

<https://gpsjam.org/>



Open data on GPS interference: Scandinavia, Baltics

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Why does it matter?

- GPS, Galileo, Glonass, Beidou used for Positioning and Navigation
 - Mobile phones and cars
 - Ships and Aircraft
 - Alternative (inertial navigation) not as accurate
- Also used for time and frequency reference
 - Important in Critical National Infrastructure: Finance, Energy Telecommunications etc.
 - Cheaper than atomic clocks!
 - NPL developing alternatives for time signal distribution
- GPS is dual use, civilian and military
 - Used in drones, guided missiles
 - Electronic Warfare Counter Measures: Jamming, spoofing)

Challenges

- Inconsistencies between countries
 - What is reported: days of disruption, individual disruptions
 - In country's territory or including international waters and flights
- Inconsistencies within a country's data
 - Change in way they report
 - Revision of numbers
- Granularity
 - Date, monthly totals, yearly totals
 - Location

Norway VS Finland



Ryan McVay / Getty Images



Jupiterimages / Getty Images

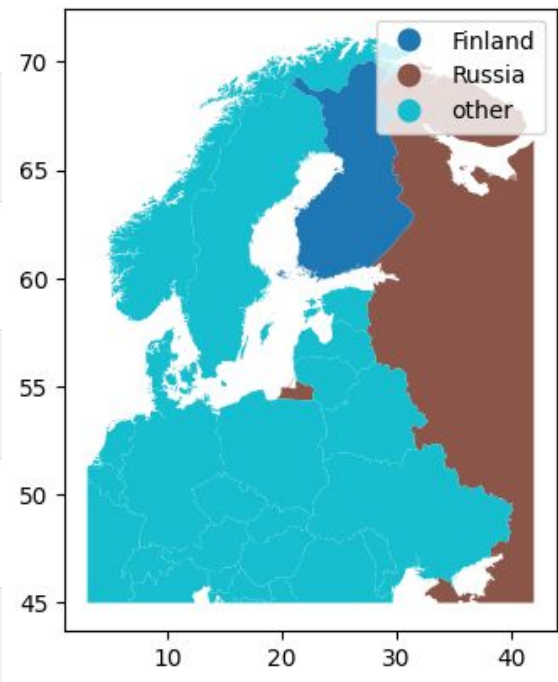
Traficom.fi

- Html table
- Numerical?

Outside:

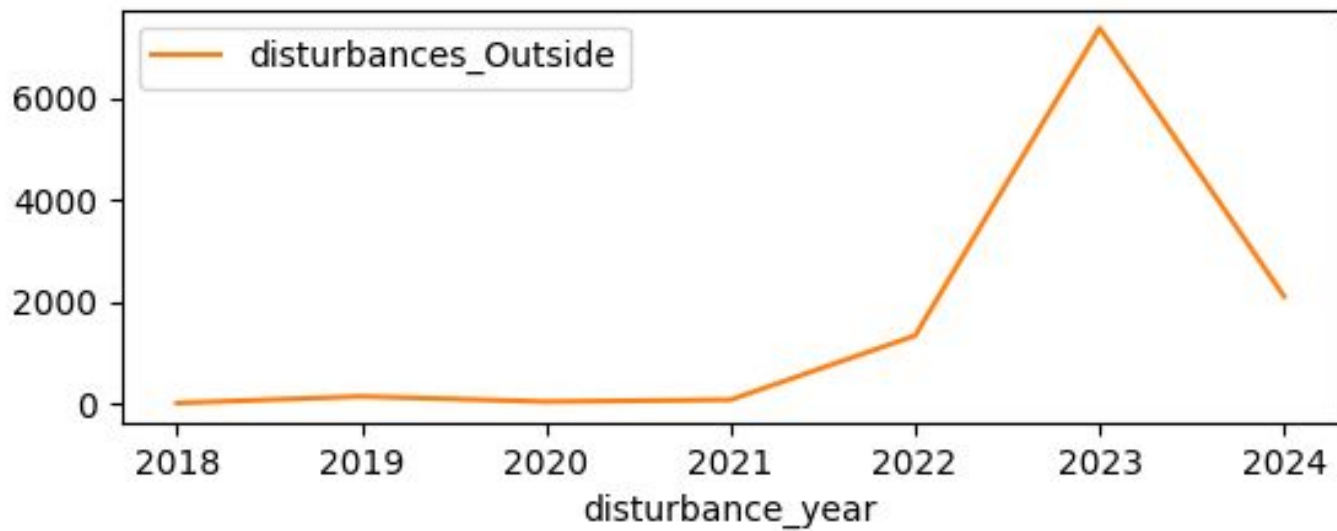
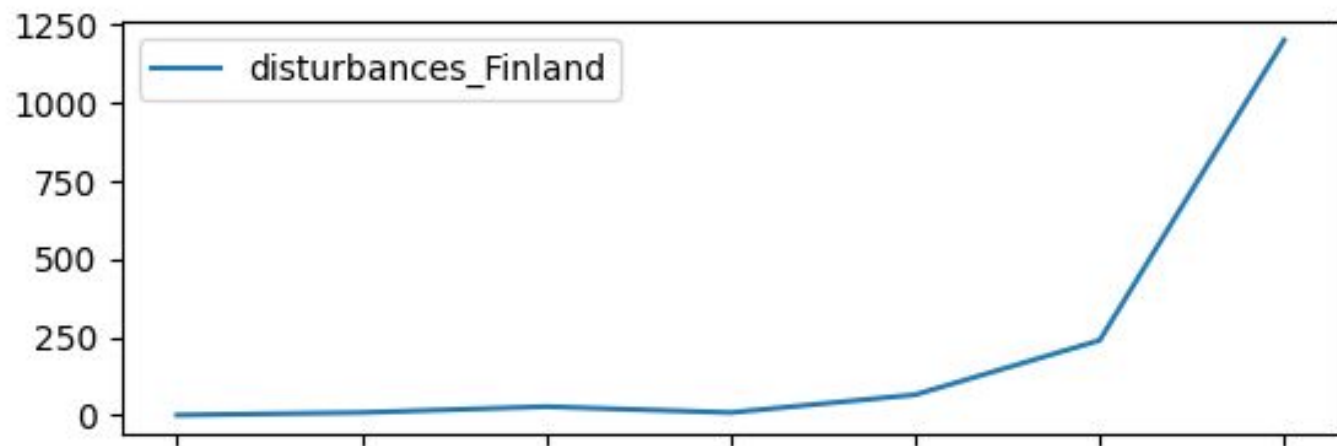
- Black Sea
- Kaliningrad
- Gulf of Finland

