

Access to multi-instrument data with focus on the ionosphere using different ESPAS data sources

ESWW11, Nov. 17 - 21, 2014

Liege, Belgium

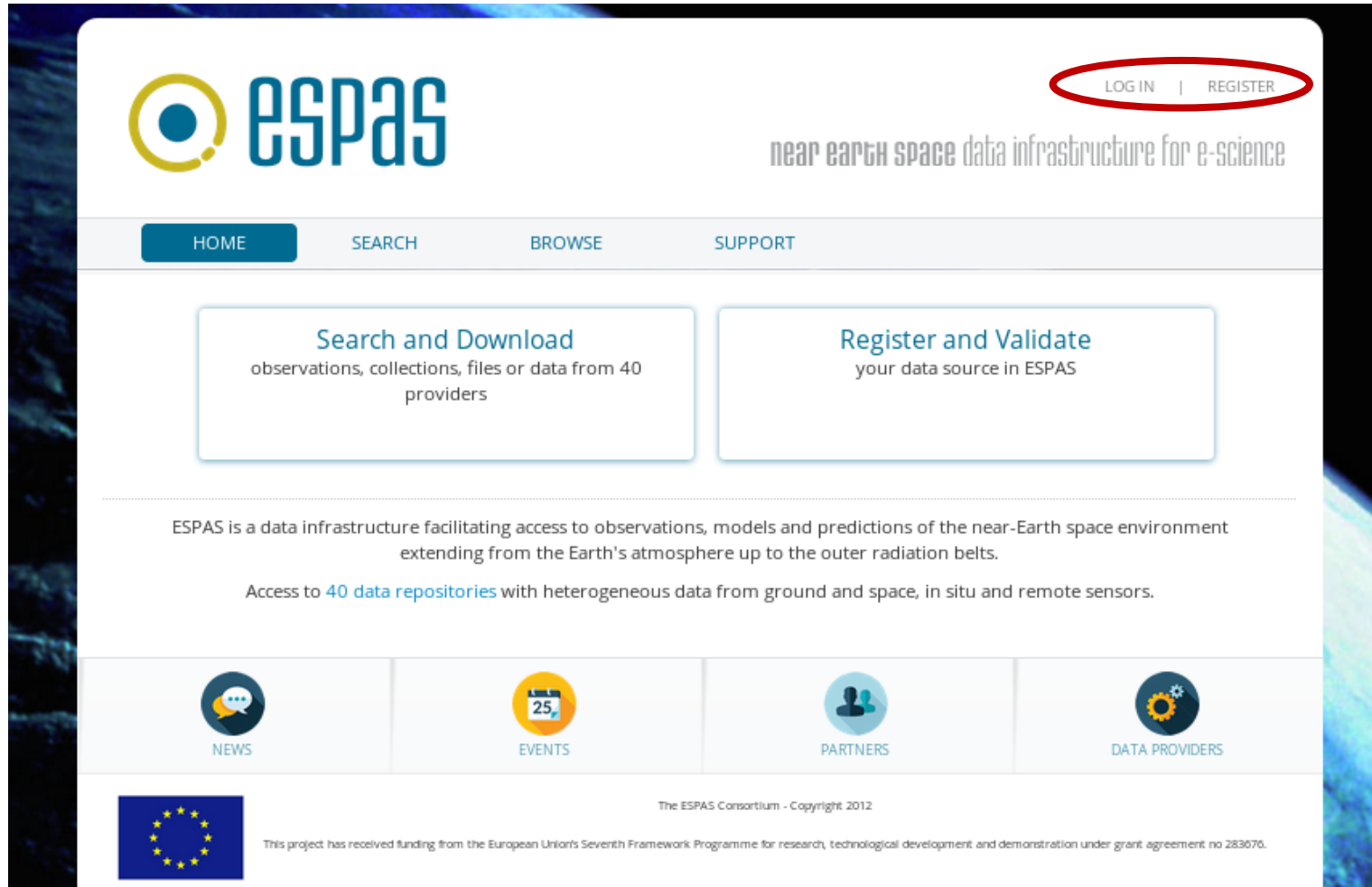
Jens Berdermann for the ESPAS consortium

Knowledge for Tomorrow



ESPAS
near earth space data infrastructure for e-science

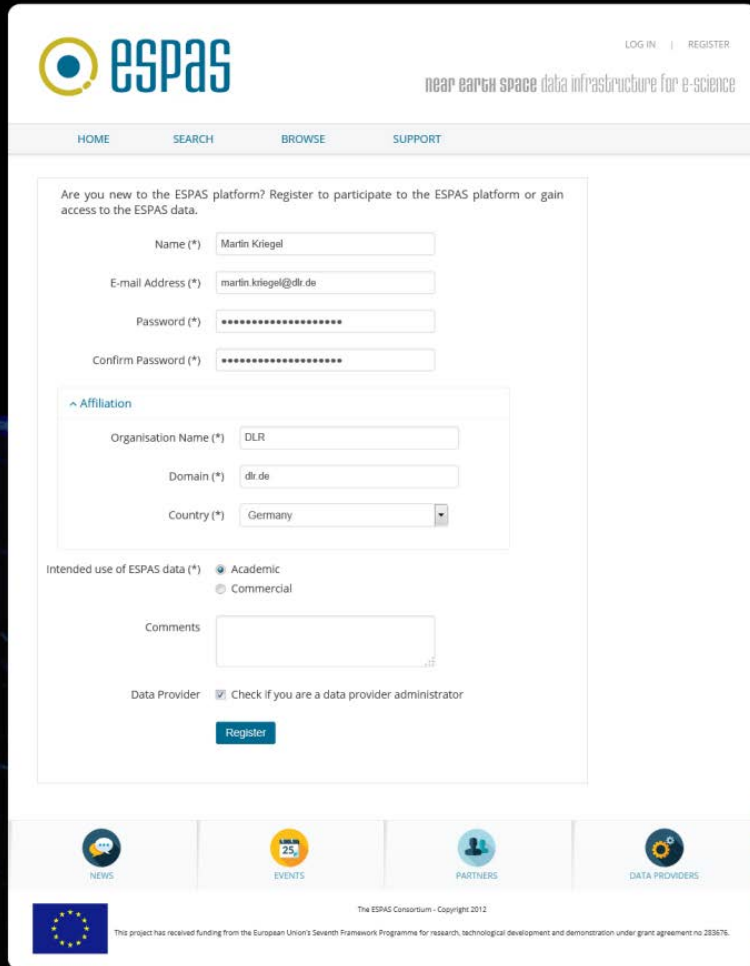
ESPAS Front Page (<https://www.espas-fp7.eu/portal/>)



The screenshot shows the ESPAS Front Page. At the top left is the ESPAS logo, consisting of a stylized 'e' in a circle followed by the text 'ESPAS'. To the right of the logo, the text 'near earth space data infrastructure for e-science' is displayed. In the top right corner, there are two links: 'LOG IN' and 'REGISTER', both of which are circled in red. Below the header is a navigation bar with four buttons: 'HOME', 'SEARCH', 'BROWSE', and 'SUPPORT'. The main content area features two large boxes. The left box is titled 'Search and Download' and contains the text 'observations, collections, files or data from 40 providers'. The right box is titled 'Register and Validate' and contains the text 'your data source in ESPAS'. Below these boxes is a paragraph of text: 'ESPAS is a data infrastructure facilitating access to observations, models and predictions of the near-Earth space environment extending from the Earth's atmosphere up to the outer radiation belts. Access to 40 data repositories with heterogeneous data from ground and space, in situ and remote sensors.' At the bottom of the main content area is a row of four icons with labels: 'NEWS' (speech bubbles), 'EVENTS' (calendar with '25'), 'PARTNERS' (two people silhouettes), and 'DATA PROVIDERS' (gears). The footer contains the European Union flag on the left, the text 'The ESPAS Consortium - Copyright 2012' in the center, and a paragraph of text on the right: 'This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283670.'



ESPAS - Registration



ESPAS near earth space data infrastructure for e-science

LOG IN | REGISTER

HOME SEARCH BROWSE SUPPORT

Are you new to the ESPAS platform? Register to participate to the ESPAS platform or gain access to the ESPAS data.

