

# Evolution of GNSS Events in the SAM Region

Period: JAN 2024 – JUL 2025

Radio Navigation Workshop for NAM and SAM Regions  
Mexico City, Mexico. 2 to 4 September 2025

**ANAC** | AVIACIÓN CIVIL  
ARGENTINA



Secretaría  
de Transporte  
Ministerio de Economía

# Evolution of GNSS events in the SAM Region



**Interference to GNSS signals and its mitigation is a very present issue and especially considered and studied by ICAO in its forums and documents, since at the international level there have been repeated incidents of interference in GNSS that affect the operational safety of international air navigation.**

**All Member States were therefore required to take measures to ensure that sources of GNSS interference signals are identified and mitigated in order to ensure that the integrity of international air navigation is maintained.**



# Evolution of GNSS events in the SAM Region

**An important recommendation is to identify cases of interference, for that you can count on the collection of reports.**



**Daily map representation of spoofing and jamming events:**

- **GPSJAM site <https://gpsjam.org/> developed by John Wiseman in July 2022 with data provided by ADS-B Exchange.**
- **Stanford University <https://rfi.stanford.edu/?date=2025-08-01&mode=jamming&granularity=daily&heatmap=true>**

**IATA document "Global Navigation Satellite System, GNSS Radio Frequency Interference Safety Risk Assessment" (September 2024 edition) presenting data taken from the Global Aviation Data Management (GADM) program.**



# Evolution of GNSS events in the SAM Region

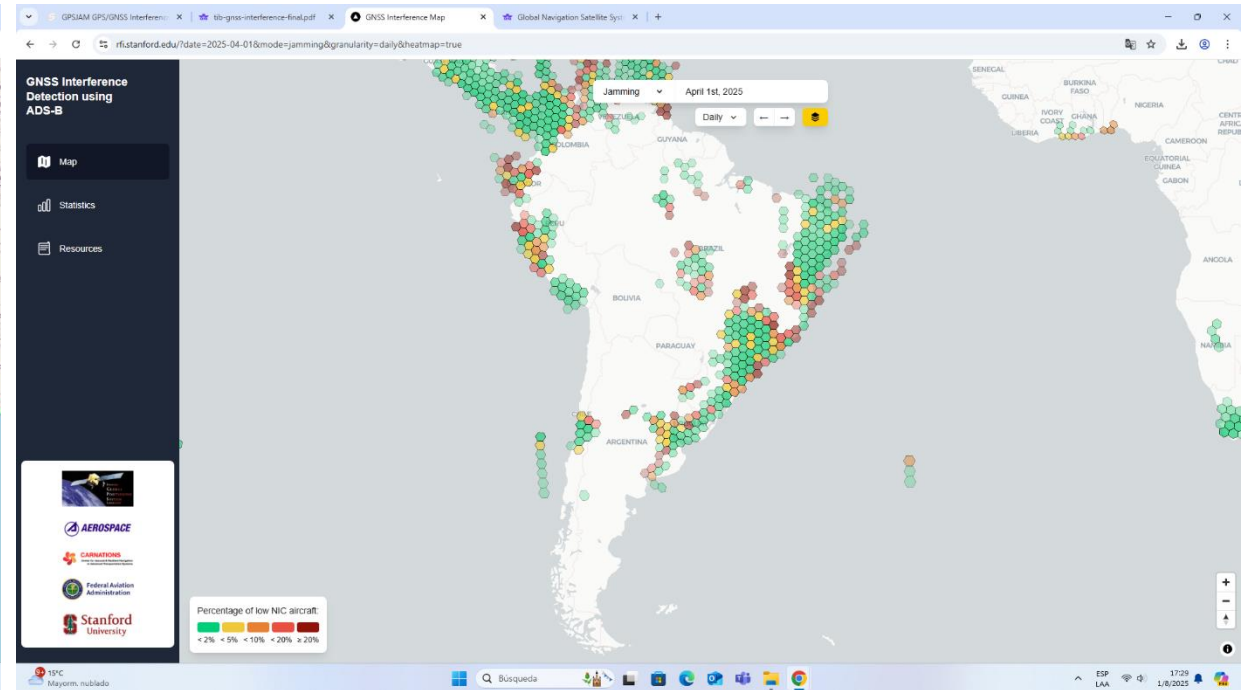
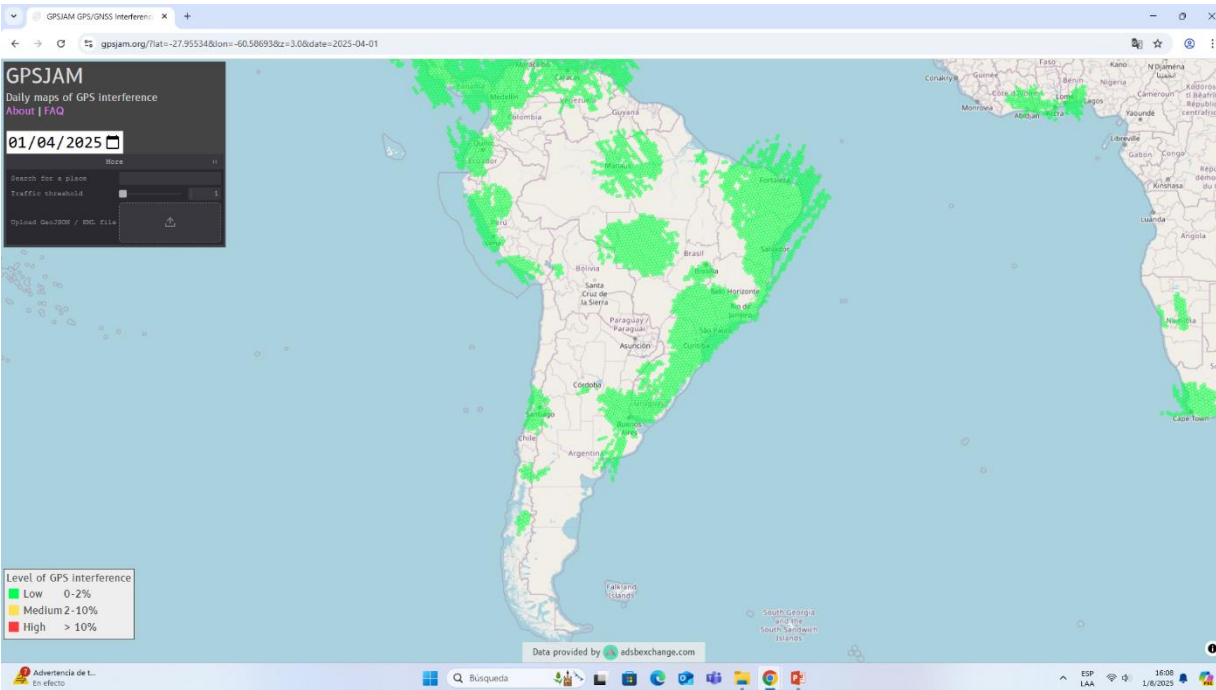


