



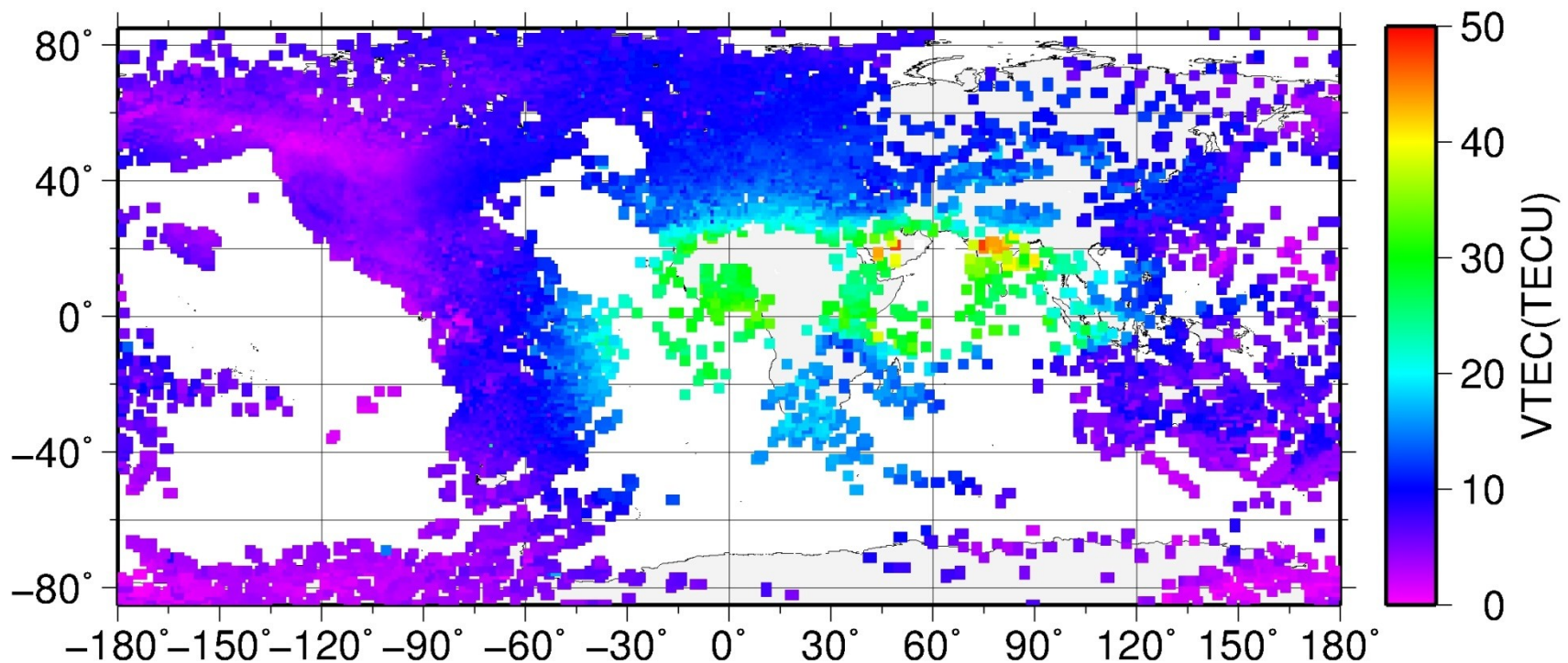
Total electron content driven data products of SIMuRG

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Ilya Edemskiy and Semen Syrovatskiy

Motivation

Madrigal Database at Haystack Observatory: Vertical TEC. Madrigal provides vertical TEC, precalculated data. Which are usefull for space weather research appliation. Our purpose to provide more flexible interface and more data products

06/09/2017 Time= 11.8667 UT



Our features



- Query based
- Plots (maps and series) and data
- Various data products
- Preliminary analysis **(right on the web)**
- Machine Learning engine
- Slant and grided data

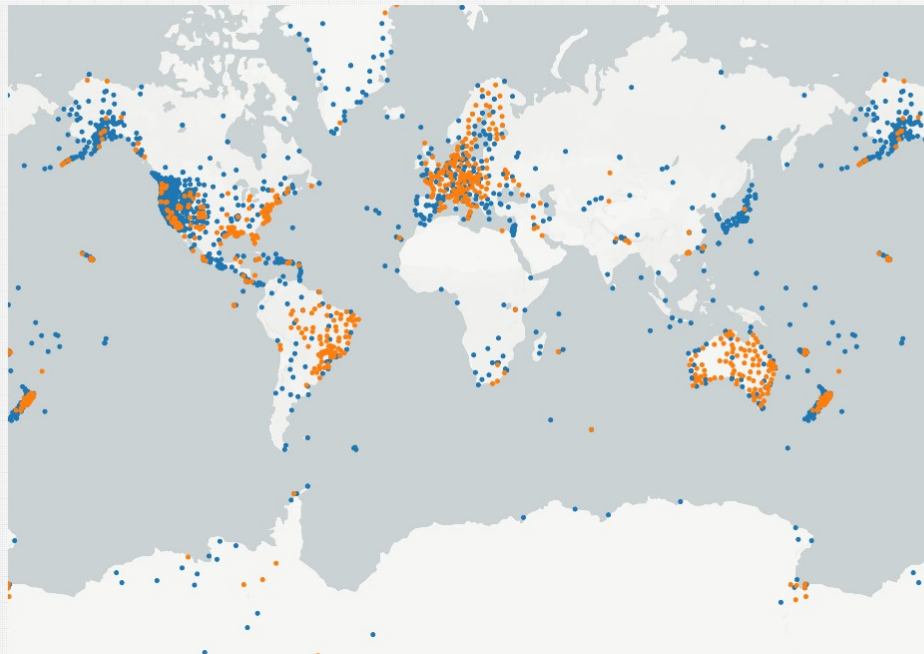
SIMuRG *[Yasukevich et al. 2020]*

<https://simurg.iszf.irk.ru>

SIMuRG: System for the Ionosphere Monitoring and Researching from GNSS.