Year	Finland	Finnish operators' notifications outside of Finland
2018	0	6
2019	8	137
2020	27	34
2021	8	71
2022	65	1331
2023	239	7370
2024 (by 30 April)	Around 1200	Around 2100

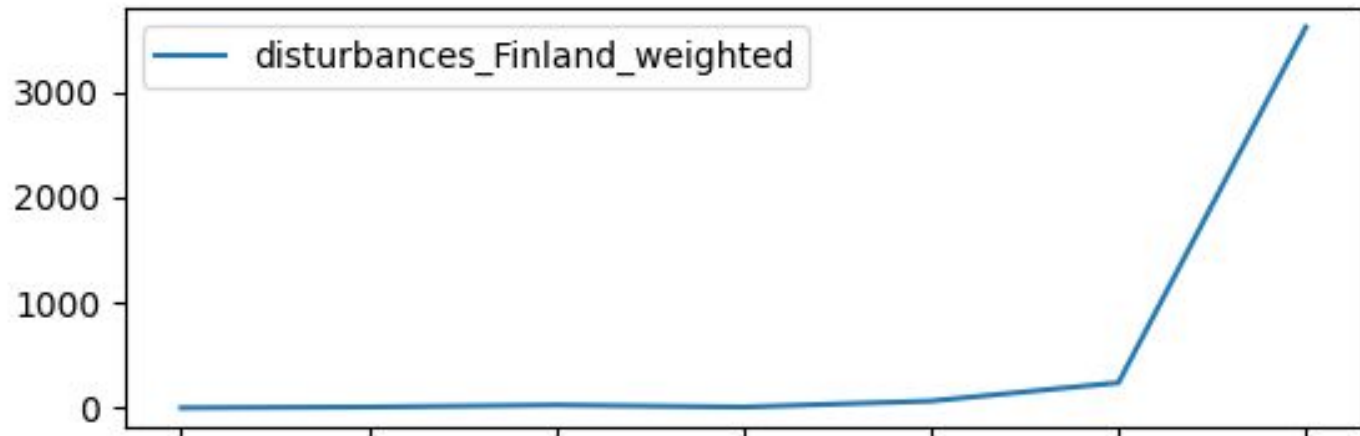


The map displays the geographical distribution of notifications. Finland is highlighted in dark blue, Russia in brown, and other regions in cyan. The map shows a high concentration of notifications in Russia, particularly in the Kaliningrad region and the Gulf of Finland. The x-axis represents longitude (10 to 40) and the y-axis represents latitude (45 to 70).