**Below are the screenshots of the sites that report the status of jamming/spoofing events in a period from JAN 2025 to JUL 2025.**

**Initially the GPSJAM images are shown and then those from Stanford University, observing that the patterns match**



# Evolution of GNSS events in the SAM Region



# GPSJAM

Daily maps of GPS interference  
[About](#) | [FAQ](#)

01/01/2024

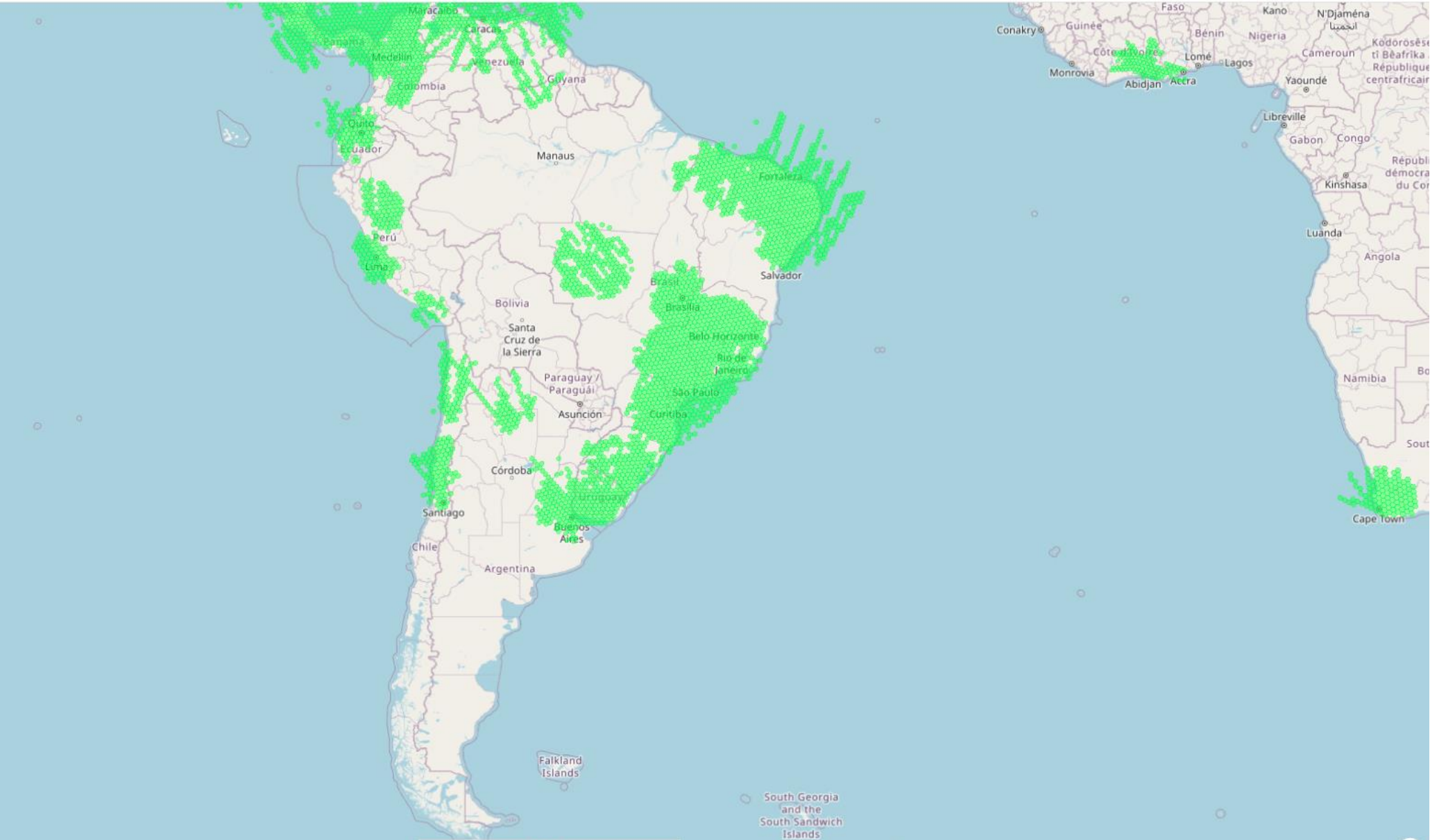
Search for a place

Traffic threshold

Upload GeoJSON / KML file

Level of GPS interference

- Low 0-2%
- Medium 2-10%
- High > 10%



Data provided by [adsbexchange.com](#)