Name (*) Martin Kriegel

E-mail Address (*) martin.kriegel@dlr.de

Password (*)

Confirm Password (*)

Affiliation

Organisation Name (*) DLR

Domain (*) dlr.de

Country (*) Germany

Intended use of ESPAS data (*)
 Academic
 Commercial

Comments

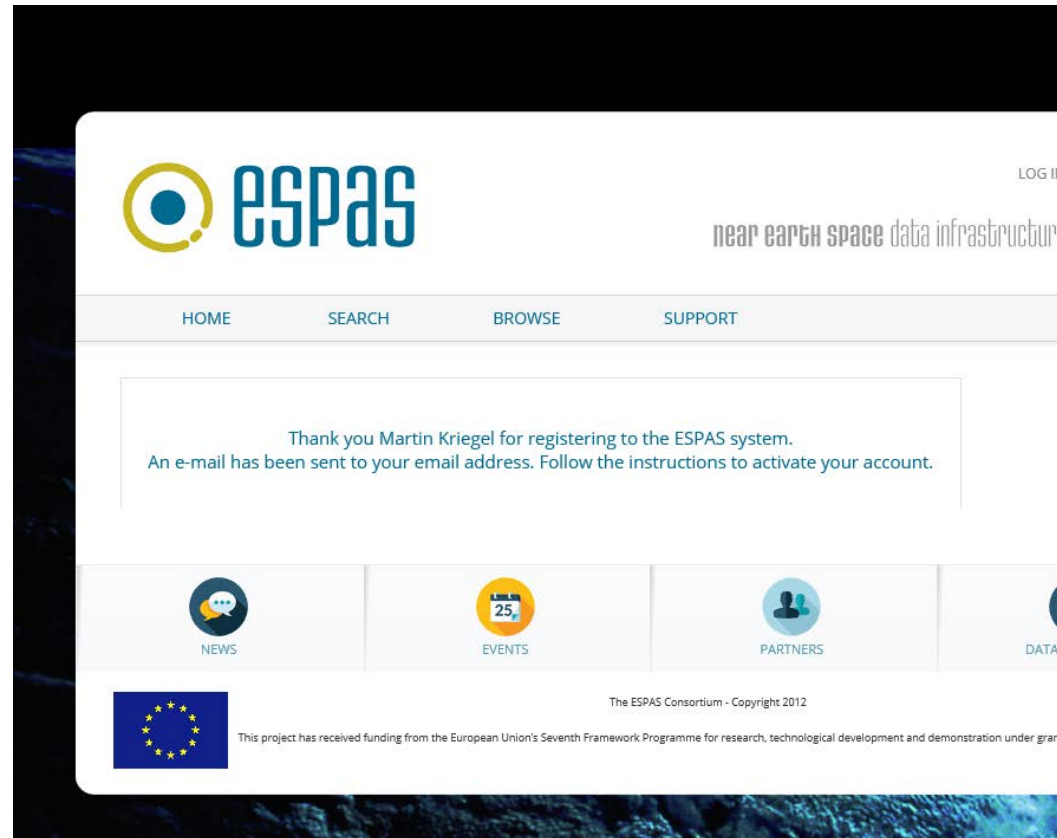
Data Provider Check if you are a data provider administrator

Register

NEWS EVENTS PARTNERS DATA PROVIDERS

The ESPAS Consortium - Copyright 2012

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 233676.



ESPAS near earth space data infrastructure for e-science

LOG IN

HOME SEARCH BROWSE SUPPORT

Thank you Martin Kriegel for registering to the ESPAS system.
An e-mail has been sent to your email address. Follow the instructions to activate your account.

NEWS EVENTS PARTNERS DATA PROVIDERS

The ESPAS Consortium - Copyright 2012

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 233676.



ESPAS Front Page – Start browse the Metadata

 LOG IN | REGISTER

near earth space data infrastructure for e-science

HOME SEARCH **BROWSE** SUPPORT

Search and Download
observations, collections, files or data from 40 providers

Register and Validate
your data source in ESPAS

ESPAS is a data infrastructure facilitating access to observations, models and predictions of the near-Earth space environment extending from the Earth's atmosphere up to the outer radiation belts.

Access to [40 data repositories](#) with heterogeneous data from ground and space, in situ and remote sensors.

 NEWS  EVENTS  PARTNERS  DATA PROVIDERS

 The ESPAS Consortium - Copyright 2012
This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283070.




ESPAS Front Page – Start browse the Metadata

The screenshot shows the ESPAS website front page. At the top left is the ESPAS logo, consisting of a stylized blue and yellow circle followed by the text 'ESPAS'. To the right of the logo are links for 'LOG IN' and 'REGISTER'. Below the logo is the tagline 'near earth space data infrastructure for e-science'. A navigation bar contains 'HOME', 'SEARCH', 'BROWSE' (highlighted in a dark blue box), and 'SUPPORT'. The main content area features a section titled 'Navigate in ESPAS' with a sub-header 'Navigate in data providers information accessible via ESPAS: platforms, projects, instruments, models, collections etc.' Below this is a search input field with the placeholder text 'Start typing to select option'. A dropdown menu is open, listing several data provider options: 'Leknes Magnetometer Data (L)', 'Longyearbyen Magnetomete', 'LYRAnominalAll (LYRAnomina', 'Maps TEC Assimilated (EU) (cc', 'Maps TEC Assimilated (Global', 'Maps TEC Gradient Latitude (', 'Maps TEC Gradient Latitude (', and 'Maps TEC Gradient Longitude'. To the right of the main content area is a sidebar titled 'IN THIS SECTION' with three links: 'Overview', 'Metadata' (highlighted in a dark blue box), and 'Statistics'.



ESPAS Front Page – Start data search

 LOG IN | REGISTER

near earth space data infrastructure for e-science

HOME

SEARCH

BROWSE

SUPPORT

Search and Download

observations, collections, files or data from 40 providers

Register and Validate

your data source in ESPAS

ESPAS is a data infrastructure facilitating access to observations, models and predictions of the near-Earth space environment extending from the Earth's atmosphere up to the outer radiation belts.


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NEWS

EVENTS

PARTNERS

DATA PROVIDERS

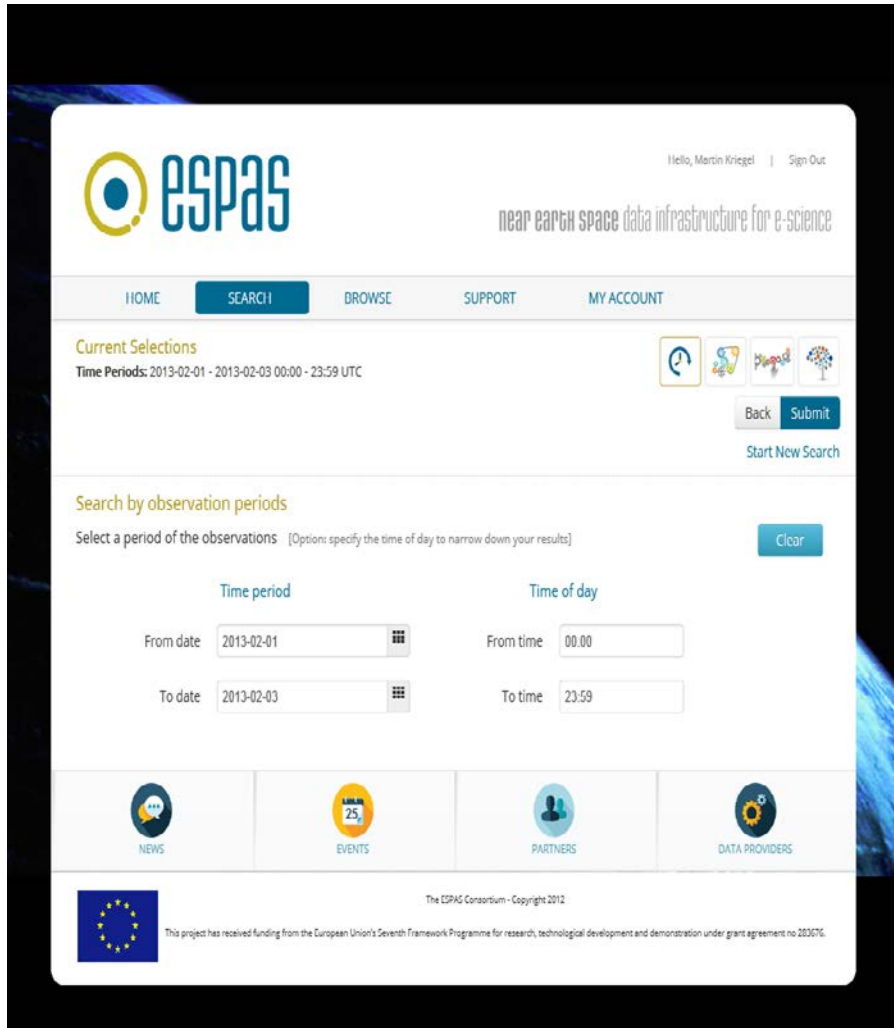


The ESPAS Consortium - Copyright 2012

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283070.



Data search using time period



The screenshot shows the ESPAS website's search interface. At the top, the ESPAS logo is on the left, and the user is logged in as "Hello, Martin Kriegel" with a "Sign Out" link. Below the logo is the tagline "near earth space data infrastructure for e-science". A navigation bar contains "HOME", "SEARCH" (highlighted), "BROWSE", "SUPPORT", and "MY ACCOUNT".