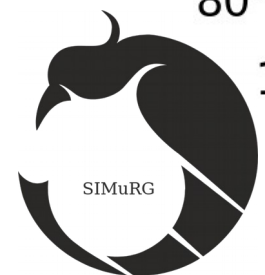
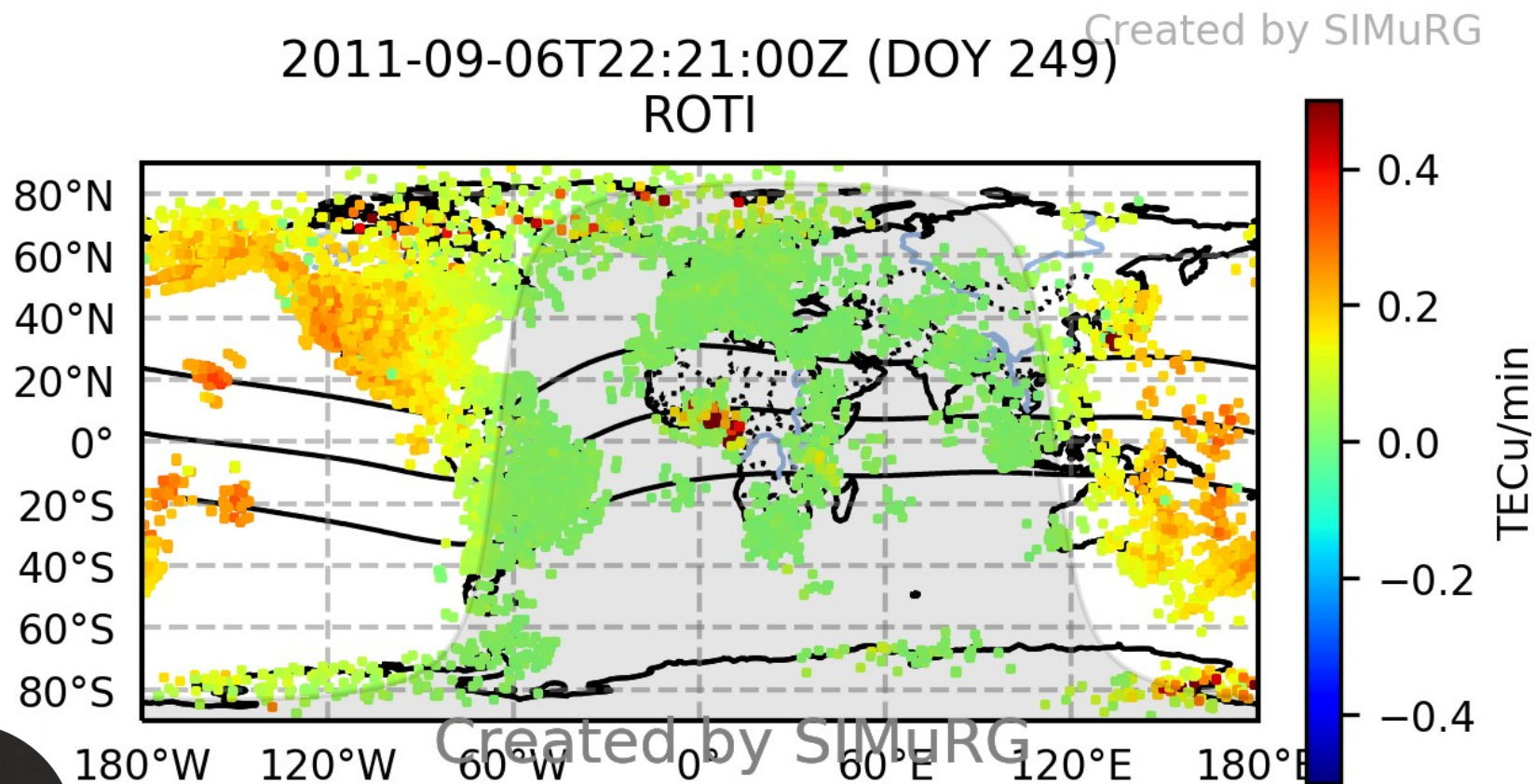
SIMuRG is the tool for collecting, processing, storage and presentation of GNSS total electron content data. The data product are TEC variations series, corrected TEC, TEC variations maps, Wtec and Iv indices, ionospheric disturbances parameters

Developed under Russian Science Foundation support (project № 17-77-20005)



Data products: ROTI (solar flare)