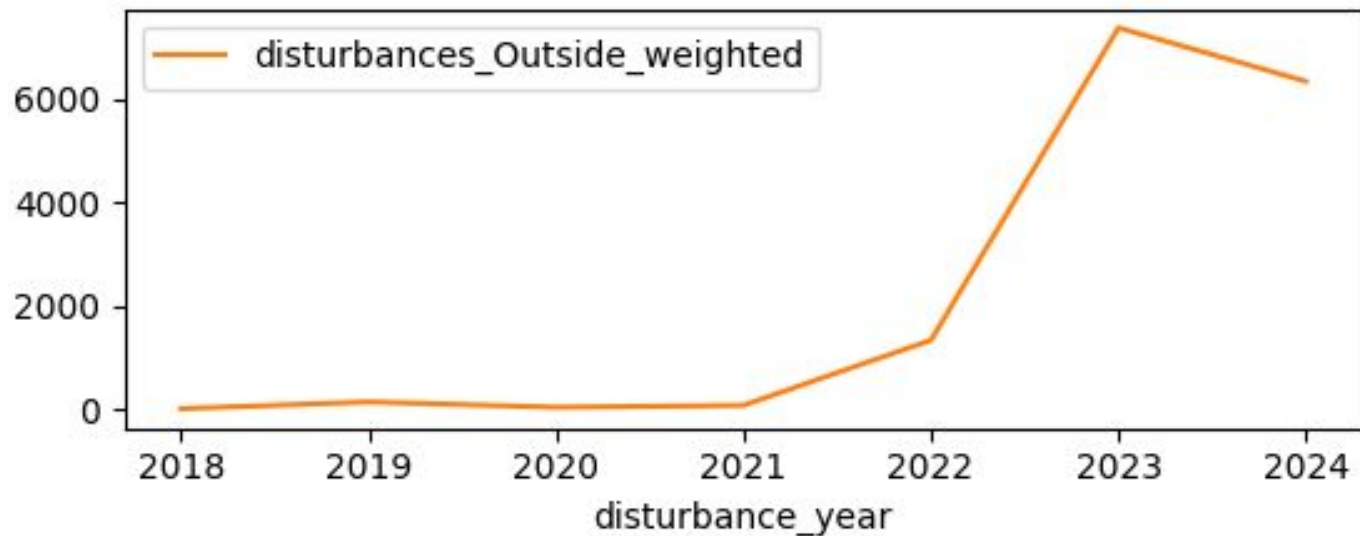
2024 an
incomplete year



Weighted by
 $365 / \# \text{ of days}$
2024 count: 3620

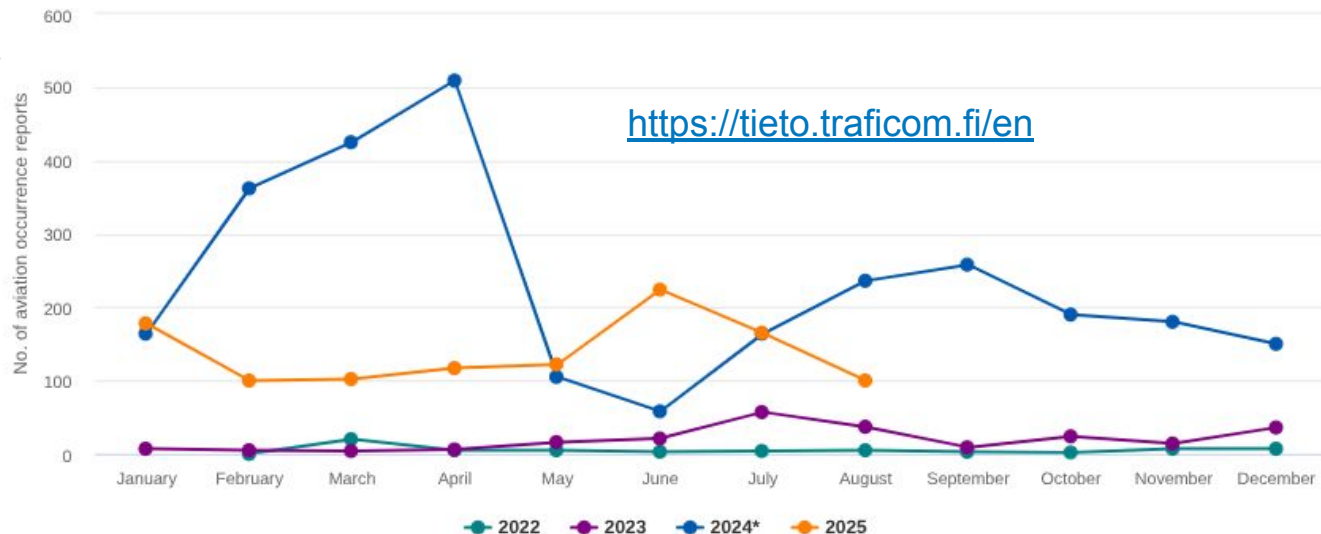


Seasonality ?
(fewer flights in
winter?)



