All Quiet'. The conditions for marking expectations as 'All Quiet', observe a time horizon of 48 hours in the future with flaring expected to remain below C level, solar wind parameters to be at nominal levels and geomagnetic conditions to be at quiet to unsettled levels (K<4).

***Provider***

*Solar Influences Data analysis Center (SIDC)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/sidc-S113-federated

## S.121 Latest Catania continuum image

***Description***

This product consists on the publication of the latest full-disk image of the solar photosphere acquired by INAF Catania Observatory

***Provider***

*Catania Astrophysical Observatory (INAF)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/catania-S121-federated

## S.122 Latest Catania Halpha image

***Description***

This product consists on the publication of the latest full-disk image of the solar chromosphere acquired by INAF Catania Observatory

***Provider***

*Catania Astrophysical Observatory (INAF)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/catania-S122-federated

## S.123a USSPS from Catania

***Description***

Ursigram describing the characteristics of the Active Regions visible at photospheric level on the solar disk every day.

***Provider***

*Catania Astrophysical Observatory (INAF)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/catania-S123a-federated

## S.124 Athens Effective Solar Flare Forecasting (A-EFFort)

***Description***

Probabilities and advance warning of intense solar flare activity.

***Provider***

*Research Center for Astronomy and Applied Mathematics (RCAAM)*

***Portal Entry point***

http://swe.ssa.esa.int/web/guest/rcaam-federated

## Part 2: Expert groups

The second part of this document gathers contact details of the product providers.

| | Geomagnetic conditions products | Heliospheric weather products | Ionospheric weather products | Solar Weather products | Space Radiation products |
|---|---|---|---|---|---|
| Athens Neutron Monitor Station (ANeMoS), NKU Athens | | | | | 2 |
| BIRA-IASB Space Weather Services | | | | | 3 |
| Catania Astrophysical Observatory (INAF) | | | | 3 | |
| Center for Space Radiations (CSR) | | | | | 9 |
| Centre de Données de la Physique des Plasmas (CDPP) | | 1 | | | |
| Collecte Localisation Satellites (CLS) | | | 12 | | |
| Finnish Meteorological Institute (FMI) | 5 | | 2 | | |
| Helmholtz-centre Potsdam (GFZ) | 7 | | 4 | | |
| Hosted by the SWE Data Centre | | | 1 | | 3 |
| Institute of 4D-Technologies (FHNW) | | | | 1 | |

| | Geomagnetic conditions products | Heliospheric weather products | Ionospheric weather products | Solar Weather products | Space Radiation products |
|---|---|---|---|---|---|
| Ionosphere Monitoring and Prediction Center (IMPC) | | | 13 | | |
| Kanzelhöhe Observatory (KSO) | | | | 4 | |
| Mullard Space Science Laboratory (UCL) | | | | | 2 |
| National Observatory of Athens (NOA) | | | 7 | | |
| Norwegian Mapping Authority (NMA) | | | 9 | | |
| Paul Buehler | | | | | 5 |
| RAL Space (STFC) | | 2 | | | |
| Research Center for Astronomy and Applied Mathematics (RCAAM) | | | | 1 | |
| Seibersdorf Laboratories | | | | | 1 |
| Solar Influences Data analysis Center (SIDC) | 1 | | | 18 | |
| Space Research Centre (SRC) | | | 12 | | |

| | Geomagnetic conditions products | Heliospheric weather products | Ionospheric weather products | Solar Weather products | Space Radiation products |
|---|---|---|---|---|---|
| Space Research Laboratory, Department of Physics and Astronomy, University of Turku | | | | | 3 |
| Swedish Institute of Space Physics (IRF) | 1 | | | | |
| Technical University of Denmark (DTU) | | 1 | | | |
| Tromsø Geophysical Observatory (TGO) | 9 | | | | |
| UK Met Office (MET) | | 8 | | | |
| University of Graz (UNIGRAZ), Institute of Physics | | 2 | | | |

# 1 Athens Neutron Monitor Station (ANeMoS), NKU Athens

***Homepage***

**http://cosray.phys.uoa.gr**

***Affiliation***

**Panepistimiopolis**
**15771 Ilissia**
**Greece**

***Contribution to the SSA SWE network***

**Space radiation(2)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/anemos-federated**

# 2 BIRA-IASB Space Weather Services

***Homepage***

**http://www.aeronomie.be/en/services/spaceweather.htm**

***Affiliation***

**Avenue Circulaire 3**
**1180 Uccle**
**Belgium**

***Contribution to the SSA SWE network***

**Space radiation(3)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/bira-comesep-federated**
**https://spenvis.ssa-swe.eu/ssa_intro_first.php**
**http://swe.ssa.esa.int/web/guest/bira-swiff-federated**