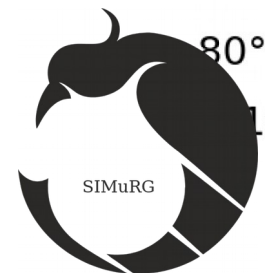
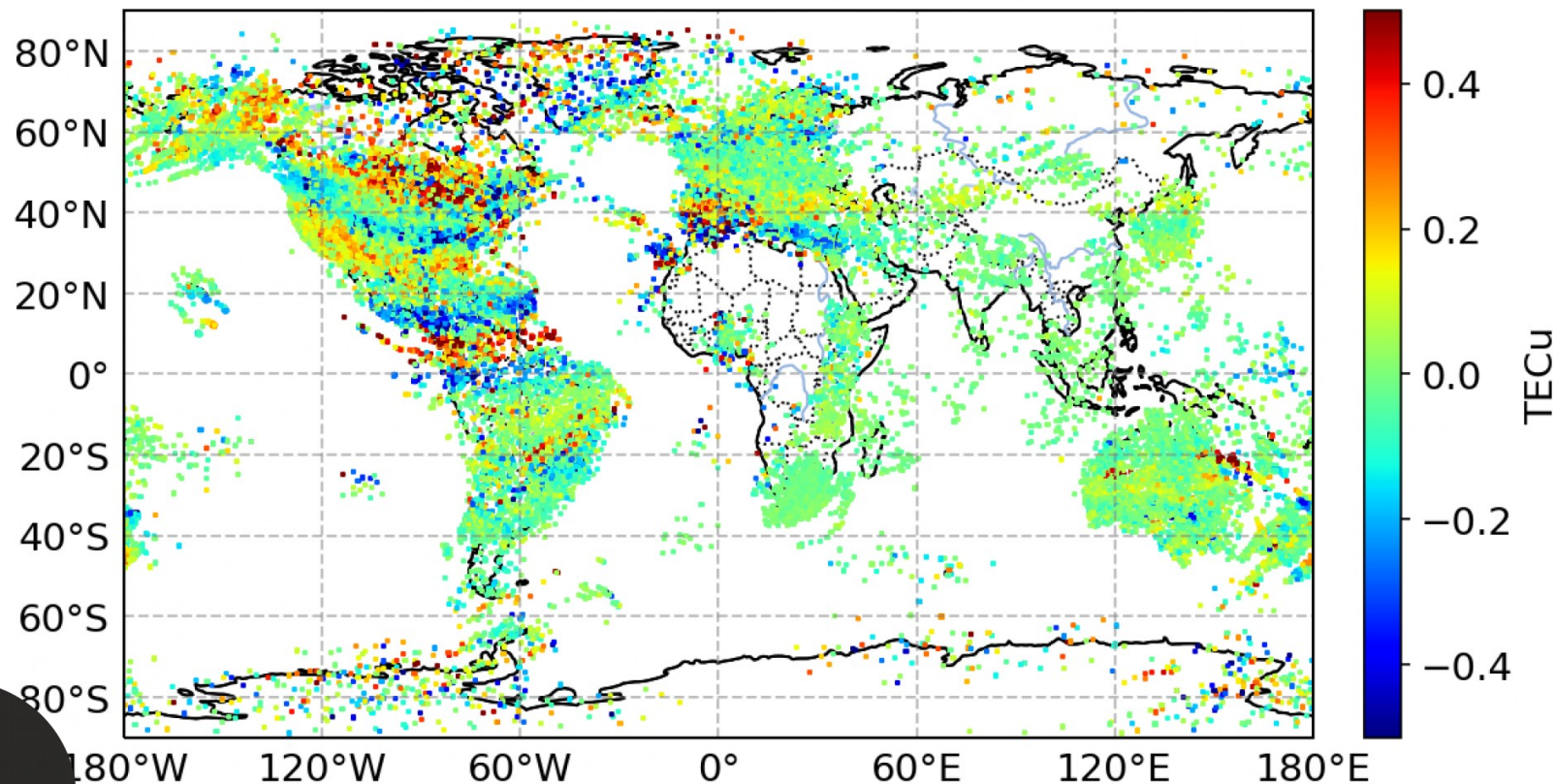
<https://simurg.iszf.irk.ru/result?id=5ea68964ef1e74e64a47abb5>



Data products: variations (geomagnetic storm)

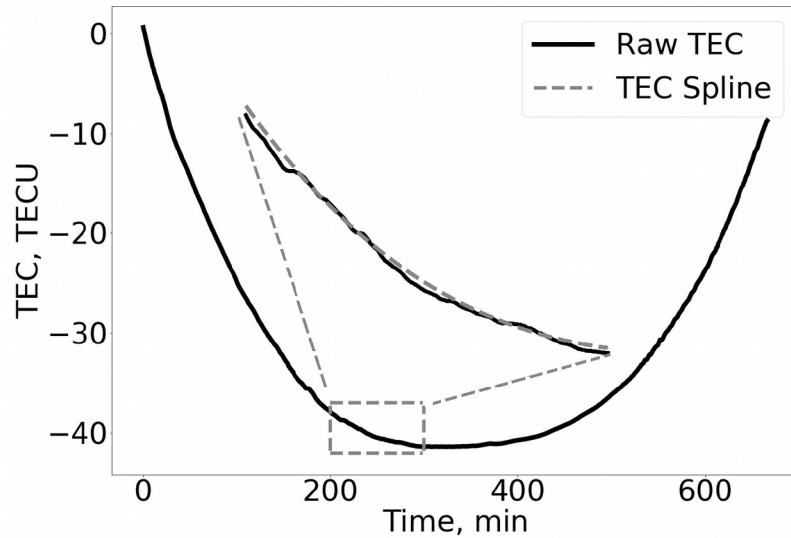
2015-06-22T20:57:30Z (DOY 173)
10-20 minute TEC variations