# GPSJAM

Daily maps of GPS interference  
[About](#) | [FAQ](#)

01/02/2024

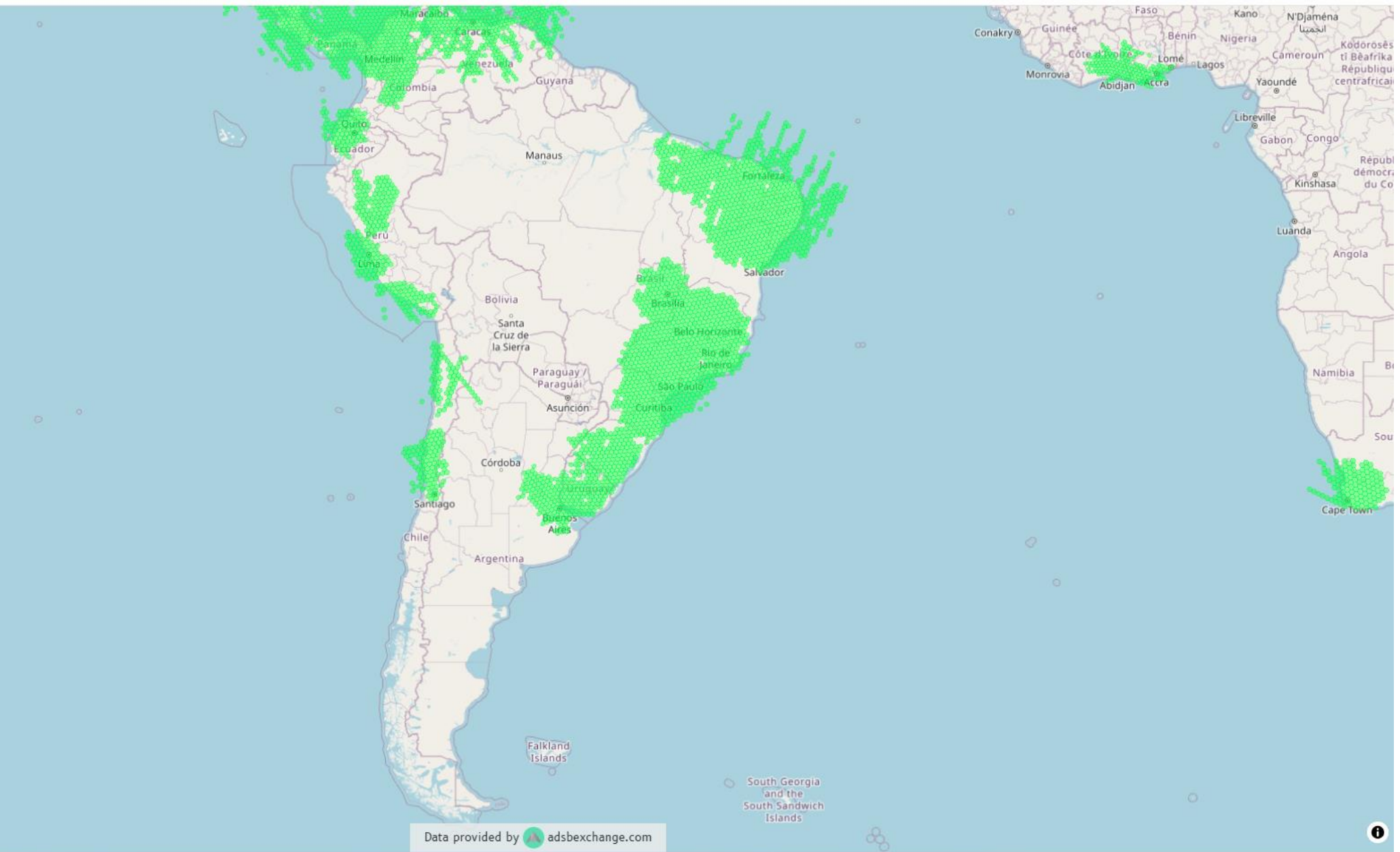
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**GPSJAM**  
 Daily maps of GPS interference  
[About](#) | [FAQ](#)

01/03/2024

More



Level of GPS interference

Low	0-2%
Medium	2-10%
High	> 10%

Data provided by adsbexchange.com

# GPSJAM

Daily maps of GPS interference

[About](#) | [FAQ](#)

01/04/2024

Search for a place

Traffic threshold: 1

Upload GeoJSON / KML file



Data provided by adsbexchange.com

# GPSJAM

Daily maps of GPS interference

[About](#) | [FAQ](#)

01/05/2024

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Data provided by adsbexchange.com