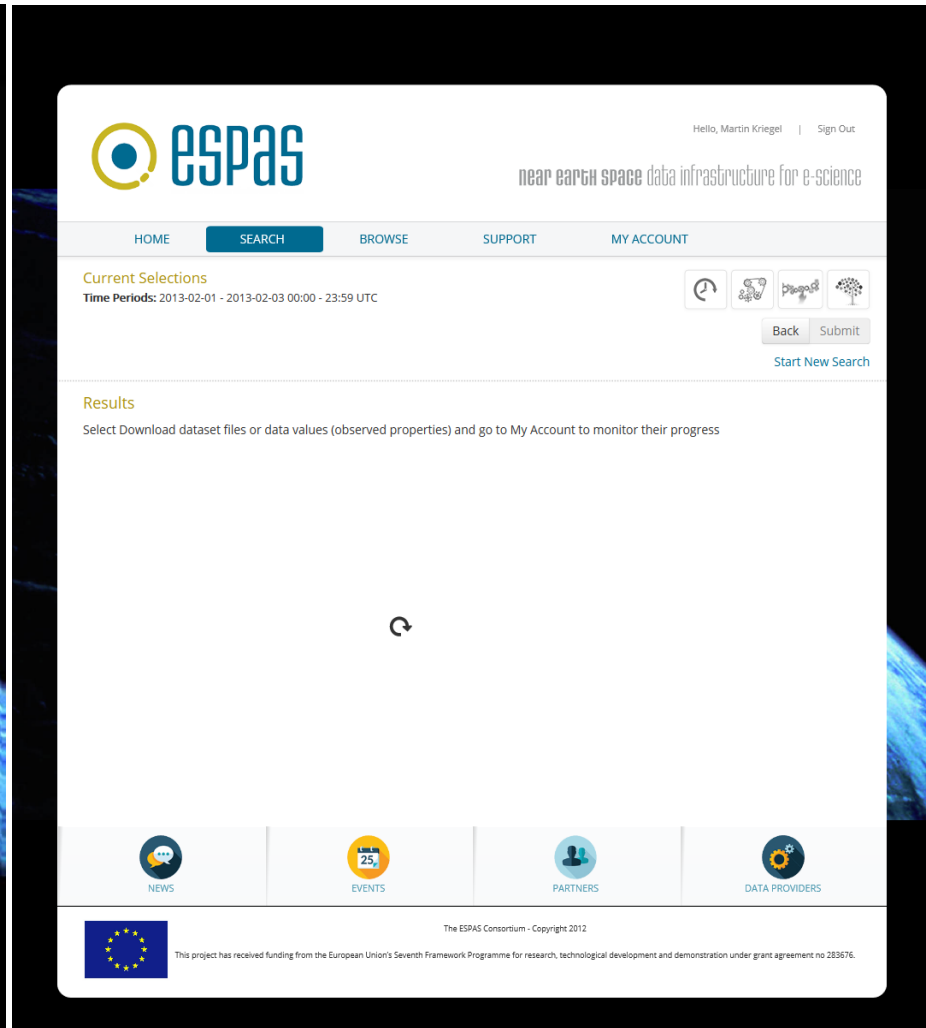
The "Current Selections" section shows the selected time period: "Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC". There are icons for refresh, download, and other actions, along with "Back" and "Submit" buttons and a "Start New Search" link.

The "Search by observation periods" section has a "Clear" button and a note: "Select a period of the observations [Options: specify the time of day to narrow down your results]".

Below this are two columns of input fields:

Time period		Time of day	
From date	2013-02-01	From time	00:00
To date	2013-02-03	To time	23:59

At the bottom, there are icons for NEWS, EVENTS, PARTNERS, and DATA PROVIDERS. A footer contains the European Union flag, the text "The ESPAS Consortium - Copyright 2012", and a funding notice: "This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283676."



The screenshot shows the ESPAS website's search results page. The top navigation and user information are identical to the previous screenshot. The "Current Selections" section shows the same time period: "Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC".

The "Results" section has a heading "Results" and a sub-heading "Select Download dataset files or data values (observed properties) and go to My Account to monitor their progress". A large loading spinner is centered on the page, indicating that the search results are still being processed.

At the bottom, there are icons for NEWS, EVENTS, PARTNERS, and DATA PROVIDERS. The footer is identical to the previous screenshot, including the European Union flag, the text "The ESPAS Consortium - Copyright 2012", and the funding notice: "This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283676."



Refine search

The screenshot shows the ESPAS (near Earth Space data infrastructure for e-science) website. At the top left is the ESPAS logo. The top right shows a user greeting: "Hello, Martin Kriegel | Sign Out". Below the logo is the tagline "near Earth Space data infrastructure for e-science". A navigation bar contains links for HOME, SEARCH, BROWSE, SUPPORT, and MY ACCOUNT. The main content area is titled "Current Selections" and shows "Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC". There are icons for a clock, a globe, a tree, and a leaf. Below these are "Back" and "Submit" buttons, and a link for "Start New Search".

The "Results" section is titled "Results" and contains the instruction: "Select Download dataset files or data values (observed properties) and go to My Account to monitor their progress".

A "Refine by" sidebar is highlighted with a red circle. It contains the following categories:

- Project
- Region of Space
- Platform
- Observation Collection
 - Model
 - Dimensionality Instance
 - Instrument
 - Dimensionality Timeline

Number of Observations : 183

Download ▾

Observation Collections

- Andenes Magnetometer Data
- Athens Digisonde SAO files (autoscaled)
- DIAS Bottomside Electron Density Nowcasting Maps
- DIAS daily f-plots of fmin,foF2 from Athens Digisonde
- DIAS daily f-plots of M(3000)F2 from Athens Digisonde
- DIAS Nowcasting Maps of MUF - transmission point: Athens (Greece)
- DIAS SIRMUP nowcasting maps of foF2
- DIAS SIRMUP nowcasting maps of M(3000)F2



Data search: Add Asset

The screenshot displays the ESPAS web interface. At the top left is the ESPAS logo, and at the top right, it says "Hello, Jens Bordenmann" and "Sign Out". Below the logo is the tagline "near earth space data infrastructure for e-science". A navigation bar contains "HOME", "SEARCH" (highlighted), "BROWSE", "SUPPORT", and "MYACCOUNT".

The main content area shows "Current Selections" with "Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC" and "Assets: Athens Digisonde". There are "Back" and "Submit" buttons, and a "Start New Search" link.

Below this is the "Search by assets" section, which includes the instruction "Select Assets on the right" and a "Clear" button.

The "Filter by" section on the left has a dropdown for "Asset Type" and a search input. Under "Instrument types", several options are listed with checkboxes: Ionosonde (checked), Vertical Ionosonde, Energetic Particle Detector, Fabry-Perot Interferometer, GNSS Dual Frequency Receiver, and Incoherent Scatter Radar.

The "Assets" section on the right has a search input and "Select All" and "Deselect All" buttons. A list of instruments is shown with checkboxes: Andeya Magnetometer, Athens Digisonde (checked), Bjernøya Geomagnetic Observatory Magnetometer, Dombås Geomagnetic Observatory Magnetometer, Danna Magnetometer, DTU Space fluxgate magnetometer, EISCAT Svalbard Radar, EISCAT Tromsø UHF Radar, EISCAT Tromsø VHF Radar, GNSS Receiver, Hopen Magnetometer, and Jäckvik Magnetometer.



near earth space data infrastructure for e-science



Data search: Add Asset

The screenshot shows the ESPAS (European Space Platform for e-Science) web interface. At the top, the ESPAS logo is on the left, and navigation links for 'HOME', 'SEARCH', 'BROWSE', 'SUPPORT', and 'MY ACCOUNT' are in the center. On the right, there are links for 'Help, User, Feedback' and 'Sign Out'. Below the navigation, the 'Current Selections' section shows 'Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC' and 'Assets: Athens Digisonde'. There are icons for 'Refresh', 'Download', 'Print', and 'Share', along with 'Back' and 'Submit' buttons and a 'Start New Search' link.

The 'Results' section includes a message: 'Select Download dataset files or data values (observed properties) and go to My Account to monitor their progress'. Below this is a box for 'Observation attributes' with a list of details: Project: European Digital Upper Atmosphere Server, Region of Space: Ionosphere, Platform: National Observatory of Athens, Instrument: Athens Digisonde, and Dimensionality Timeline: 1D Time Series. To the right, a 'Number of Observations : 3' is shown with a 'Download' button.

The 'Observation Collections' section lists 'Athens Digisonde SAO files (autoscaled)'. A description follows: 'This collection contains the SAO (text) files produced by Athens Digisonde (38.03 degrees N, 23.52 degrees W). Each SAO file contains the autoscaled characteristics for one ionogram including the echo traces h'p, echo amplitudes, frequency and range spread and most of the important ionospheric characteristics together with the electron density profile (where available). SAO stands for Standard Archiving Output format. A description of the SAO format (versions 4.2 and 4.3) can be found at: http://ulcar.uml.edu/digisonde.html'. Below the description is a table with columns for 'Date' and 'Product(s)'. The table shows one entry: '2013-01-31 21:15:00 - 2013-02-01 05:00:00' and 'AthensSAOfile (text/asc)'. There are also links for 'DIAS daily f-plots of fmin to F2 from Athens Digisonde' and 'DIAS daily f-plots of M(3000)F2 from Athens Digisonde'. At the bottom, there are icons for 'NEWS', 'EVENTS', 'PARTNERS', and 'DATA PROVIDERS'.



near earth space data infrastructure for e-science



Data search: Project



The screenshot displays the ESPAS (Near Earth Space Data Infrastructure for e-Science) search results page. At the top left is the ESPAS logo, and at the top right, the user is logged in as "Hello, Martin Kriegel" with a "Sign Out" link. Below the logo is the tagline "near earth space data infrastructure for e-science". A navigation bar includes links for HOME, SEARCH (highlighted), BROWSE, SUPPORT, and MY ACCOUNT. The "Current Selections" section shows the search criteria: "Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC". To the right of this section are icons for refresh, search, and other functions, along with "Back" and "Submit" buttons, and a "Start New Search" link. The "Results" section instructs users to "Select Download dataset files or data values (observed properties) and go to My Account to monitor their progress". It features a box for "Observation attributes" listing: Region of Space: Ionosphere, Observation Year: 2013, Model: TEC Map Processor, and Instrument: GNSS Receiver. To the right of this box, it shows "Number of Observations : 5" and a "Download" button. Below the attributes is a section for "Refine by" with expandable filters for "Project" (showing "Space Weather Application Center Ionosphere (5)") and "Platform". At the bottom of the page, there are four icons for "NEWS", "EVENTS", "PARTNERS", and "DATA PROVIDERS". The footer contains the European Union flag, the text "The ESPAS Consortium - Copyright 2012", and a funding acknowledgment: "This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283676."