Created by SIMuRG



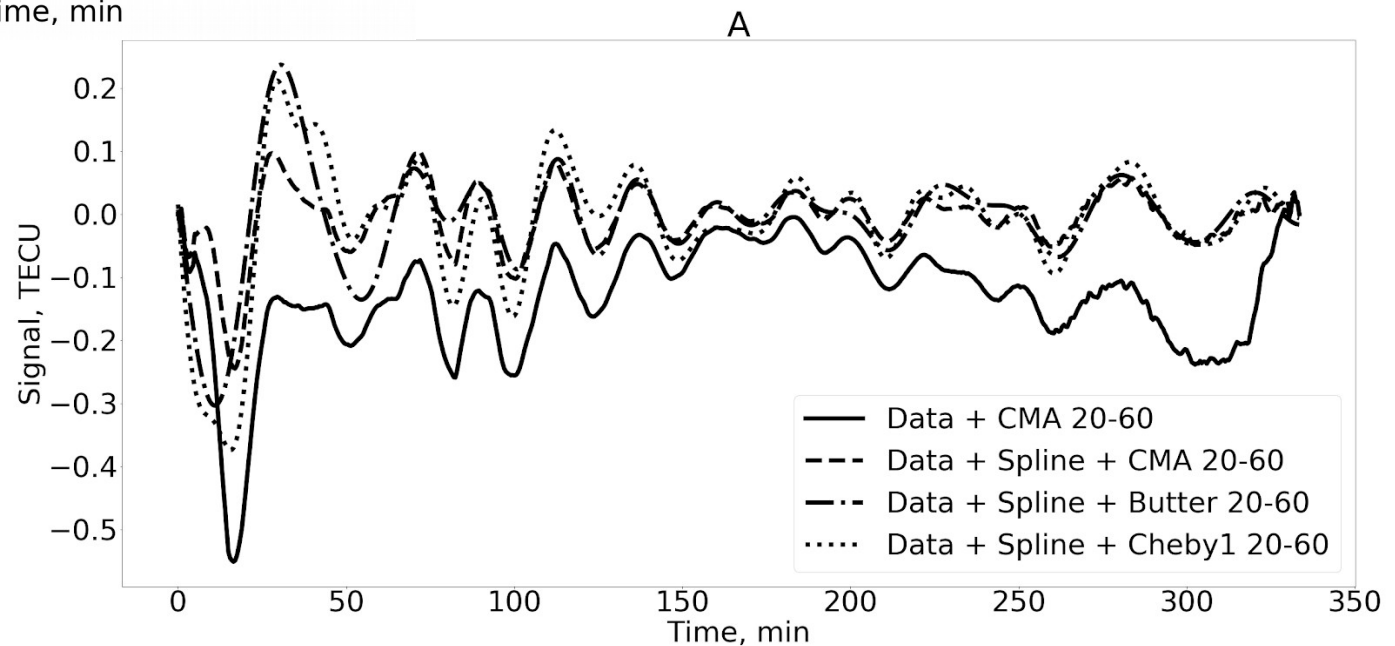
Data products: variations

(examine filtration technique)



Conventional moving average window filtrations can lead to significant artifacts. SIMuRG uses the filtration that allows to analyze variations in selected band.

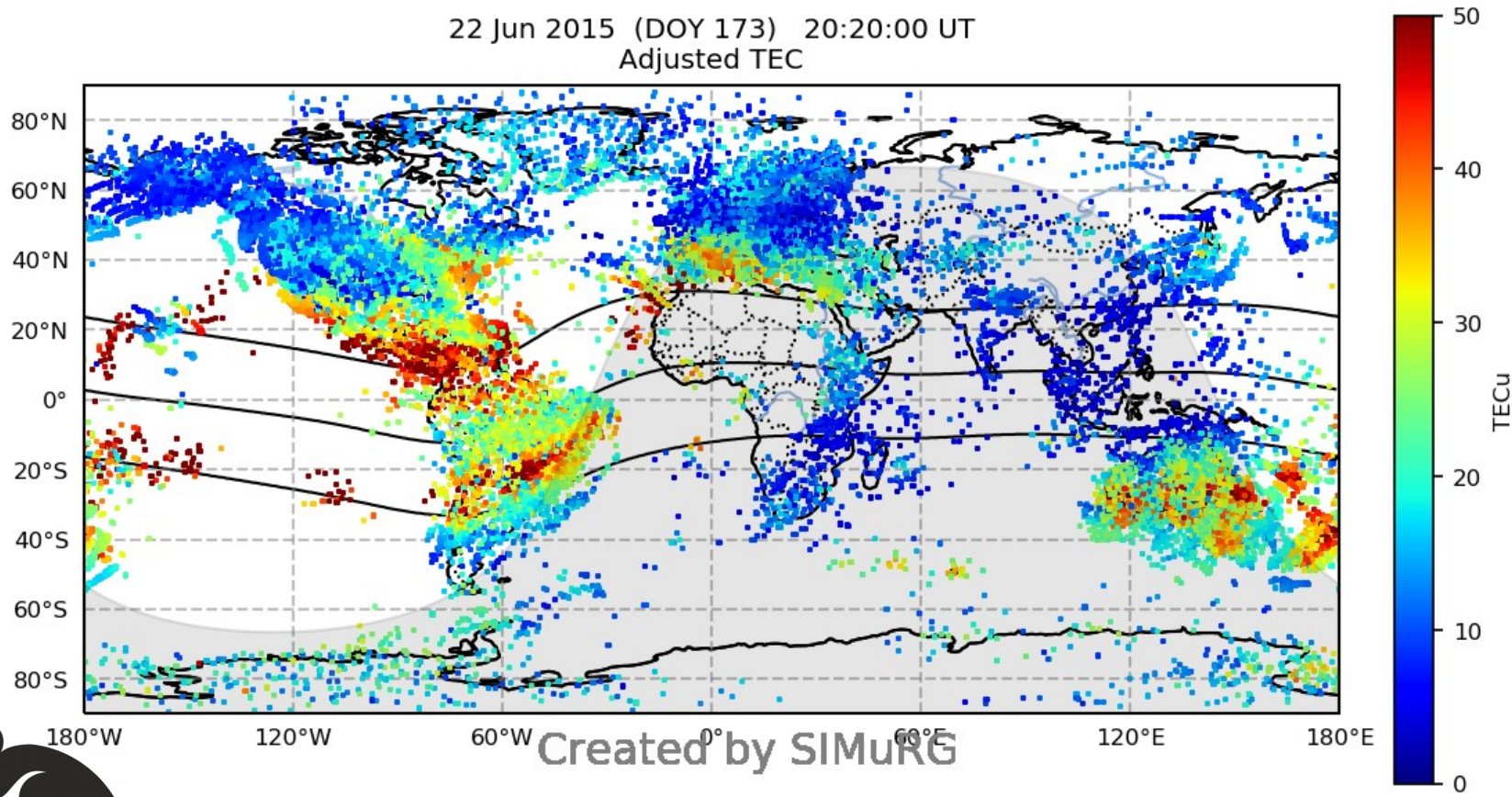
[Maletckii et al. 2020]