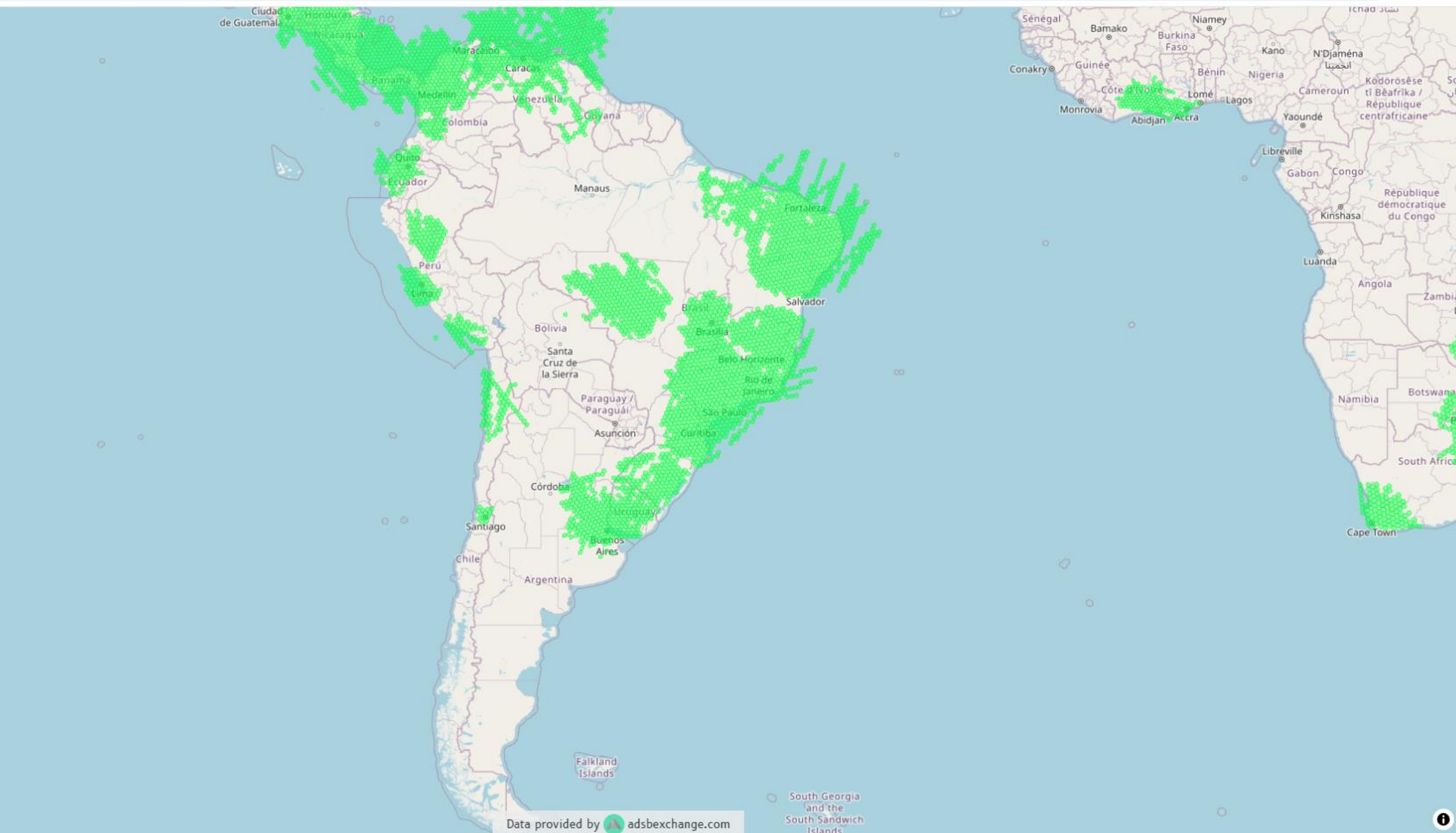
**GPSJAM**  
 Daily maps of GPS interference  
[About](#) | [FAQ](#)

01/06/2024

More

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Data provided by adsbexchange.com

# GPSJAM

Daily maps of GPS interference

[About](#) | [FAQ](#)