Add name
for download

The screenshot displays the ESPAS (Near Earth Space Data Infrastructure for e-Science) website. At the top, the ESPAS logo is visible on the left, and the user's name 'Hello, Martin Kriegel' and a 'Sign Out' link are on the right. The main navigation bar includes 'HOME' and 'near earth space data infrastructure for e-science'. A central dialog box titled 'Dataset Files Download' is open, containing the text: 'You can give a name to your download request. If you leave it empty the default name will be the date of the request.' Below this text is a text input field labeled 'Request name' and a blue 'Download' button. The background shows search results for 'Ionosphere' observations from 2013. The 'Observation attributes' section lists: Region of Space: Ionosphere, Observation Year: 2013, Model: TEC Map Processor, and Instrument: GNSS Receiver. The 'Observation Collections' section shows 'No available Observation Collections'. The 'Refine by' section has filters for 'Project' (Space Weather Application Center Ionosphere (5)) and 'Platform'. The footer includes logos for DLR, ESPAS, and the European Union, along with copyright information for 2012 and funding details from the European Union's Seventh Framework Programme.



ESPAS
near earth space data infrastructure for e-science



Start download

The screenshot shows the ESPAS website interface. At the top left is the ESPAS logo, and at the top right is the user name 'Hello, Martin Kriegel' and a 'Sign Out' link. Below the logo is the tagline 'near earth space data infrastructure for e-science'. A navigation bar contains 'HOME', 'SEARCH', 'BROWSE', 'SUPPORT', and 'MY ACCOUNT'. The main content area shows search results for 'Time Periods: 2013-02-01 - 2013-02-03 00:00 - 23:59 UTC'. A modal dialog box titled 'Dataset Files Download' is open, displaying the message: 'Your request is being processed. Please, go to MyAccount to monitor its progress.' Below the dialog, there are sections for 'Observation attrib...' and 'Refine by' with filters for 'Project' (Space Weather Application Center Ionosphere (5)) and 'Platform'. At the bottom, there are icons for NEWS, EVENTS, PARTNERS, and DATA PROVIDERS. The footer includes the European Union flag and the text: 'The ESPAS Consortium - Copyright 2012. This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283676.'



ESPAS
near earth space data infrastructure for e-science



Check My Account for progress

The screenshot shows the ESPAS website interface. At the top left is the ESPAS logo, and at the top right is the user greeting "Hello, Martin Kriegel" with a "Sign Out" link. Below the header is a navigation bar with links for HOME, SEARCH, BROWSE, SUPPORT, and MY ACCOUNT. The "MY ACCOUNT" link is highlighted with a red oval. The main content area is titled "My Dataset File Downloads" and includes a sub-header "Check out your download requests. They have a time stamp of the request. Just click on a request to see its progress, information about it, and a list of download URLs if it is completed." Below this is a list of download requests, with the first one dated "2014-11-16 11:37:10". This request details include "Query Options", "Time Periods" (2013-02-01 - 2013-02-03 00:00 - 23:59 UTC), "Refine Options", "Project" (Space Weather Application Center Ionosphere), "Expiration Date" (2014-12-16 11:37:10), and "Status" (SUBMITTING). On the right side, there is a sidebar titled "IN THIS SECTION" with links for "My Personal Info", "My Dataset File Downloads" (which is highlighted), and "My Data Values Downloads". At the bottom of the page, there are four icons representing NEWS, EVENTS, PARTNERS, and DATA PROVIDERS. The footer contains the European Union flag, the text "The ESPAS Consortium - Copyright 2012", and a funding acknowledgment: "This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283676."



Check My Account for progress

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ESPAS

near earth space data infrastructure for e-science

Hello, Martin Kriegel | Sign Out

HOME SEARCH BROWSE SUPPORT MY ACCOUNT

My Dataset File Downloads

Check out your download requests. They have a time stamp of the request. Just click on a request to see its progress, information about it, and a list of download URLs if it is completed.

^ 2014-11-16 11:37:10

Query Options	
Time Periods	2013-02-01 - 2013-02-03 00:00 - 23:59 UTC
Refine Options	
Project	Space Weather Application Center Ionosphere
Expiration Date	2014-12-16 11:37:10
Message	Download request is being processed
Status	PENDING

IN THIS SECTION

- My Personal Info
- My Dataset File Downloads
- My Data Values Downloads

NEWS EVENTS PARTNERS DATA PROVIDERS

The ESPAS Consortium - Copyright 2012

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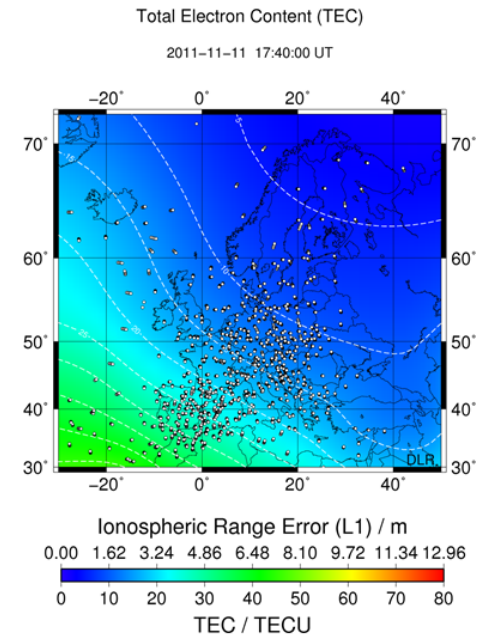
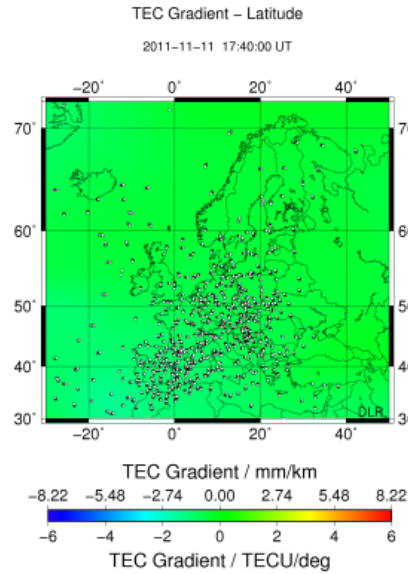
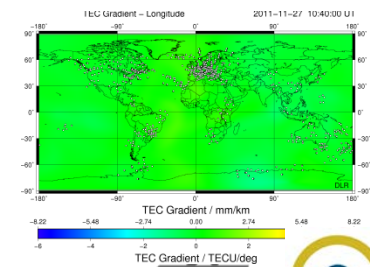
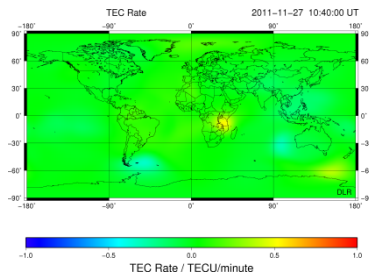
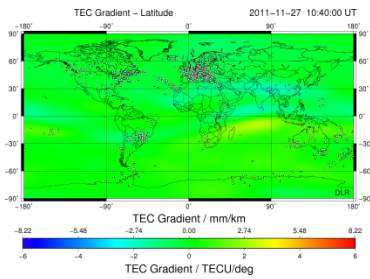
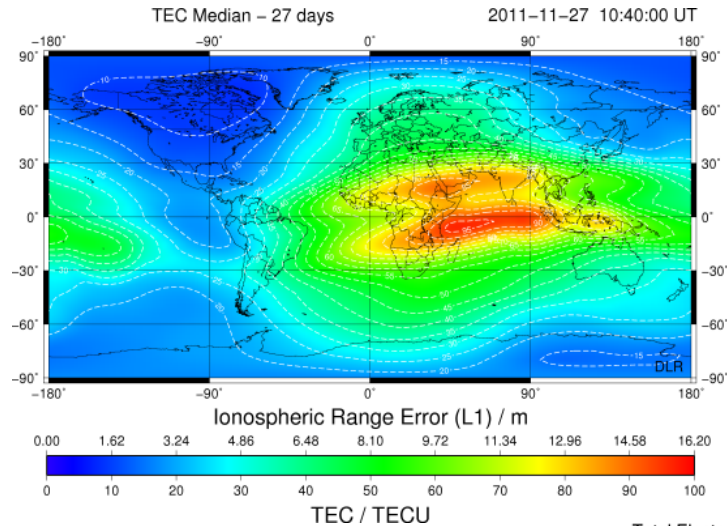
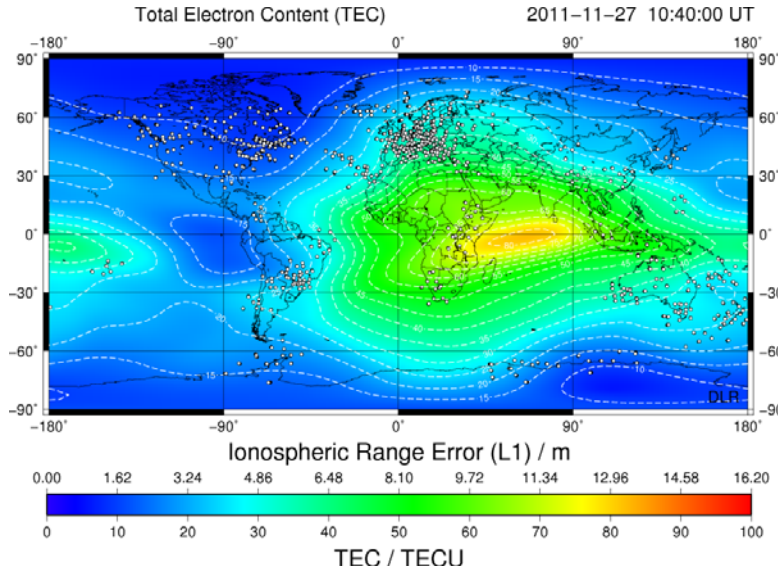