Data products: adjusted TEC

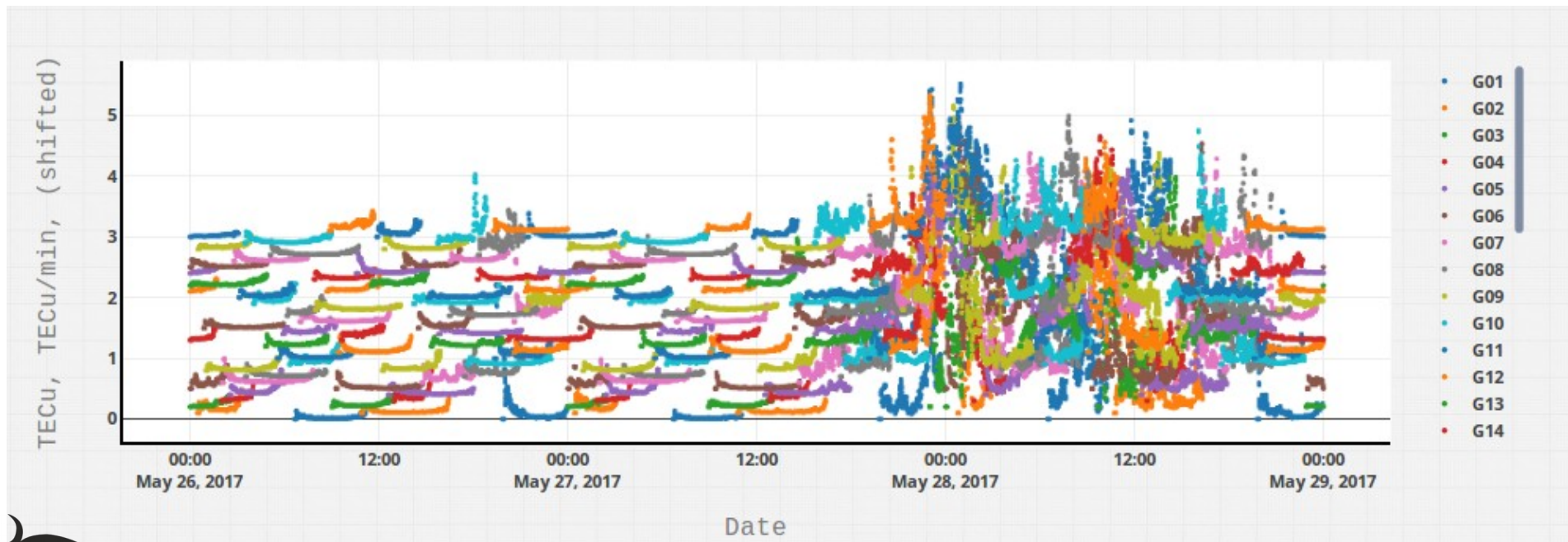
[Yasukevich et al. 2020]

Created by SIMuRG



Data products plots: series

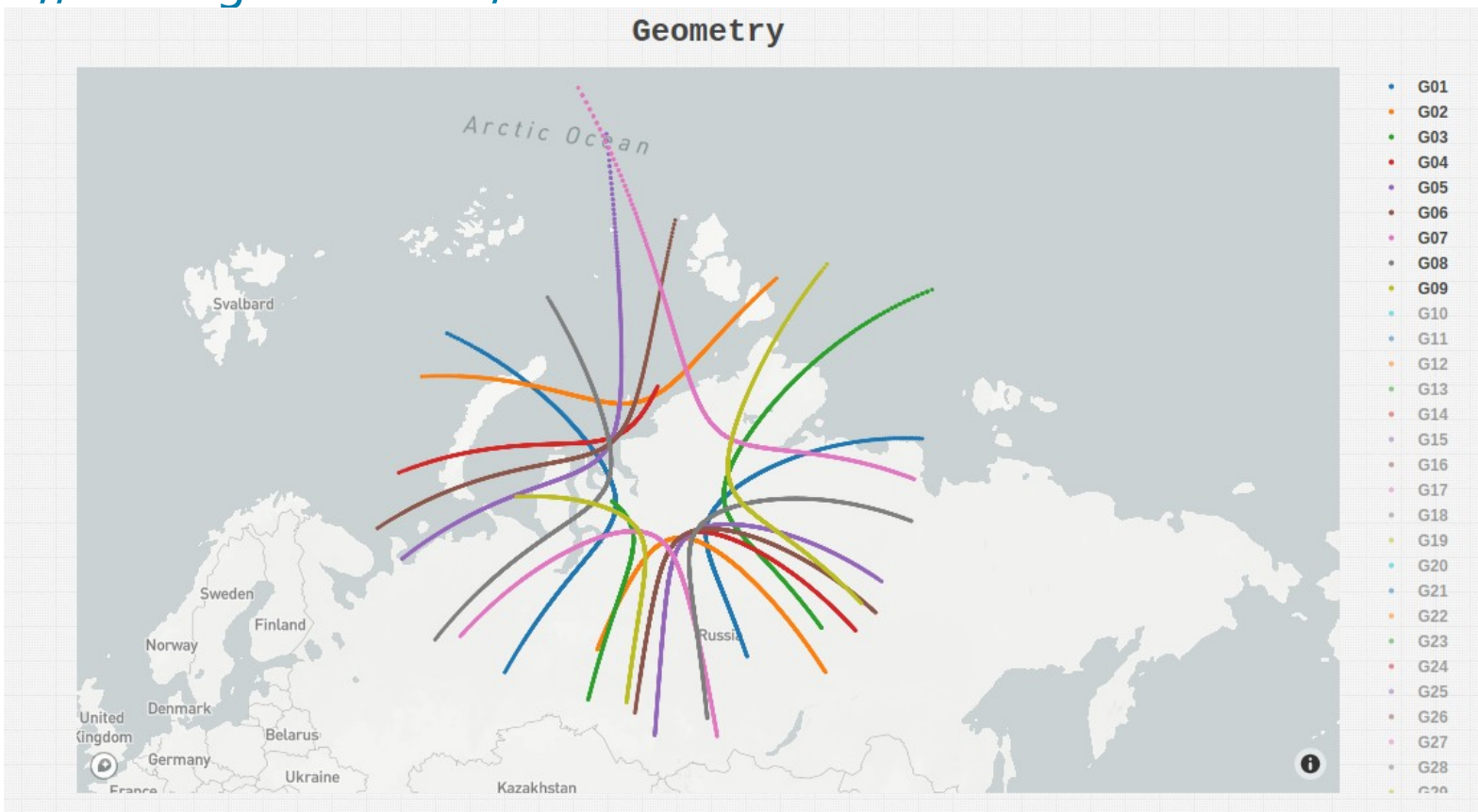
<https://simurg.iszf.irk.ru/result?id=5eb2928f5b0a5c1c390ec49f>