# 3 Catania Astrophysical Observatory (INAF)

***Homepage***

**http://www.oact.inaf.it/**

***Affiliation***

**Via S. Sofia 78**
**95123 Catania**
**Italy**

***Contribution to the SSA SWE network***

**Solar weather(3)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/catania-federated**

# 4 Center for Space Radiations (CSR)

***Homepage***

**http://web.csr.ucl.ac.be/uclelicsr/**

***Affiliation***

**2 Chemin du Cyclotron**
**B-1348 Louvain-la-Neuve**
**Belgium**

***Contribution to the SSA SWE network***

**Space radiation(9)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/csr-ept-federated**

# 5 Centre de Données de la Physique des Plasmas (CDPP)

***Homepage***

**http://www.cdpp.eu**

***Affiliation***

**9, avenue du Colonel Roche**
**31028 Toulouse Cedex 4**
**France**

***Contribution to the SSA SWE network***

**Heliospheric weather(1)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/cdpp-amda-federated**

# 6 Collecte Localisation Satellites (CLS)

***Homepage***

**http://www.cls.fr**

***Affiliation***

**11, rue Hermès**
**31520 Ramonville Saint-Agne**
**France**

***Contribution to the SSA SWE network***

**Ionospheric weather(12)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/ism-public**

# 7 Finnish Meteorological Institute (FMI)

***Homepage***

**http://en.ilmatieteenlaitos.fi/**

***Affiliation***

**Erik Palménin aukio 1**
**FI-00560 HELSINKI**
**Finland**

***Contribution to the SSA SWE network***

**Geomagnetic conditions(5)**
**Ionospheric weather(2)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/raf-public**

# 8 Helmholtz-centre Potsdam (GFZ)

***Homepage***

**http://www.gfz-potsdam.de/en**

***Affiliation***

**Telegrafenberg**
**14473 Potsdam**
**Germany**

***Contribution to the SSA SWE network***

**Geomagnetic conditions(7)**
**Ionospheric weather(4)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/potsdam-federated**

# 9 Hosted by the SWE Data Centre

***Homepage***

**http://swe.ssa.esa.int/**

***Affiliation***

**Robert-Bosch-Straße 5**
**64293 Darmstadt**
**Germany**

***Contribution to the SSA SWE network***

**Ionospheric weather(1)**
**Space radiation(3)**

***Portal Entry Point***

**http://swe.ssa.esa.int/**

# 10 Institute of 4D-Technologies (FHNW)

***Homepage***

**http://www.fhnw.ch/homepage?set_language=en**

***Affiliation***

**Oxfordshire**
**OX11 0QX**
**Switzerland**

***Contribution to the SSA SWE network***

**Solar weather(1)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/ecallisto-federated**

## 11 Ionosphere Monitoring and Prediction Center (IMPC)

***Homepage***

**http://www.dlr.de/kn/en**

***Affiliation***

**Linder Höhe**
**51147 Cologne**
**Germany**

***Contribution to the SSA SWE network***

**Ionospheric weather(13)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/swaci-federated**

## 12 Kanzelhöhe Observatory (KSO)

***Homepage***

**http://www.kso.ac.at/index_en.php**

***Affiliation***

**Universitätsplatz 3**
**8010 Graz**
**Austria**

***Contribution to the SSA SWE network***

**Solar weather(4)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/kso-federated**

## 13 Mullard Space Science Laboratory (UCL)

***Homepage***

**http://www.ucl.ac.uk/mssl**

***Affiliation***

**Gower Street**
**London WC1E 6BT**
**United Kindom**

***Contribution to the SSA SWE network***

**Space radiation(2)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/mssl-federated**

## 14 National Observatory of Athens (NOA)

***Homepage***

**http://www.iono.noa.gr**

***Affiliation***

**Lofos Nymfon, Thissio, P.O. Box 20048**
**GR-11810 Athens**
**Greece**

***Contribution to the SSA SWE network***

**Ionospheric weather(7)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/dias-federated**

## 15 Norwegian Mapping Authority (NMA)

***Homepage***

**http://www.kartverket.no/en/**

***Affiliation***

**Kartverksveien 21**
**Hønefoss**
**3507 Norway**

***Contribution to the SSA SWE network***

**Ionospheric weather(9)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/rtim-federated**
**http://swe.ssa.esa.int/web/guest/resoss-federated**