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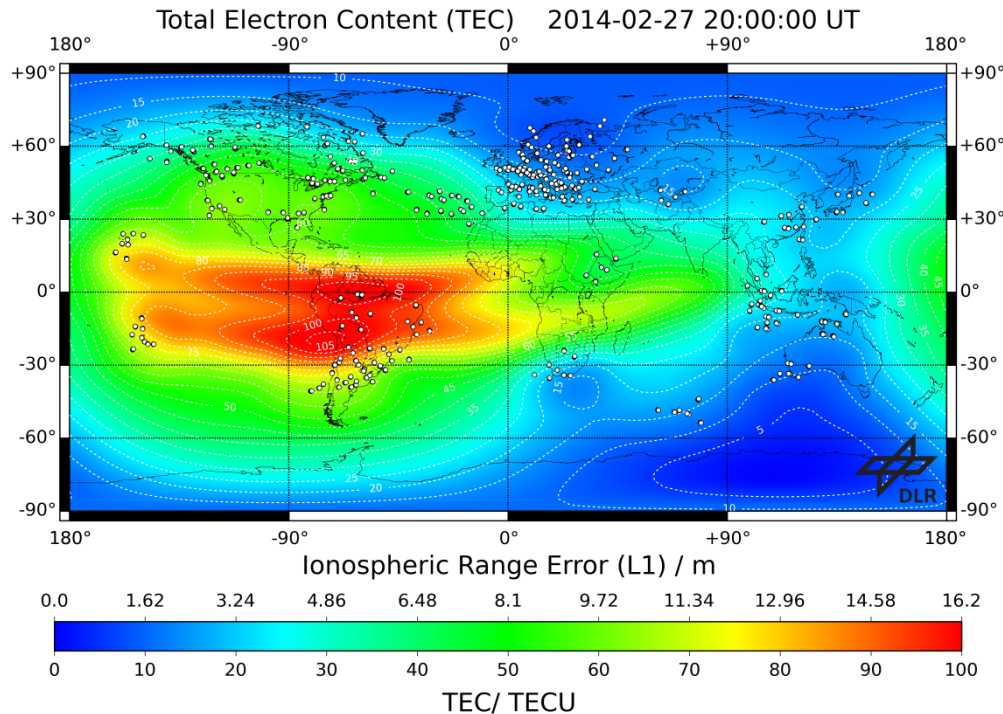
TEC Products



espas
 european space data infrastructure for e-science



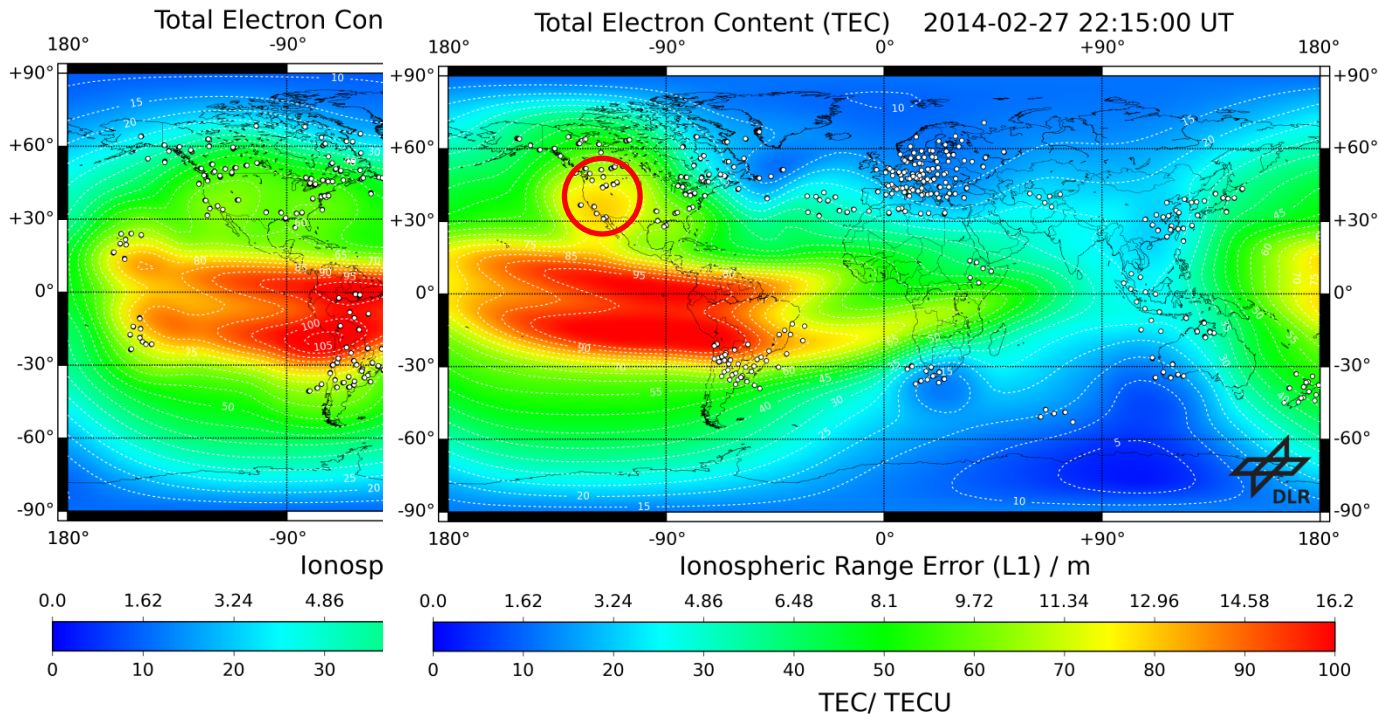
Monitoring of the ionospheric state- TEC reconstruction



The global Total Electron Content (TEC) Map updated every 15 min for monitoring the actual state of the Ionosphere. Example from the **27th February 2014 at 8 pm and 10 pm** shows ionospheric disturbances above North America caused by a medium size geomagnetic storm. Such disturbances can have effects on the performance of Space Based Augmentation Systems (SBAS) such as the American WAAS or the European EGNOS system.



Monitoring of the ionospheric state- TEC reconstruction



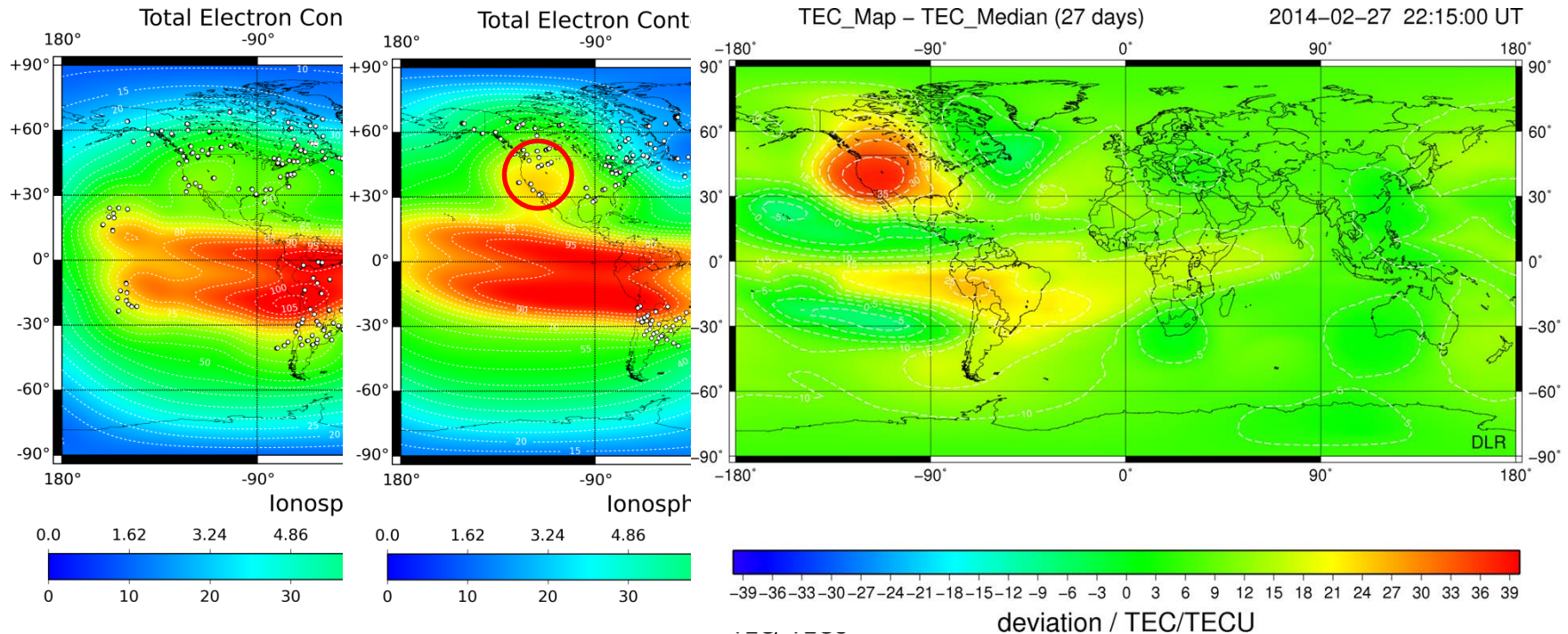
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ESPAS
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Monitoring of the ionospheric state- TEC reconstruction



The global Total Electron Content (TEC) Map updated every 15 min for monitoring the actual state of the Ionosphere. Example from the **27th February 2014 at 8 pm and 10 pm** shows ionospheric disturbances above North America caused by a medium size geomagnetic storm. Such disturbances can have effects on the performance of Space Based Augmentation Systems (SBAS) such as the American WAAS or the European EGNOS system.