Data products: geometry

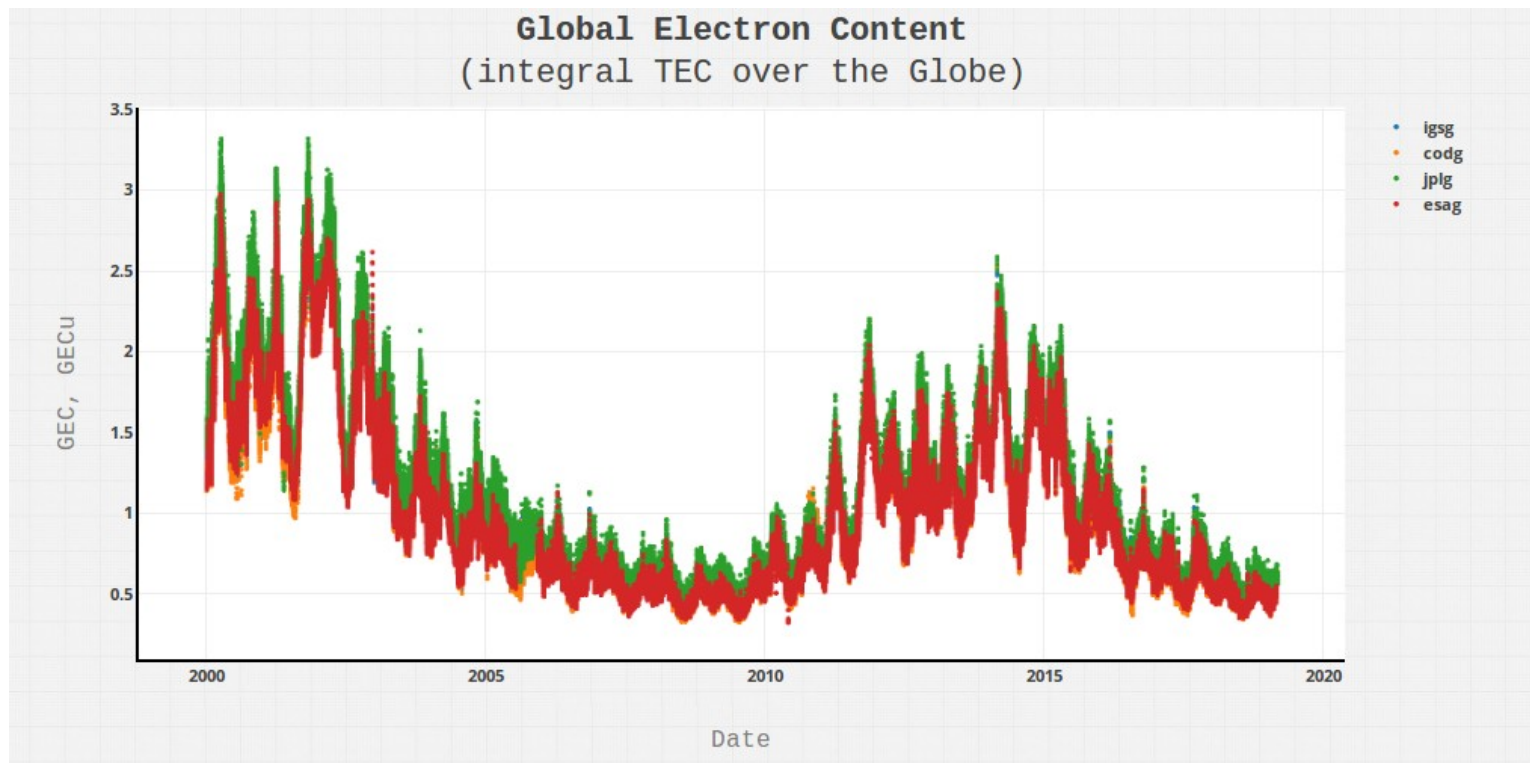
GNSS sounding geometry is spatially extended. We provide the interactive plots for understanding where data are coming from.

<https://simurg.iszf.irk.ru/result?id=5eb2928f5b0a5c1c390ec49f>



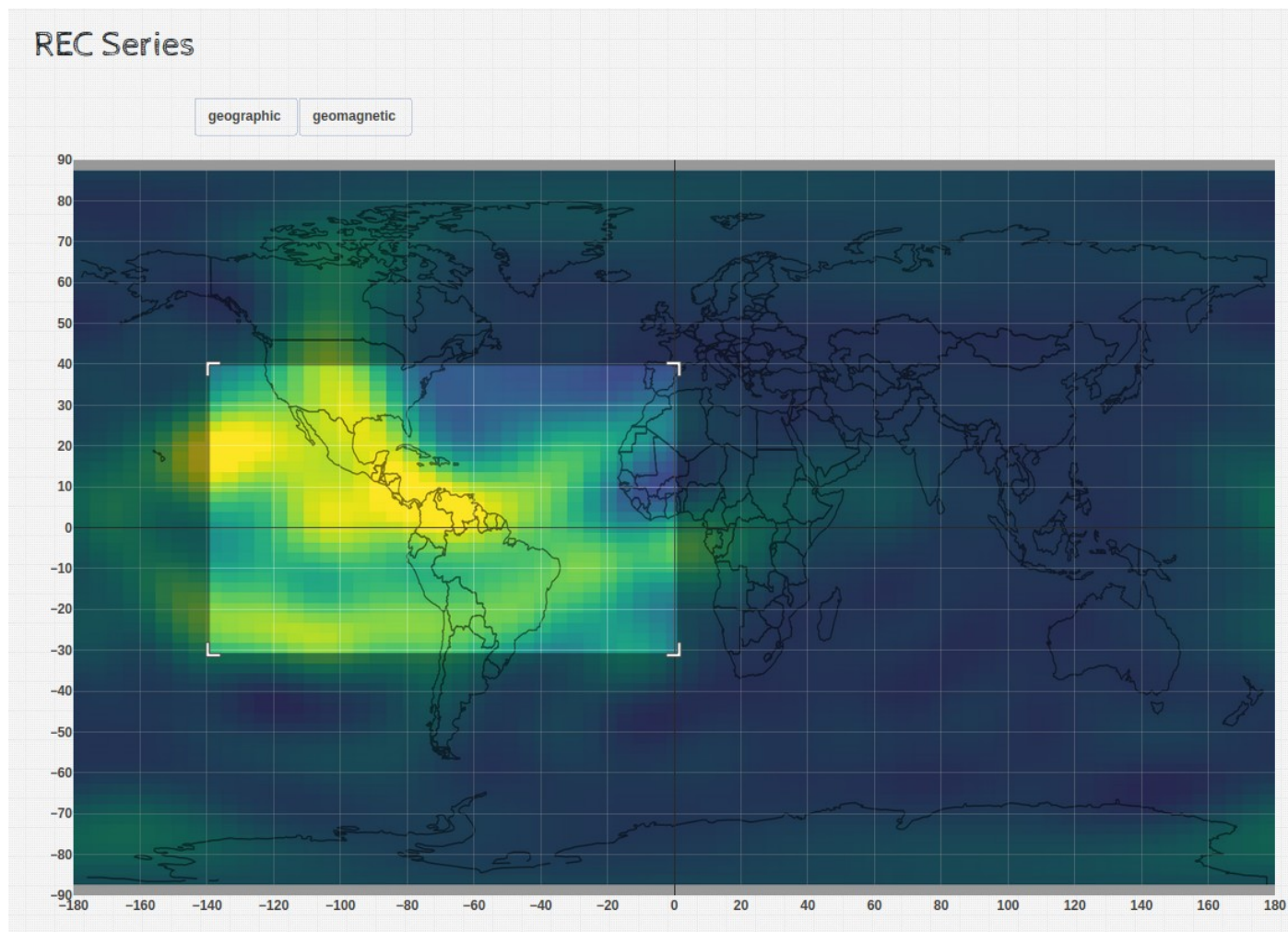
Data products: GEC (global electron content)