01/07/2024

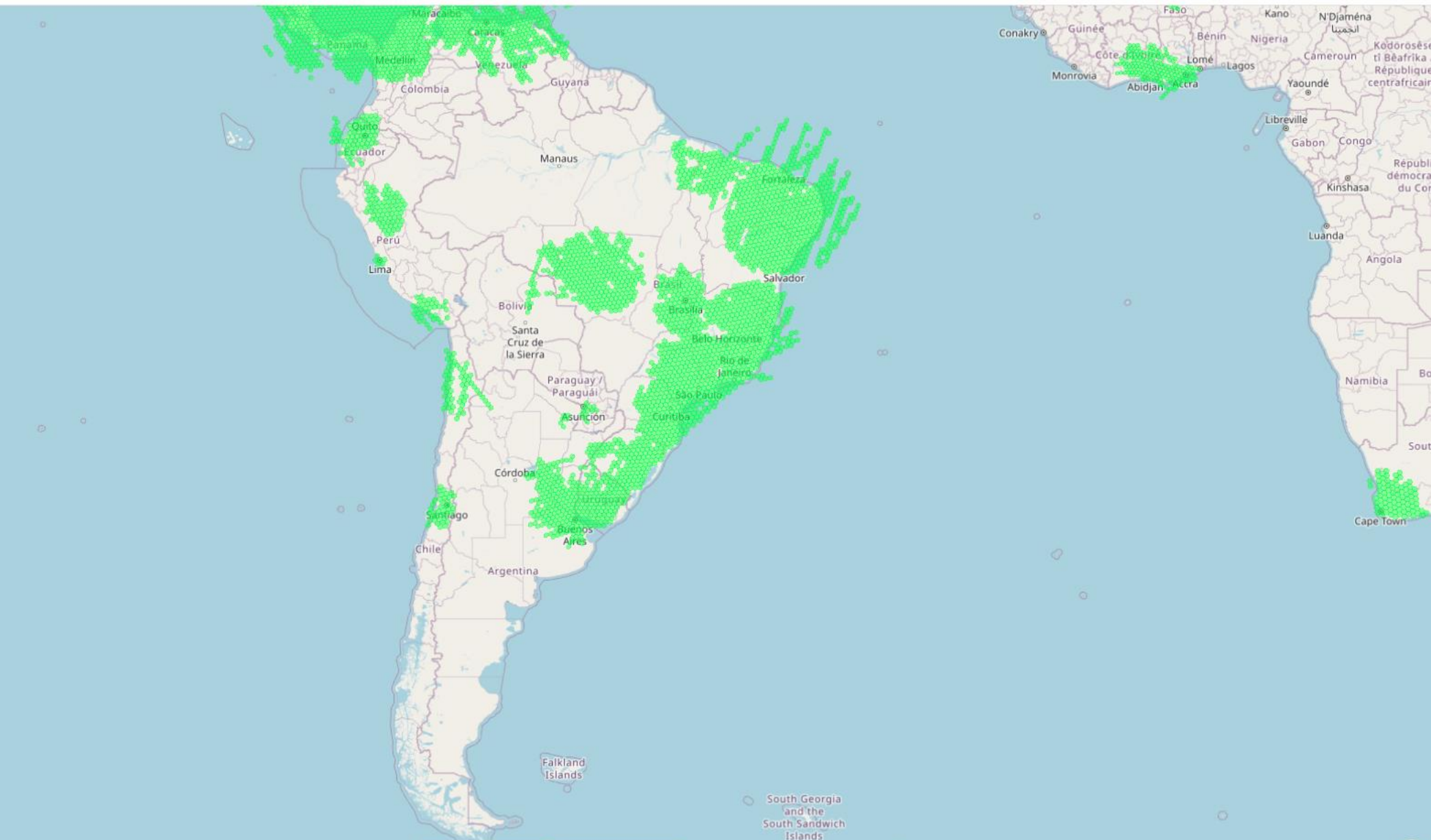
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Daily maps of GPS interference

[About](#) | [FAQ](#)

01/08/2024

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Data provided by adsbexchange.com

# GPSJAM

Daily maps of GPS interference

[About](#) | [FAQ](#)

01/09/2024

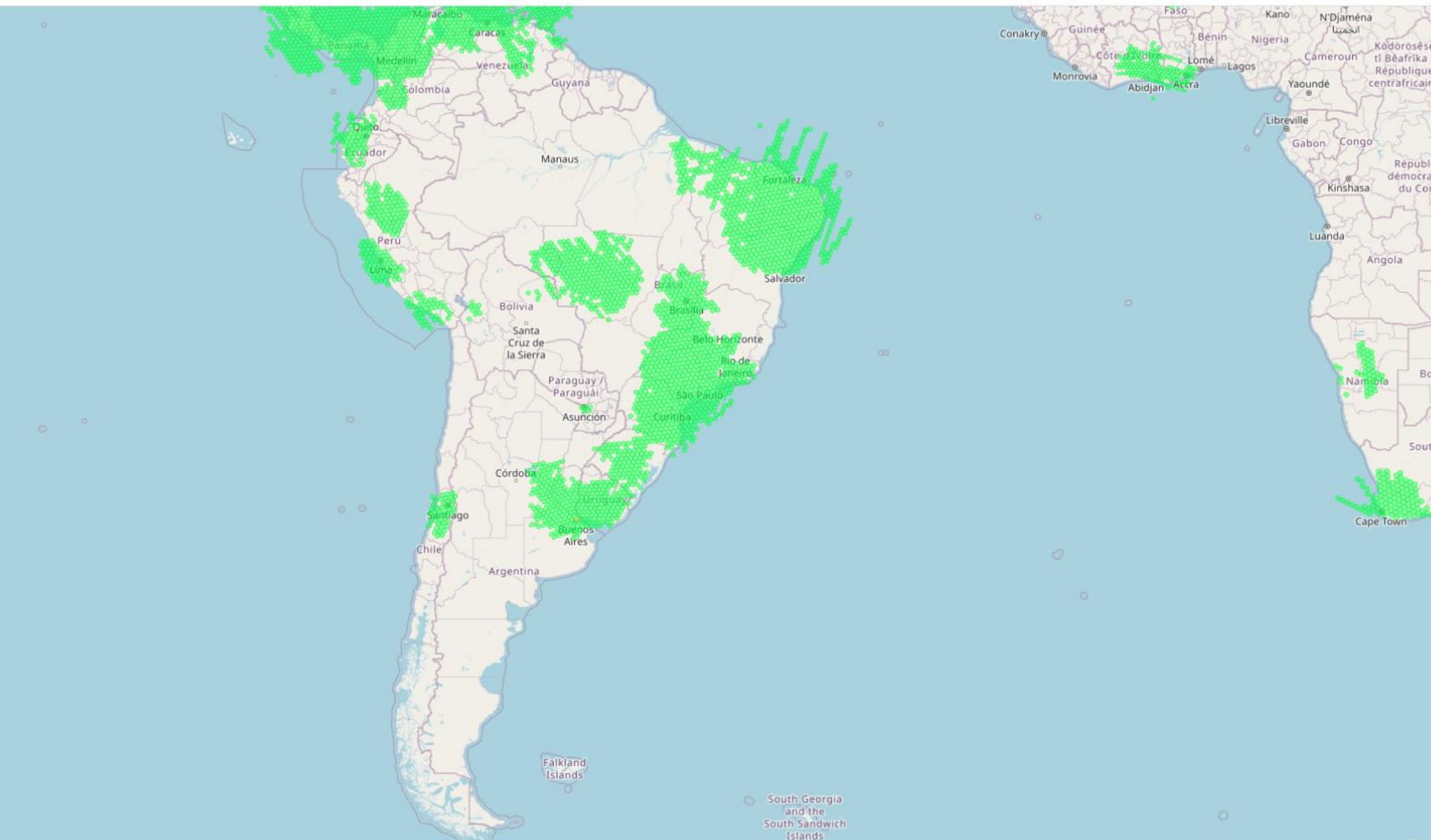
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Daily maps of GPS interference