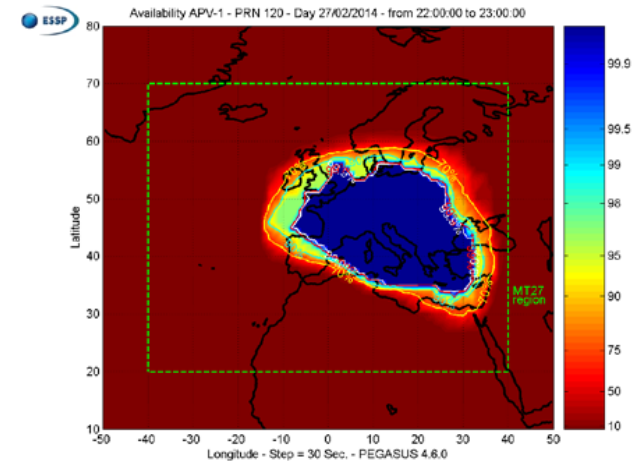
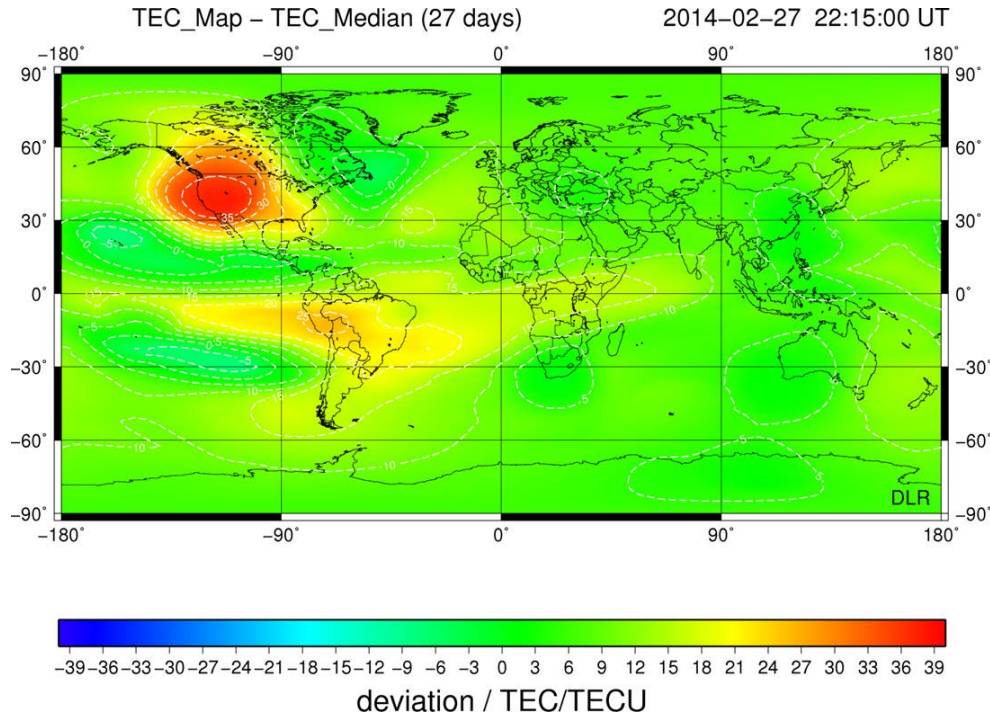


ESPAS
EUROPEAN SPACE DATA INFRASTRUCTURE FOR E-SCIENCE



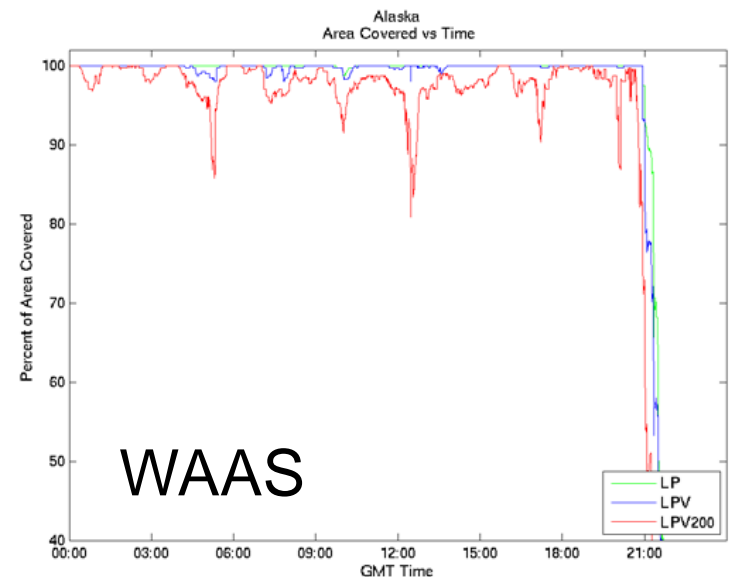
Moderate ionospheric Storm on 27./28. February 2014

EGNOS



LPV availability of WAAS over Alaska on 27th February 2014.

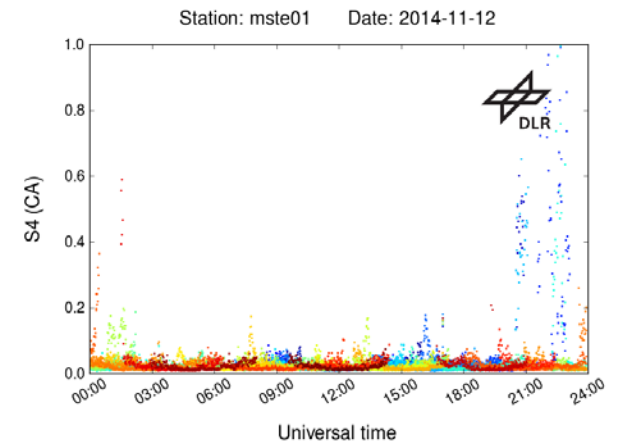
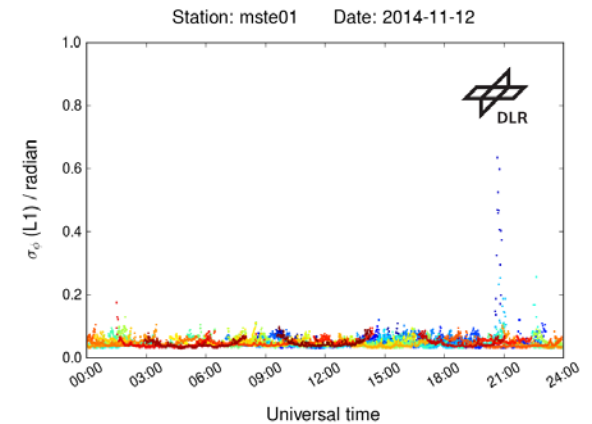
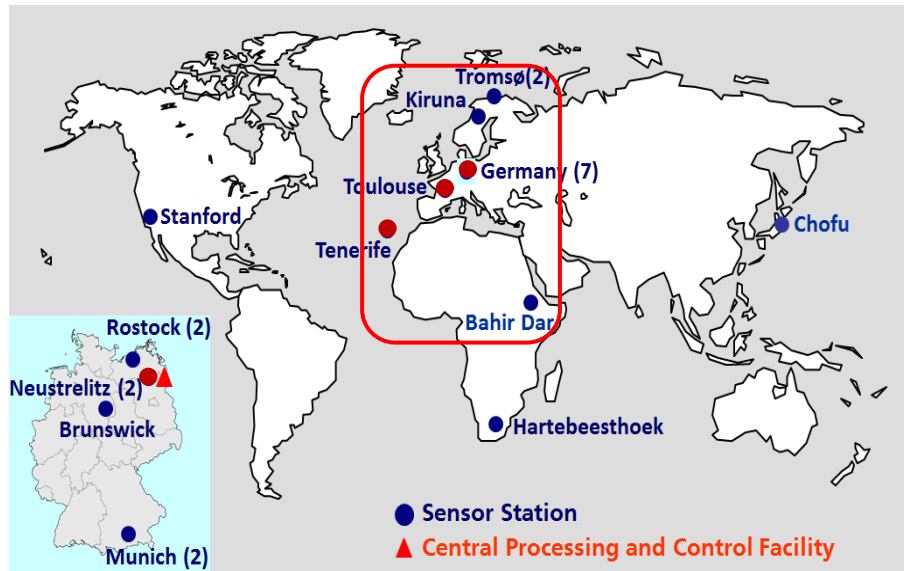
(**L**ocalizer **P**erformance with **V**ertical **G**uidance)



espas
European Space Data Infrastructure for e-science



GNSS scintillation



Origin: Equatorial plasma flow reverses around twilight, driving Rayleigh-Taylor instability (RTI) and bubble creation