Aviation occurrence reports concerning GPS reception interference in Finland

- *March 2022, numerous incidents.*
- *From January 2024 interference in southern Finland*
- *Finnish territory: Air navigation service providers and Finnish airlines*
- *Finnish airlines report incidents abroad.*
- **Reporting criteria revised May 2024 to be inline with other EU countries*



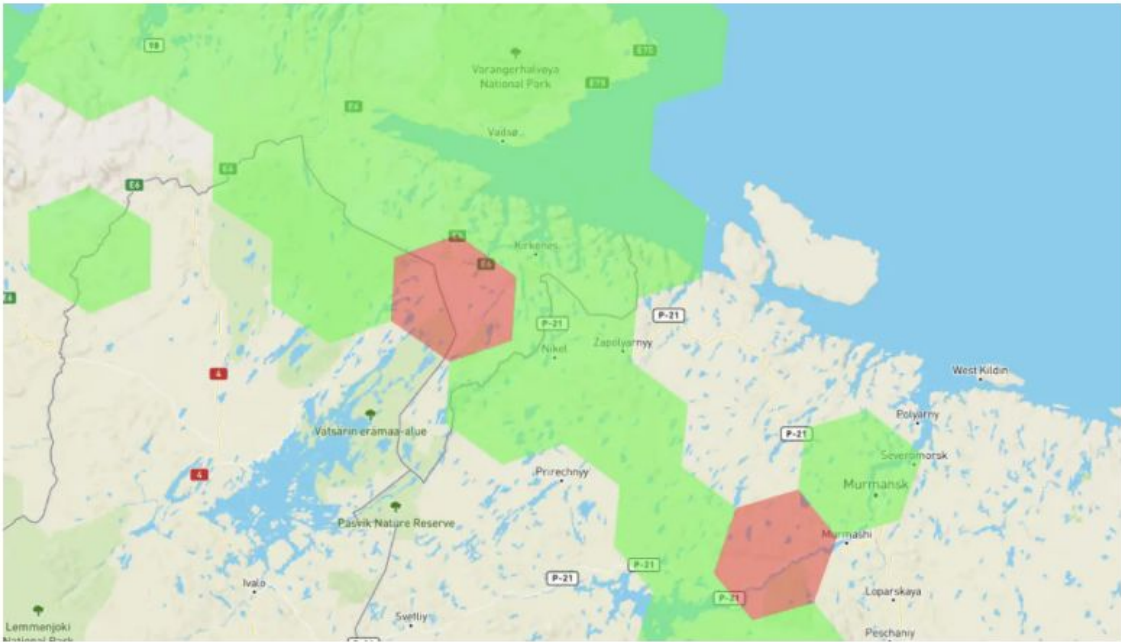
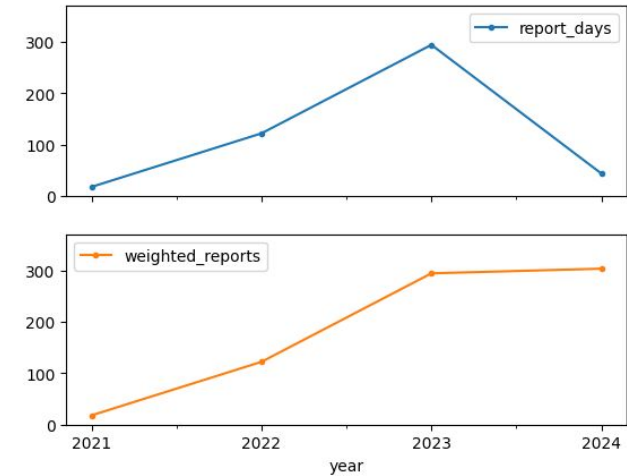
Save the graph data as a CSV file