<https://simurg.iszf.irk.ru/gec>



Data products: REC (regional electron content)

<https://simurg.iszf.irk.ru/recseries>

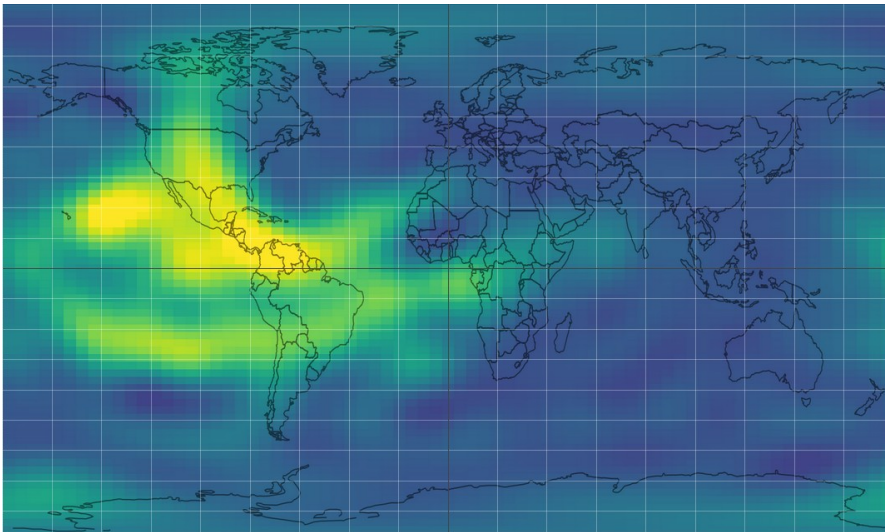


Data products: GIM Plots

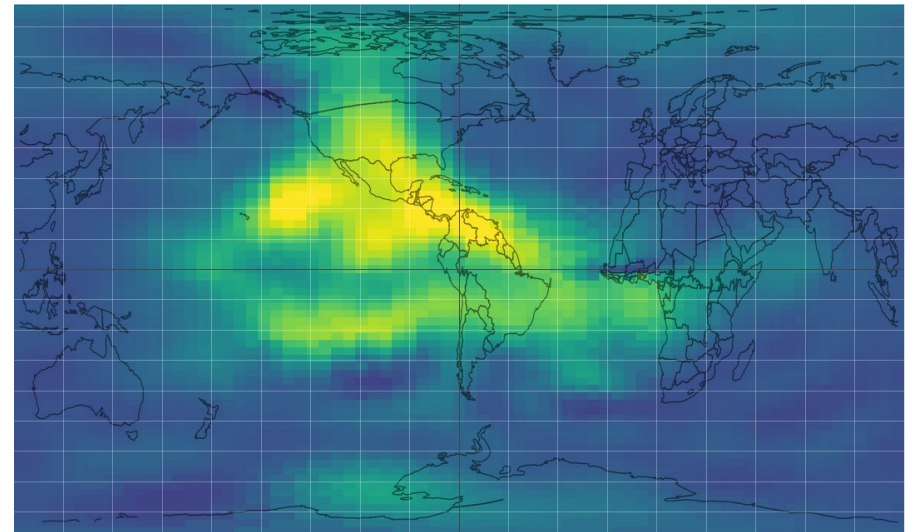
(GIMs are provided by various sources)