[About](#) | [FAQ](#)

01/10/2024

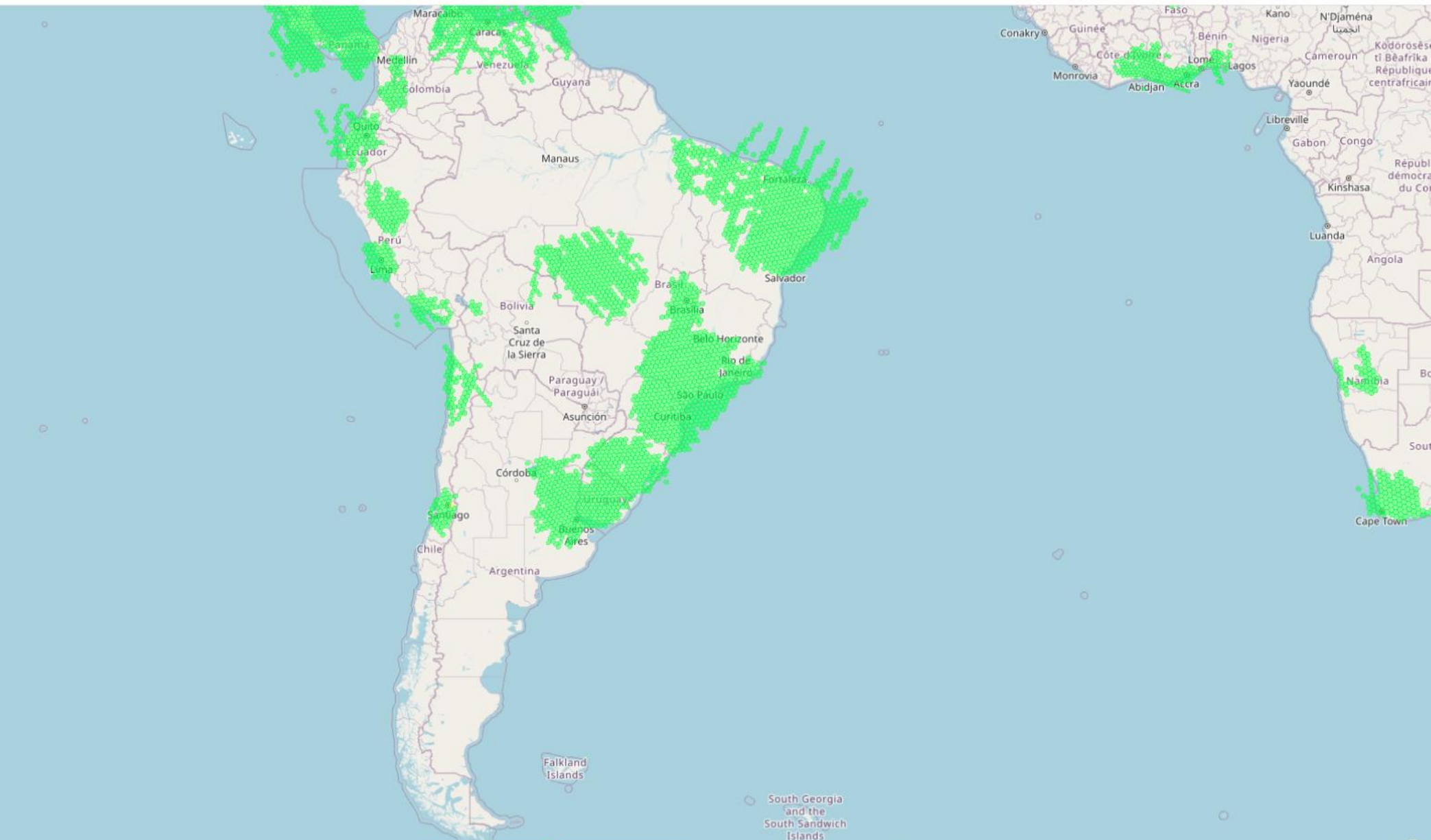
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# GPSJAM

Daily maps of GPS interference

[About](#) | [FAQ](#)