Year	2022	2023	2024*	2025 (in the end of August)
Total	61	236	2 800	1117

<https://www.thebarentsobserver.com/>

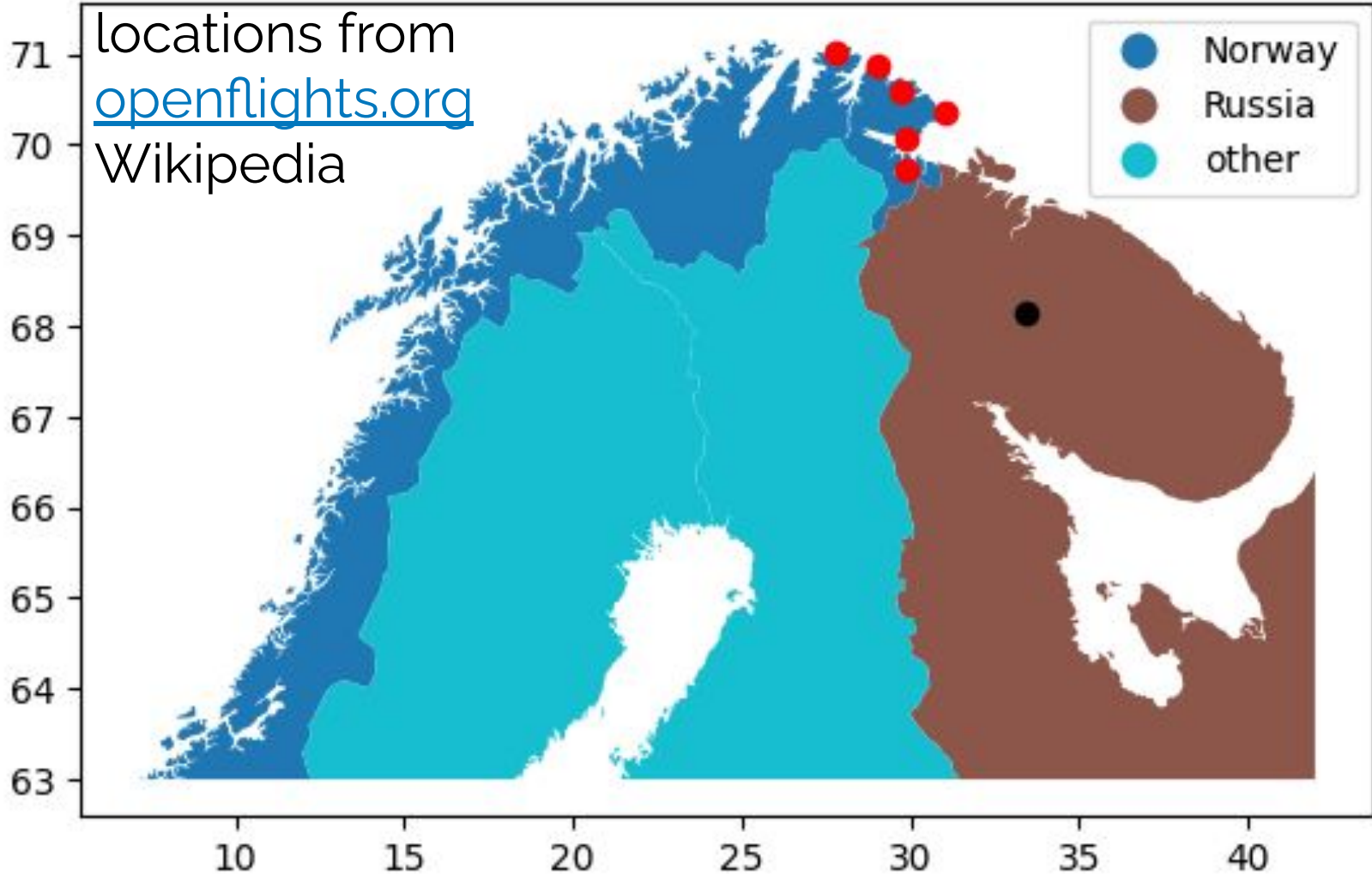
Quoting Norwegian Communication Authority.

interference in Finnmark, Norway



February 25: Red marks areas with high GPS jamming. Green is low. Russia's Northern Fleet has several electronic warfare units near Severomorsk, in the Pechenga region near the border with Norway and Finland. The red area marked on the Norwegian side of the border is the final approach for civilian aircraft landing from west to east at Kirkenes airport. Screenshot from GPSJam.org

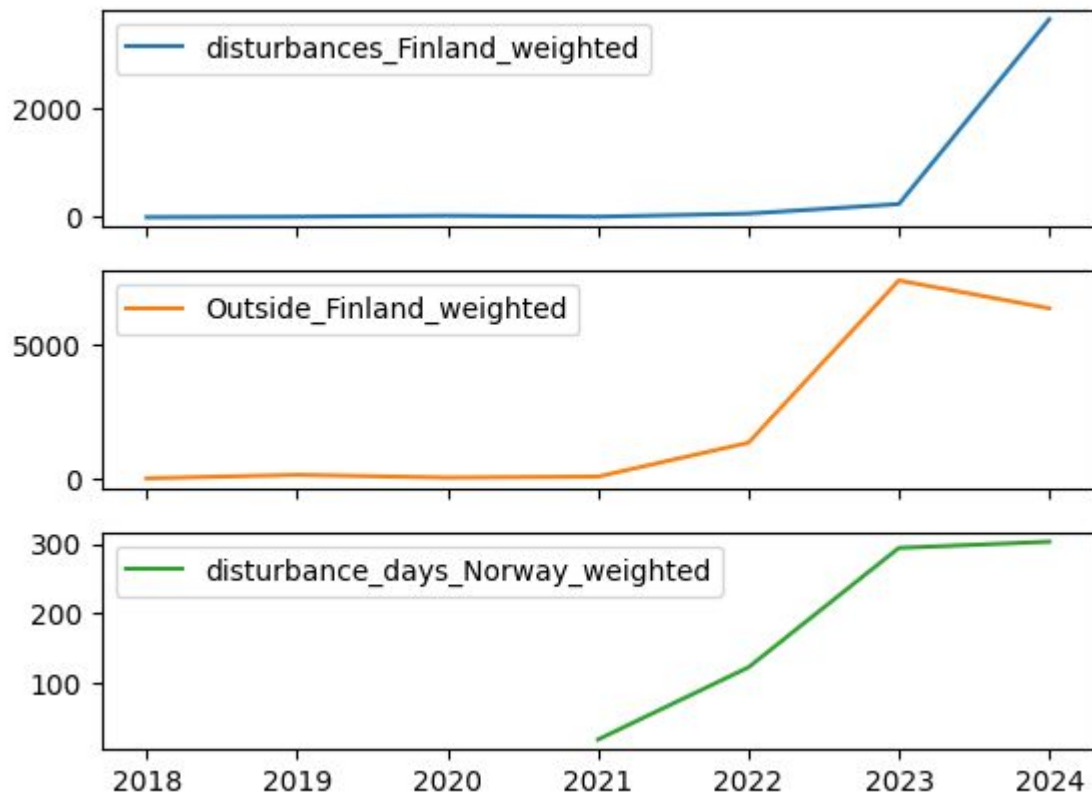
GPS jamming reports are coming from pilots on the airliners SAS, Norwegian and Widerøe as well as civilian air ambulances flying in and out of Kirkenes airport and the smaller airports along the coast of Finnmark, like Vadsø, Vardø, Båtsfjord, Berlevåg and Mehamn.