We provide plots of the GIMs
<https://simurg.iszf.irk.ru/gecmap>

Geographic



Geomagnetic

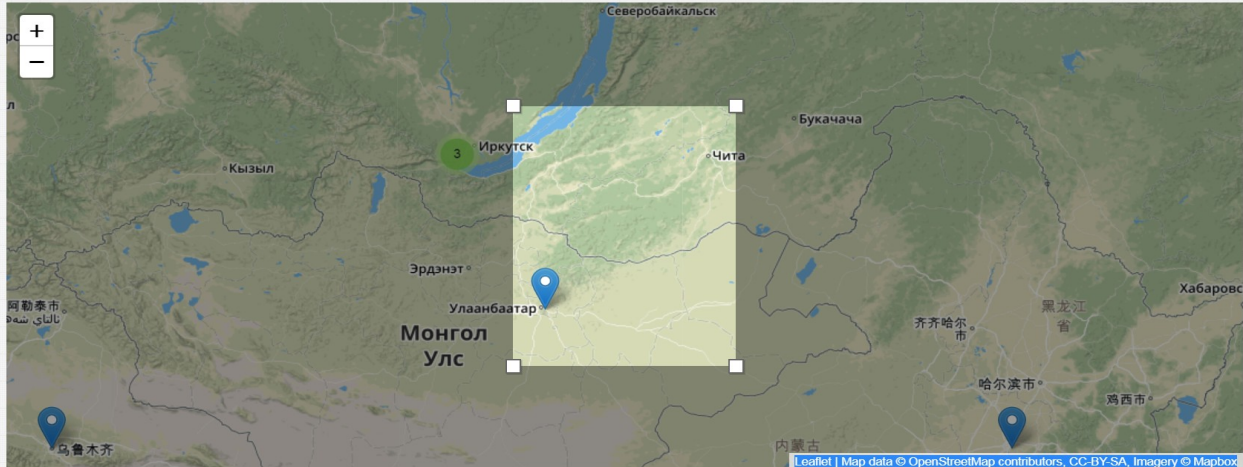


GUI and API

(https://simurg.iszf.irk.ru/documentation/how_to_api)

SIMuRG Home FTPs Receivers Queries ▾

TEC variations maps



Map showing TEC variations over a region in Mongolia and surrounding areas. The map includes labels for cities like Иркутск, Чита, and Улаанбаатар, and regions like Монгол Улс. A yellow rectangular region is highlighted over the Gobi Desert area, with a blue location pin in the center.

e-mail

Email

Start date and time End date and time

Additional settings

Vmin Vmax Output data format

Filtration range (periods) Colormap

Aspect Grid

Create

SIMuRG group 2018



Event detection

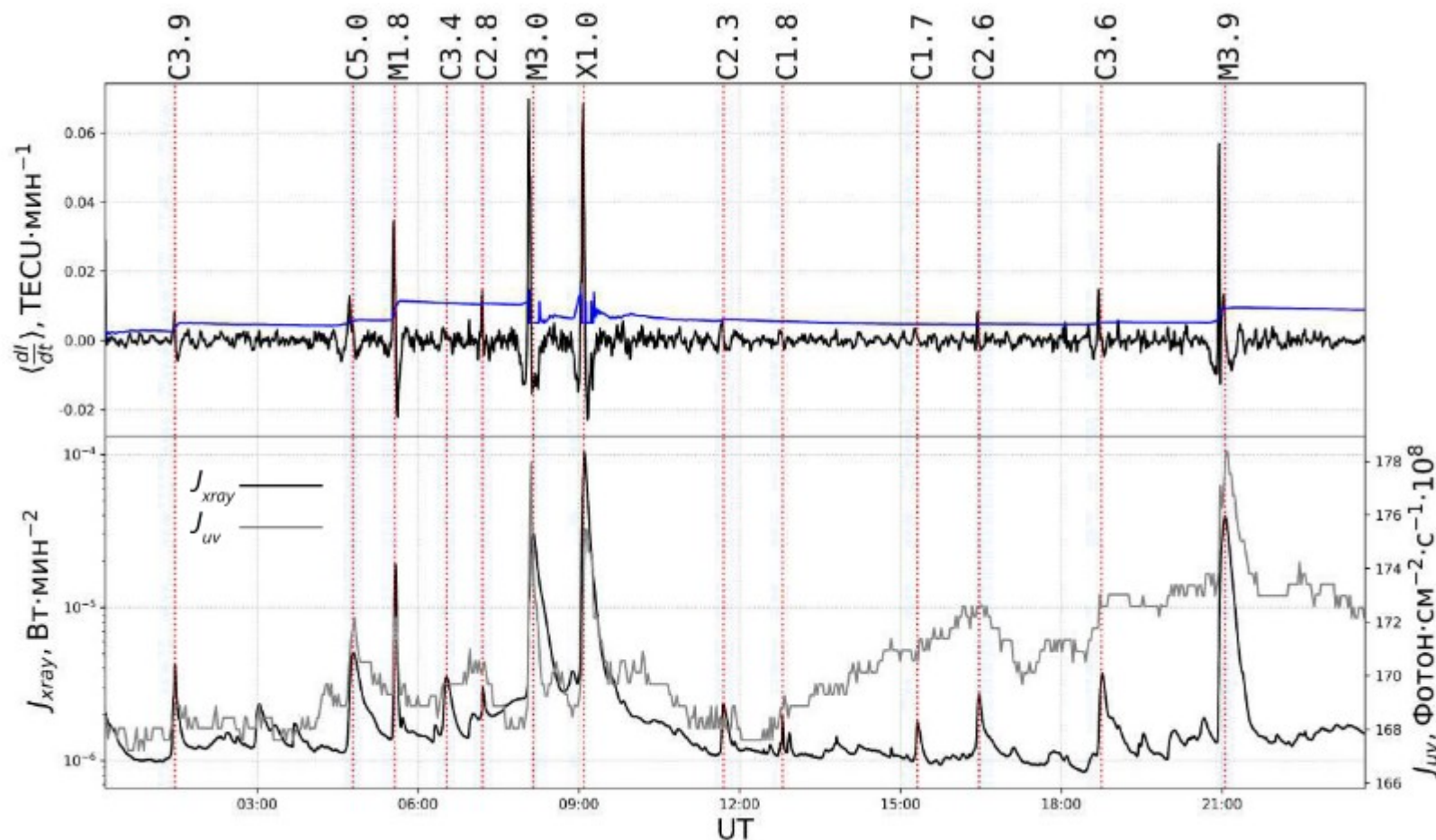
Each map query has option to go to interactive mode and to detect and submit events:

<https://simurg.iszf.irk.ru/interactive?id=5ea1bc4ac6fe76b9bcef3144>



Research [Syrovatskiy et al., 2018]

Using SIMuRG there was developed algorithm for solar flare detection based on GNSS data.



Research

Using SIMuRG REC it is possible to see after storm effect. Each point below corresponds to REC in slice (± 30 latitude) for each longitude