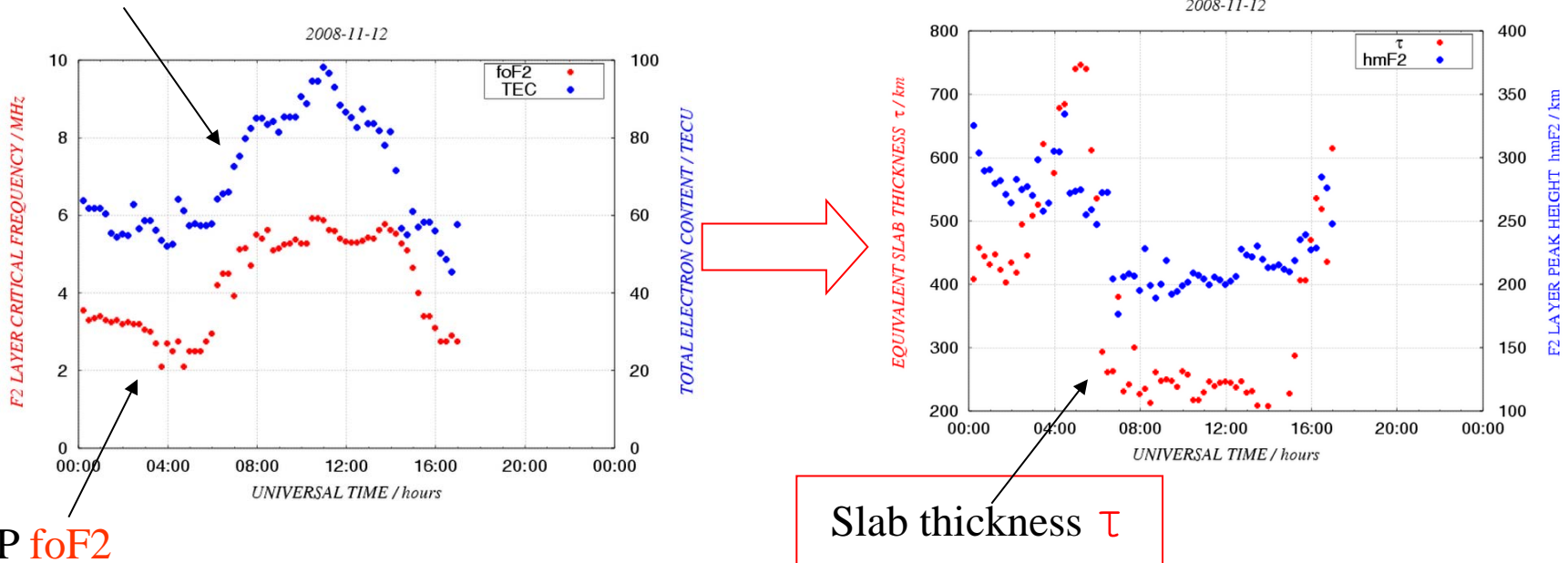
Causes: Amplitude Scintillation



Equivalent Slab Thickness provided by SWACI

Slab thickness over Juliusruh/IAP and corresponding ionosonde data of the IAP Kuehlungsborn (54.4° N; 13.4° E).

SWACI - TEC

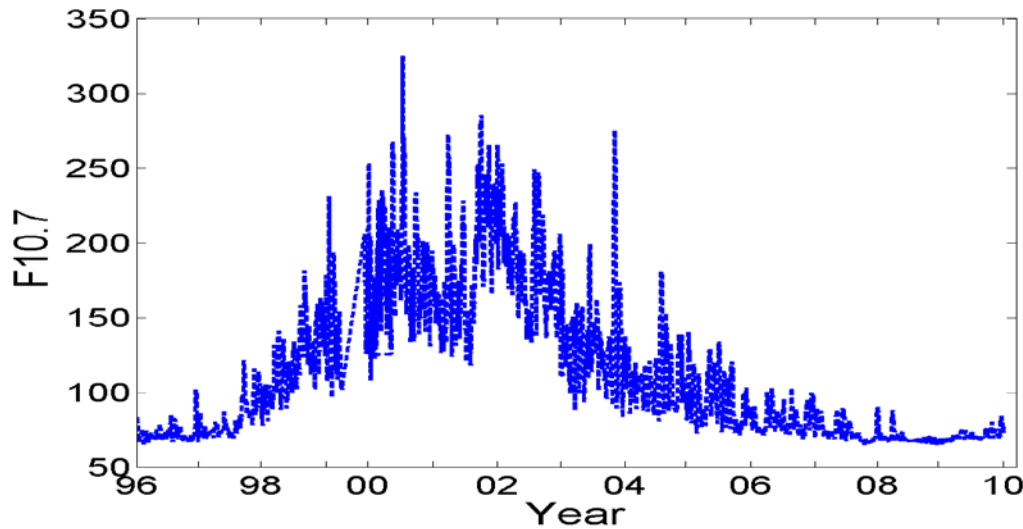


IAP foF2

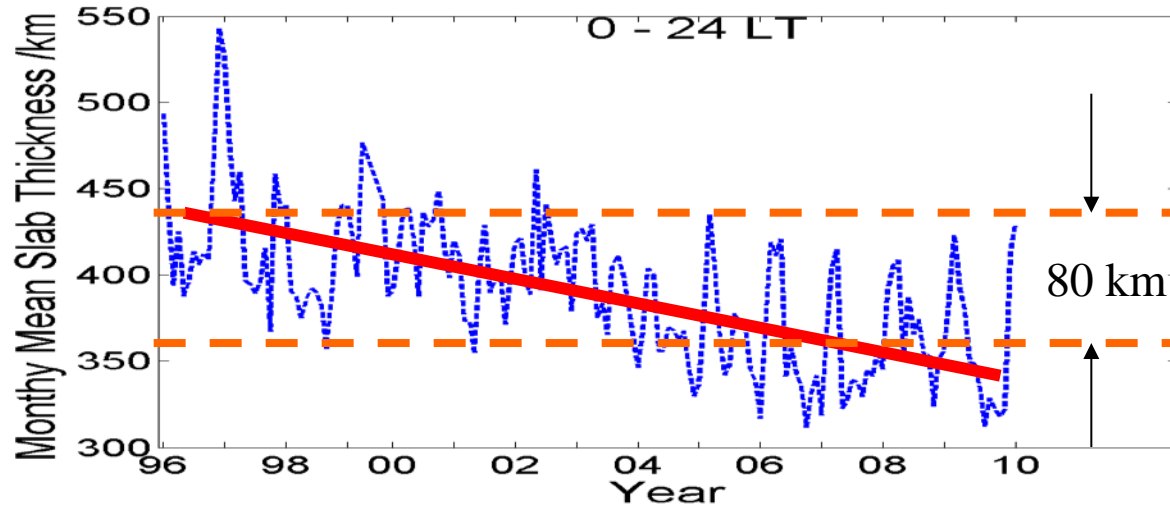
- Measure of the width of the shape of the vertical electron density profile
- Defined by the ratio of the total electron content (TEC) and the peak electron density of the local ionosphere.
- To compute the peak electron density, vertical sounding data from different ionosonde stations are used.
- The corresponding TEC data are extracted from the SWACI TEC maps.



Climatology of daily averaged slab thickness



- Strong decrease of monthly and daily averaged slab thickness over Juliusruh during solar cycle 23
- No significant correlation of averaged slab thickness values with F10.7 index
- No clear seasonal variation
- **Is this a long-term trend indicating a long-term contraction, i.e. cooling of the thermosphere ?**



- The TEC Time Series Plotter is a demonstrator for an ESPAS value added service generated by the ESPAS data provider DLR.
- It allows to plot and analyse the time series of Total Electron Content (TEC) values and the corresponding range errors for different radio frequencies at selected locations worldwide for a given time period.
- It supports the detection of space weather effects and the related influence on navigation systems.

Poster:

“Value added services within the ESPAS system”



Open Session on Recent Advances in
Space Weather Science
Wednesday 19 November



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near earth space data infrastructure for e-science



Which locations on Earth do you want to analyse?

Simply add some locations to your time series plot by clicking on the map or by entering the coordinates or addresses in the form below the map. You can delete locations by using a right click on the map or delete all locations at once by using the form below the map.



Longitude Latitude Location Map actions
 Enter longitude in ° Enter latitude in ° Enter location e.g. DLR Neustrelitz

Which time period and which time interval do you want to analyse?

Please specify the start and the end time according to your downloaded ESPAS data. Here you can limit the amount of data by setting a time interval of interest.

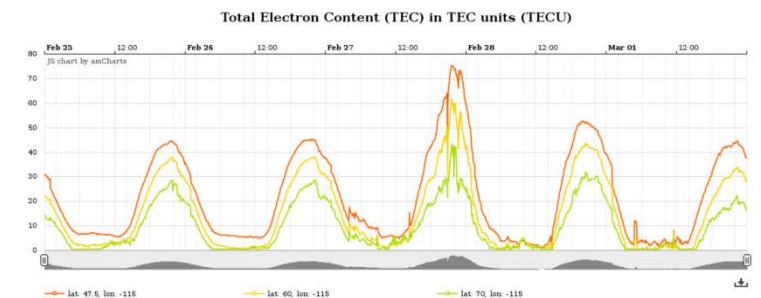
Start Time End Time Interval

May we ask for some TEC data provided you by ESPAS?