No VS Fi

Weighted by
 $365 / \text{number of days}$

- Finland:
 - notifications
 - to April 30th 2024
- Norway
 - days
 - To Feb 22nd 2024



Poland and Baltic states

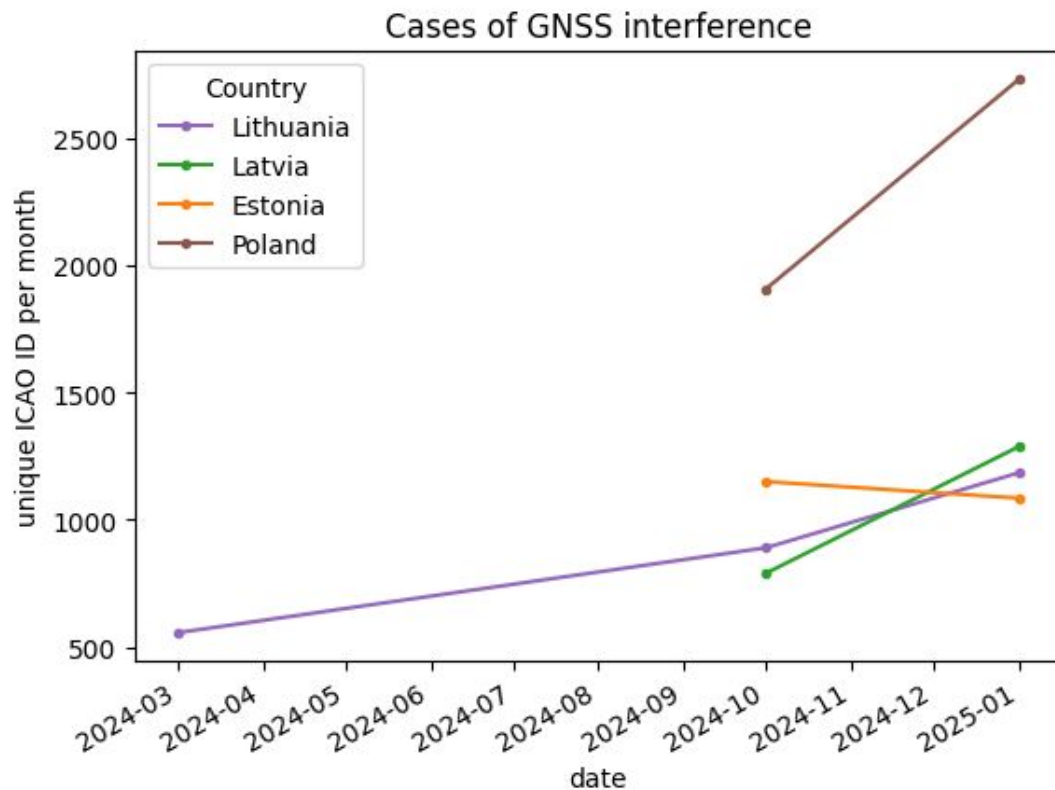
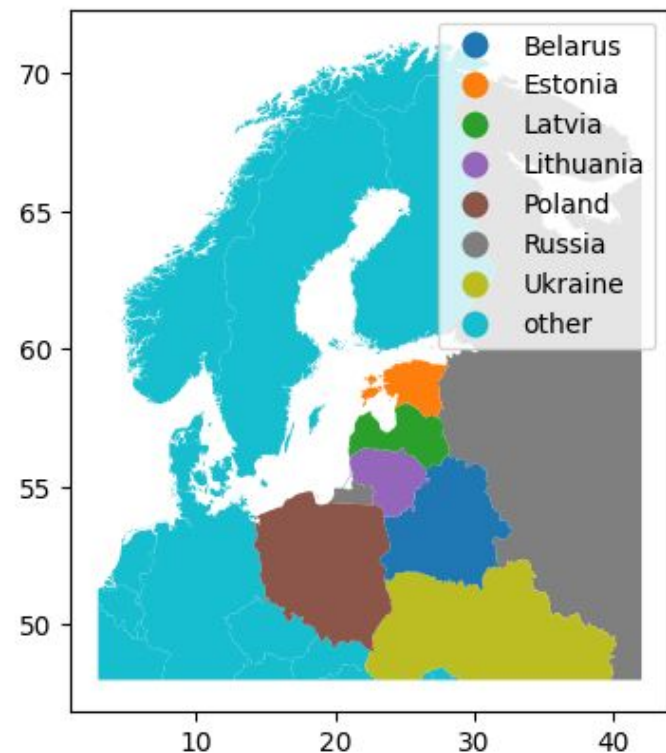