01/11/2024

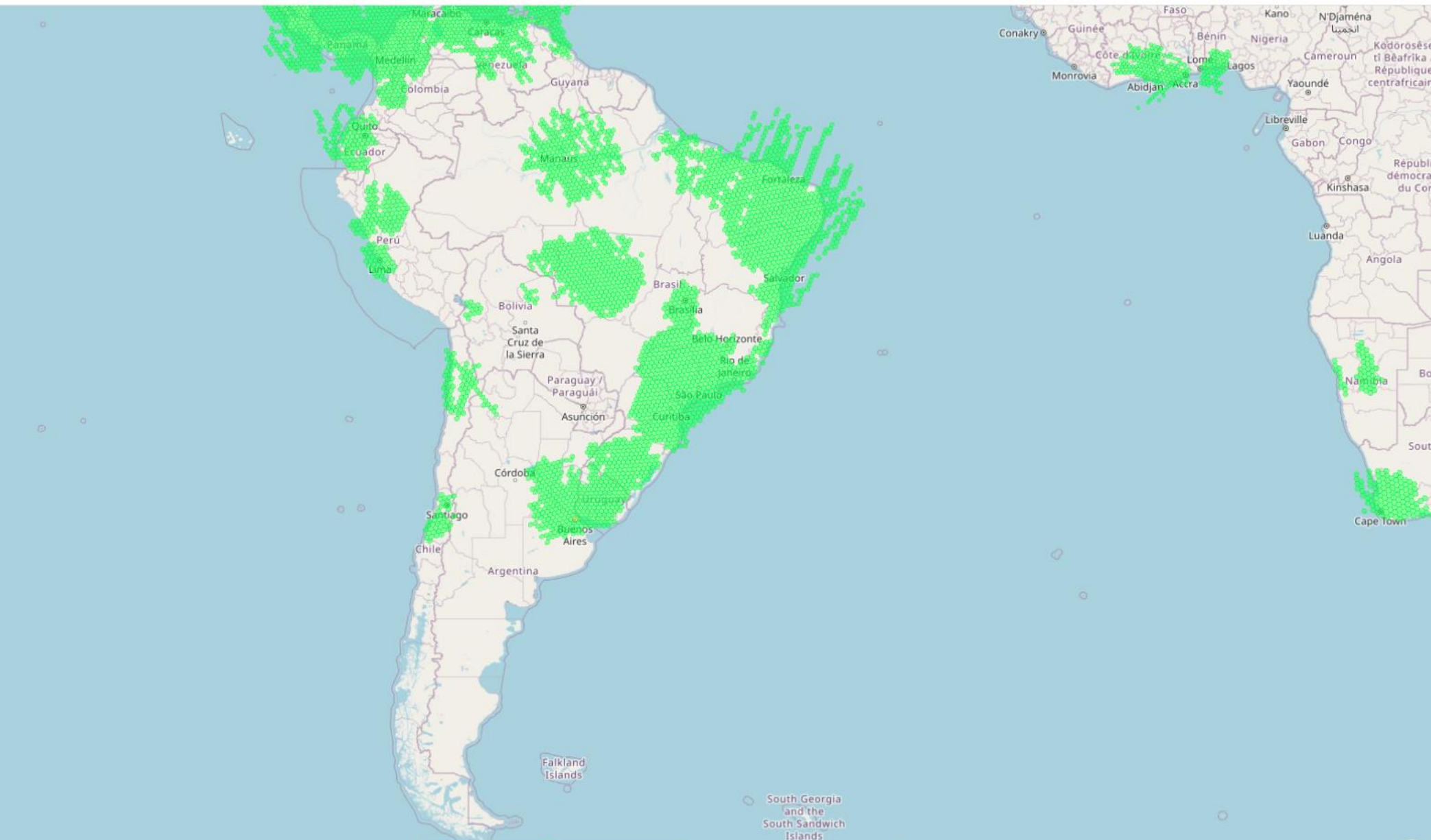
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Data provided by adsbexchange.com

# GPSJAM

Daily maps of GPS interference

[About](#) | [FAQ](#)

01/12/2024

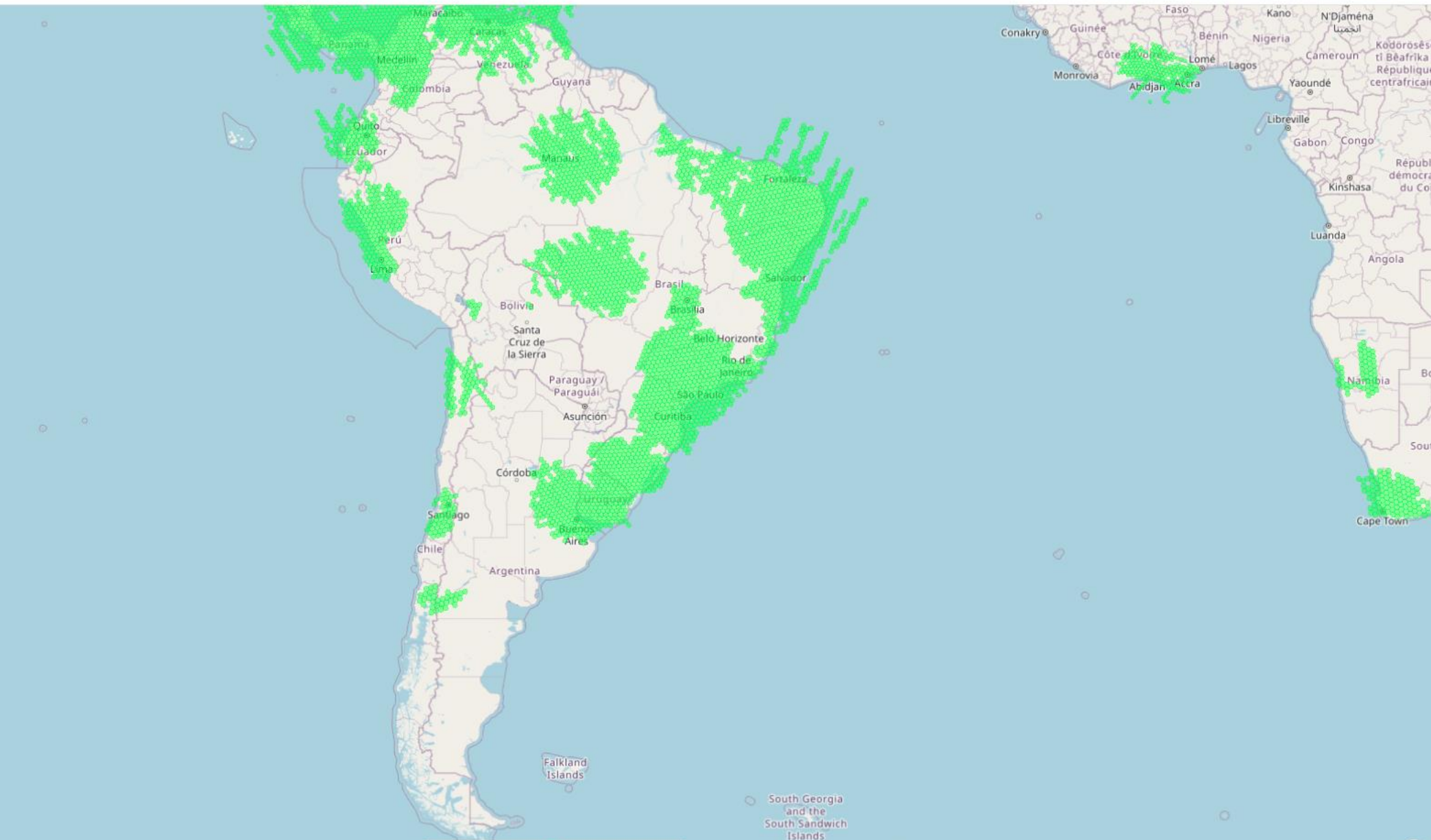
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Daily maps of GPS interference  
[About](#) | [FAQ](#)