Please specify the location of your downloaded ESPAS data and click the progress bar to start generating the time series plot. The data is plotted right after the import of your ESPAS dataset was successful. Feel free to readjust your filter settings to refresh your time series plot.

You may download the data or an image file of the generated time series for further investigations.

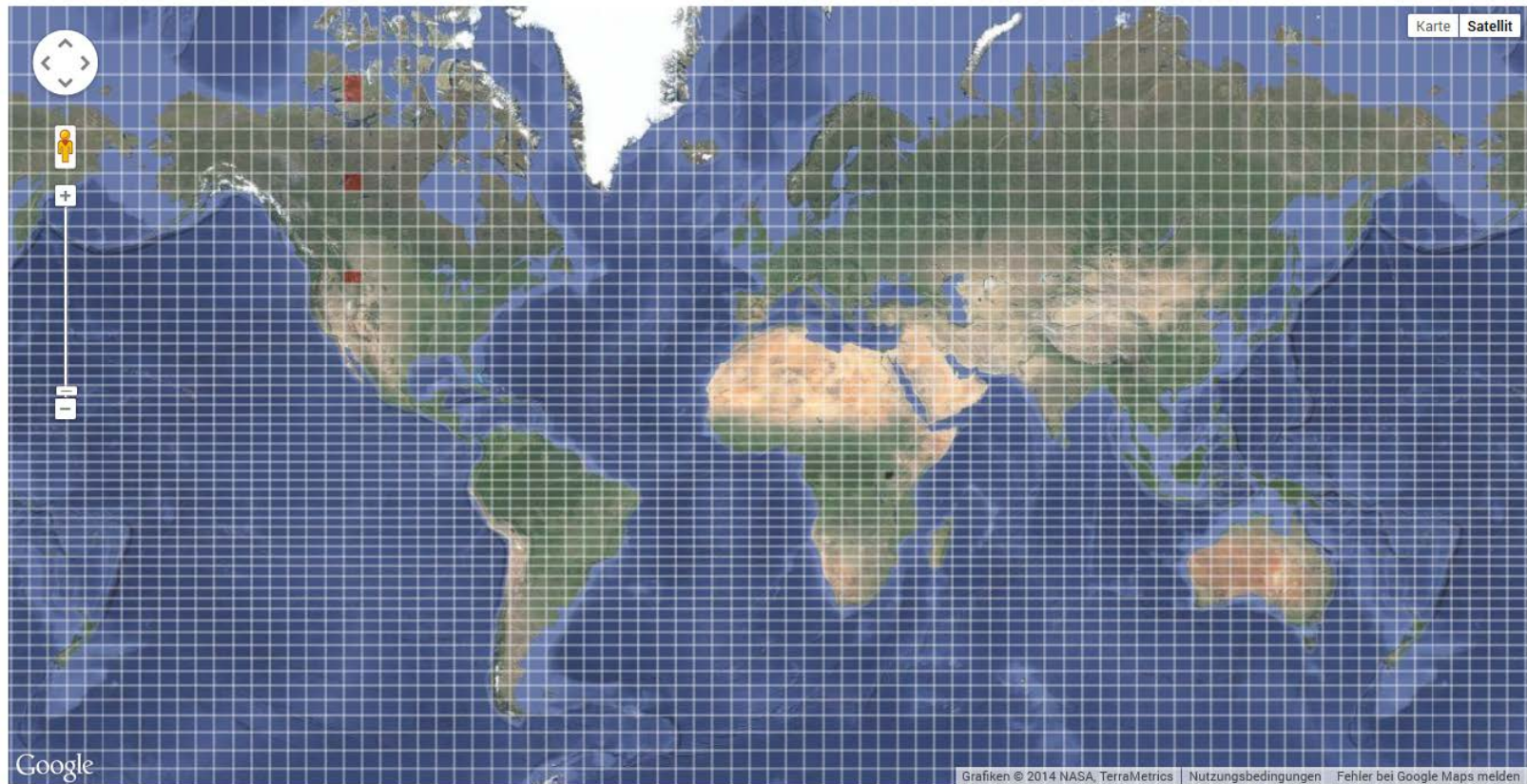
Path to Data Progress
 100%
 Generation of plot finished. Click the progress bar to reprocess the plot.



Step 1: Location

Which locations on Earth do you want to analyse?

Simply add some locations to your time series plot by clicking on the map or by entering the coordinates or addresses in the form below the map. You can delete locations by using a right click on the map or delete all locations at once by using the form below the map.



Longitude

Latitude

Location

Map actions



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Step 4: Results

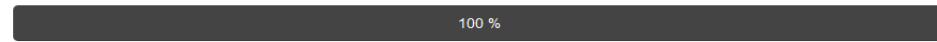
May we ask for some TEC data provided you by ESPAS?

Please specify the location of your downloaded ESPAS data and click the progress bar to start generating the time series plot. The data is plotted right after the import of your ESPAS dataset was successful. Feel free to readjust your filter settings to refresh your time series plot.

You may download the data or an image file of the generated time series for further investigations.

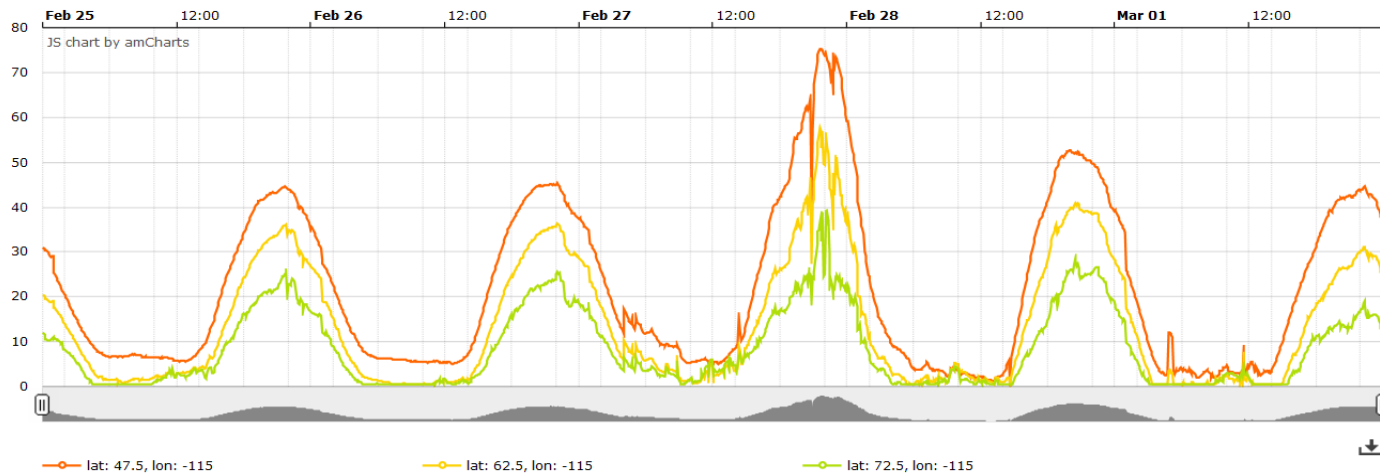
Path to Data

Progress



Generation of plot finished. Click the progress bar to reprocess the plot.

Total Electron Content (TEC) in TEC units (TECU)



Poster: “Value added services within the ESPAS system” Open Session on Recent Advances in Space Weather Science Wednesday 19 November



ESPAS
EUROPEAN SPACE DATA INFRASTRUCTURE FOR E-SCIENCE



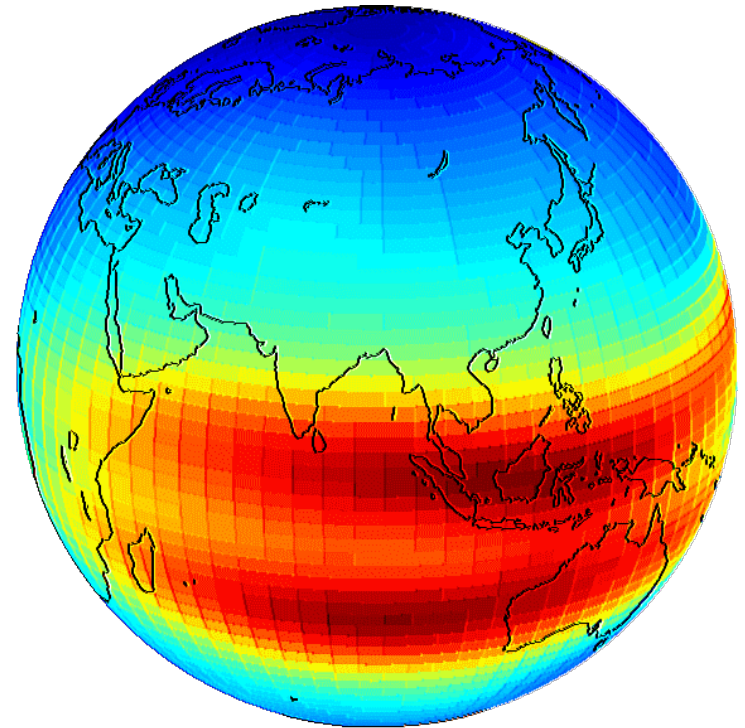
Thanks for your attention!

Contact:

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