Steve Lipofsky www.Basketballphoto.com

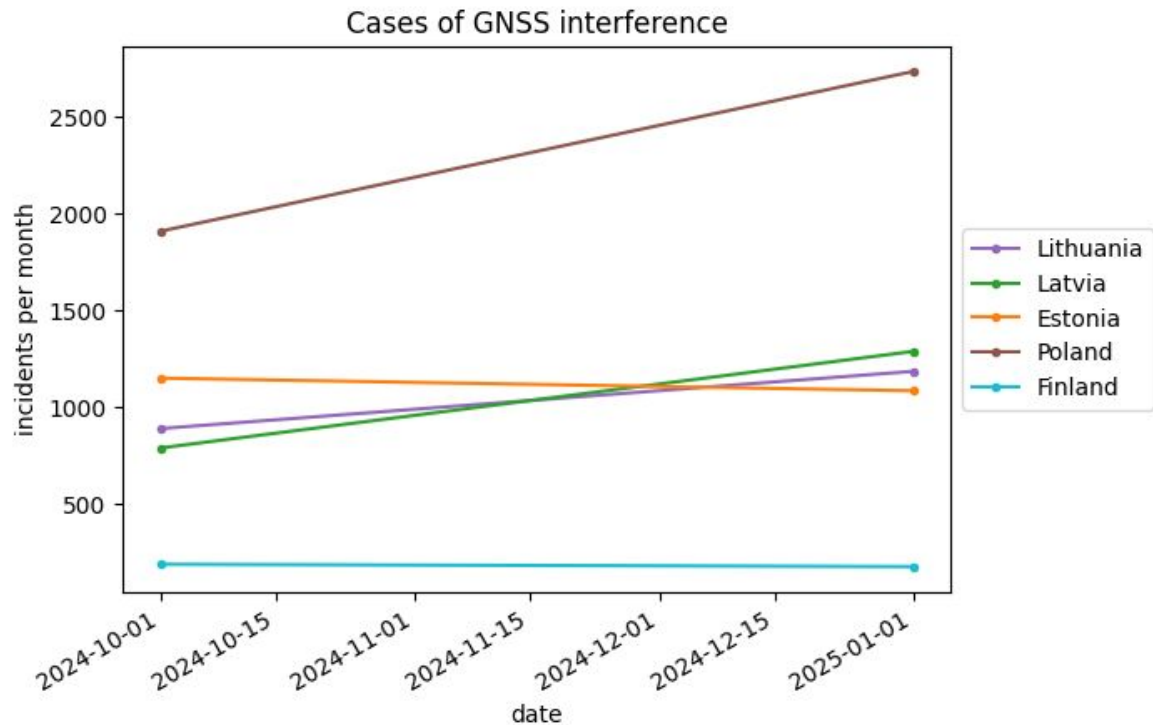
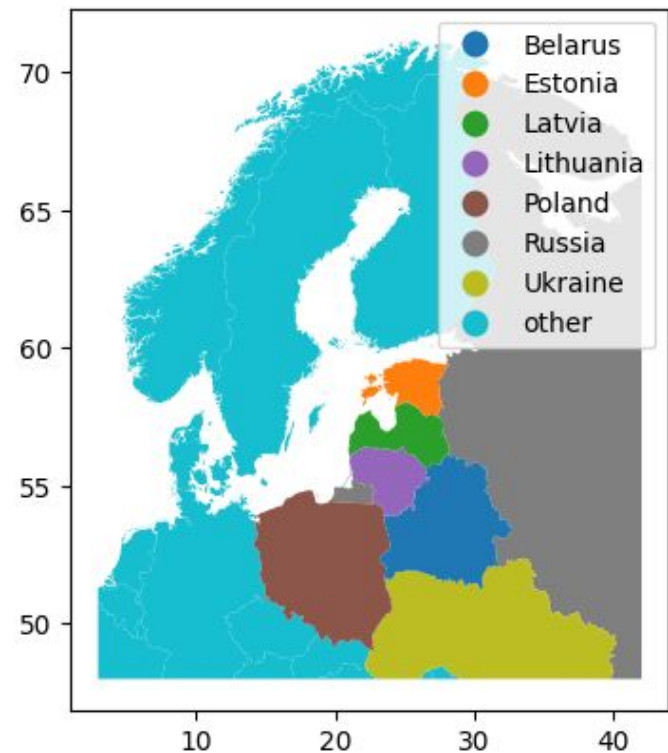
Information in a footnote of the “EU call for Action”

³ In Lithuania: starting from 556 cases in March 2024 to 890 in October 2024 and 1185 in January 2025; in Latvia: from 790 cases in October 2024 to 1288 cases in January 2025; in Estonia: 1150 cases in October 2024 and 1085 cases in January 2025; in Poland: 1908 cases in October 2024 to 2732 cases in January 2025 (according to unique ICAO ID per month).