## 16 Paul Buehler

***Homepage***

**https://srem.buehler-paschen.at**

***Affiliation***

**Haspelmeistergasse 15**
**1140 Viena**
**Austria**

***Contribution to the SSA SWE network***

**Space radiation(5)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/pb-srem-federated**

## 17 RAL Space (STFC)

***Homepage***

**https://www.ralspace.stfc.ac.uk//Pages/Space-weather.aspx**

***Affiliation***

**Oxfordshire**
**OX11 0QX**
**United Kindom**

***Contribution to the SSA SWE network***

**Heliospheric weather(2)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/ral-federated**

## 18 Research Center for Astronomy and Applied Mathematics (RCAAM)

***Homepage***

**http://astro.academyofathens.gr/**

***Affiliation***

**Soranou Efesiou 4**
**GR-11527 Athens**
**Greece**

***Contribution to the SSA SWE network***

**Solar weather(1)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/rcaam-federated**

## 19 Seibersdorf Laboratories

***Homepage***

**http://www.seibersdorf-laboratories.at/en/**

***Affiliation***

**Forschungszentrum**
**2444 Seibersdorf**
**Austria**

***Contribution to the SSA SWE network***

**Space radiation(1)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/avidos-federated**

## 20 Solar Influences Data analysis Center (SIDC)

***Homepage***

**http://sidc.oma.be/**

***Affiliation***

**Avenue Circulaire – Ringlaan, 3**
**1180 Brussels**
**Belgium**

***Contribution to the SSA SWE network***

**Geomagnetic conditions(1)**
**Solar weather(18)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/sidc-federated**
**http://swe.ssa.esa.int/web/guest/sidc-G105-federated**

## 21 Space Research Centre (SRC)

***Homepage***

**http://rwc.cbk.waw.pl/**

***Affiliation***

**Bartycka 18A**
**00-716 Warsaw**
**Poland**

***Contribution to the SSA SWE network***

**Ionospheric weather(12)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/src-federated**

## 22 Space Research Laboratory, Department of Physics and Astronomy, University of Turku

***Homepage***

**http://www.srl.utu.fi**

***Affiliation***

**FI-20014 University of Turku**
**Finland**

***Contribution to the SSA SWE network***

**Space radiation(3)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/utu-federated**

## 23 Swedish Institute of Space Physics (IRF)

***Homepage***

**http://irf.se**

***Affiliation***

**Box 812, SE-981 28**
**Kiruna**
**Sweden**

***Contribution to the SSA SWE network***

**Geomagnetic conditions(1)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/irf-federated**

## 24 Technical University of Denmark (DTU)

***Homepage***

**http://www.space.dtu.dk/english**

***Affiliation***

**Elektrovej building 327+328+371 and Ørsteds Plads building 348**
**DK-2800 Kgs. Lyngby**
**Denmark**

***Contribution to the SSA SWE network***

**Heliospheric weather(1)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/dtu-aware-federated**

## 25 Tromsø Geophysical Observatory (TGO)

***Homepage***

**http://www.tgo.uit.no/**

***Affiliation***

**N-9037 Tromsø**
**Norway**

***Contribution to the SSA SWE network***

**Geomagnetic conditions(9)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/tgo-federated**

## 26 UK Met Office (MET)

***Homepage***

**http://www.metoffice.gov.uk**

***Affiliation***

**FitzRoy Road**
**Exeter**
**United Kindom**

***Contribution to the SSA SWE network***

**Heliospheric weather(8)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/metoffice-selwe-federated**
**http://swe.ssa.esa.int/web/guest/metoffice-helswe-federated**

# 27 University of Graz (UNIGRAZ), Institute of Physics

***Homepage***

**https://www.uni-graz.at/en/**

***Affiliation***

**Universitätsplatz 3**
**8010 Graz**
**Austria**

***Contribution to the SSA SWE network***

**Heliospheric weather(2)**

***Portal Entry Point***

**http://swe.ssa.esa.int/web/guest/graz-eswf-federated**
**http://swe.ssa.esa.int/web/guest/graz-dbm-federated**