EU call for action

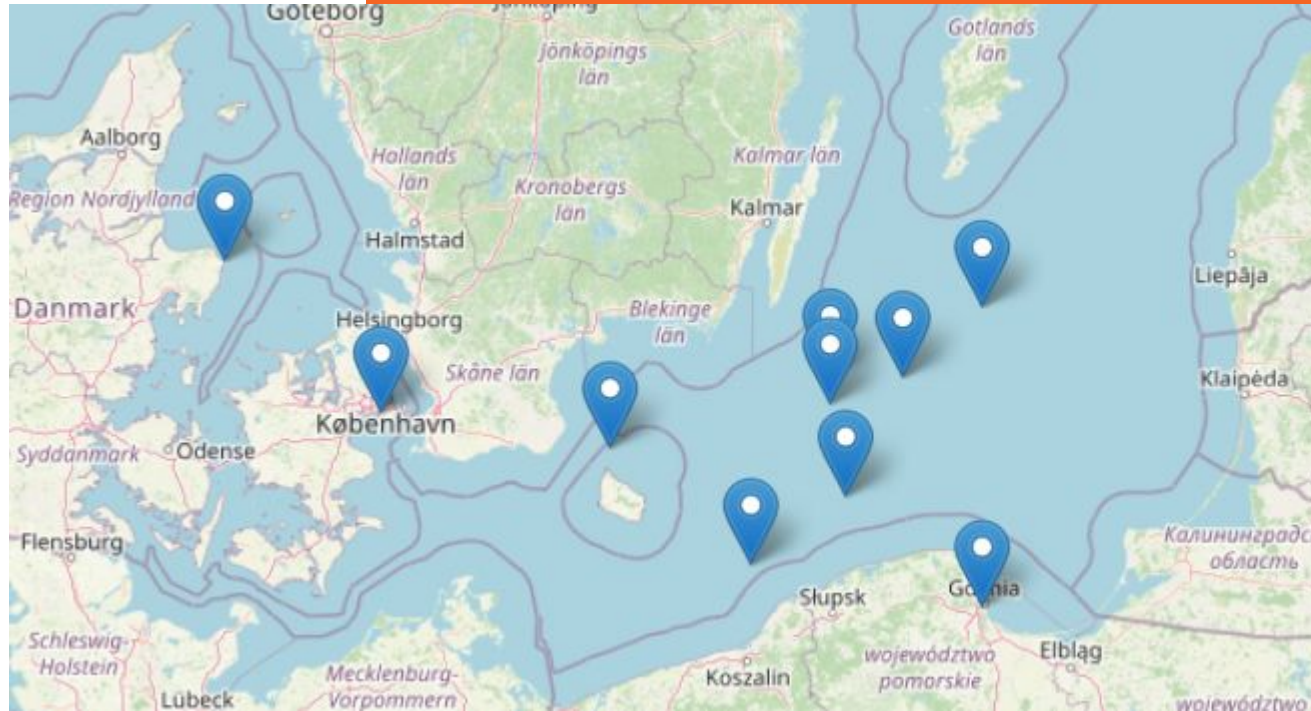


VS Finland?



US Coast Guard Navigation Centre

Individual reports:
USER: Vessel is in the
Baltic Sea enroute to
Russia, all GPS units
are unable to obtain a
fix for the last 10
hours.



Thank you!

https://github.com/stelios-c/GPS_analysis/tree/main/scandi_baltic
<https://www.linkedin.com/in/stelios-christodoulou-4869aa250/>

Gory detail



-Pandas html table scraping

```
url='situational-picture-disturbances-satellite-navigation-finland-2024'  
(pd  
  .read_html('https://www.traficom.fi/en/news/'+url)  
  [0]  
  .to_csv('finland_disturbance.csv', index=False)  
)
```

Openflights.org repo

```
airports_path=\n'https://raw.githubusercontent.com/jpatokal/openflights/refs/heads/master/data/airports.dat'\nairports_df=pd.read_csv(airports_path,\n                        header=None,\n                        names=['Airport_ID', 'airport_name', 'city', 'country',\n                              'iata', 'icao', 'lat', 'lon', 'altitude', 'Timezone',\n                              'DST', 'Tz', 'type', 'source'],\n                        na_values='\\N',\n                        on_bad_lines='warn')
```

```
affected_list='Kirkenes|Vadsø|Vardø|Båtsfjord|Berlevåg|Mehamn'\nnorway_df=airports_df.query("airport_name.str.contains('"+affected_list+"')")
```

- Python Wikipedia Library

```
In [8]: air_base=wikipedia.page("Olenya_air_base").coordinates
```

```
In [9]: air_base_df=pd.DataFrame({'airport':'Olenya_base', 'latitude':float(air_base[0]),
```

[illegible]

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version 4.0 on 8 October 2015.
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