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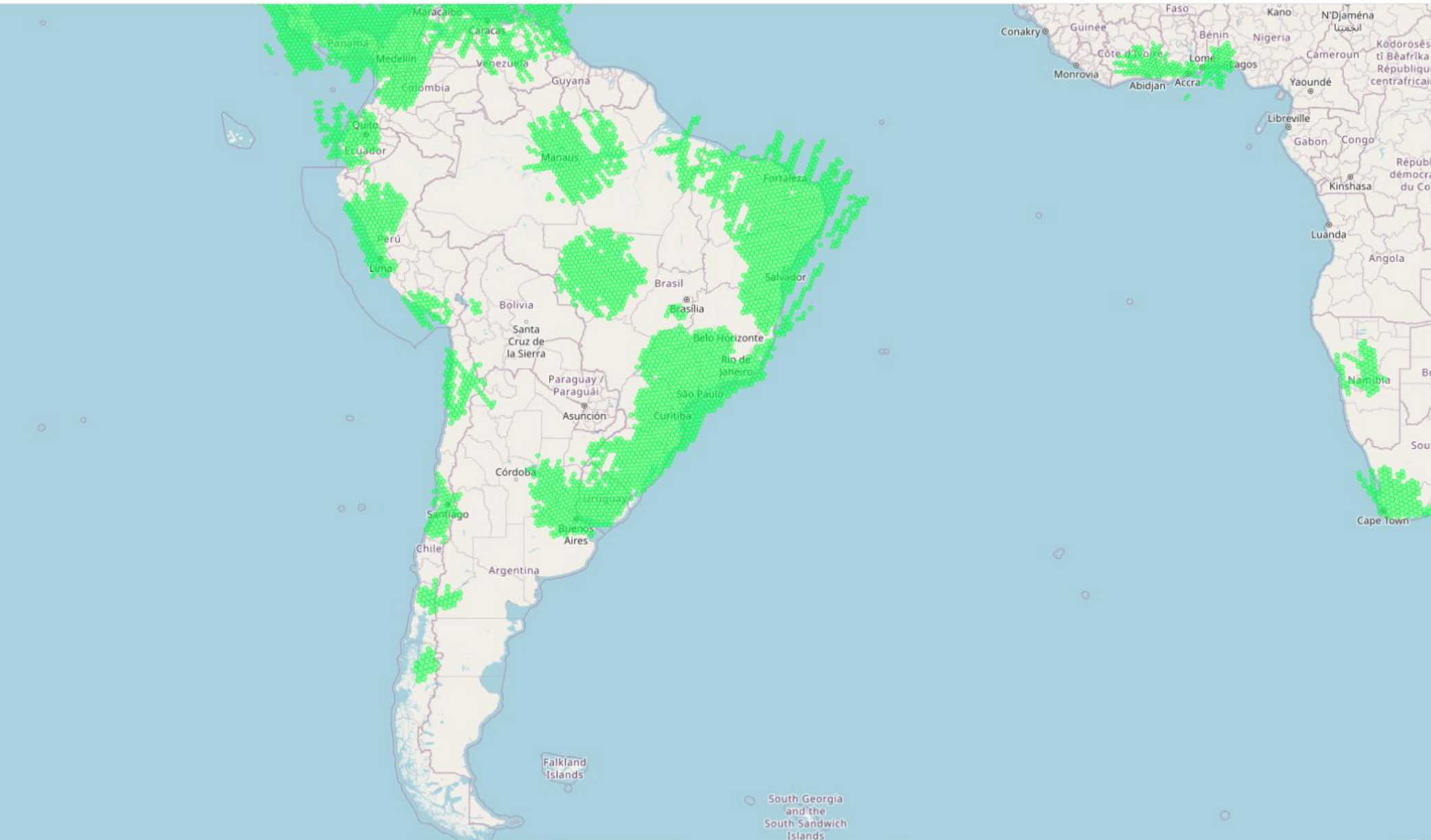
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Daily maps of GPS interference

[About](#) | [FAQ](#)

01/02/2025

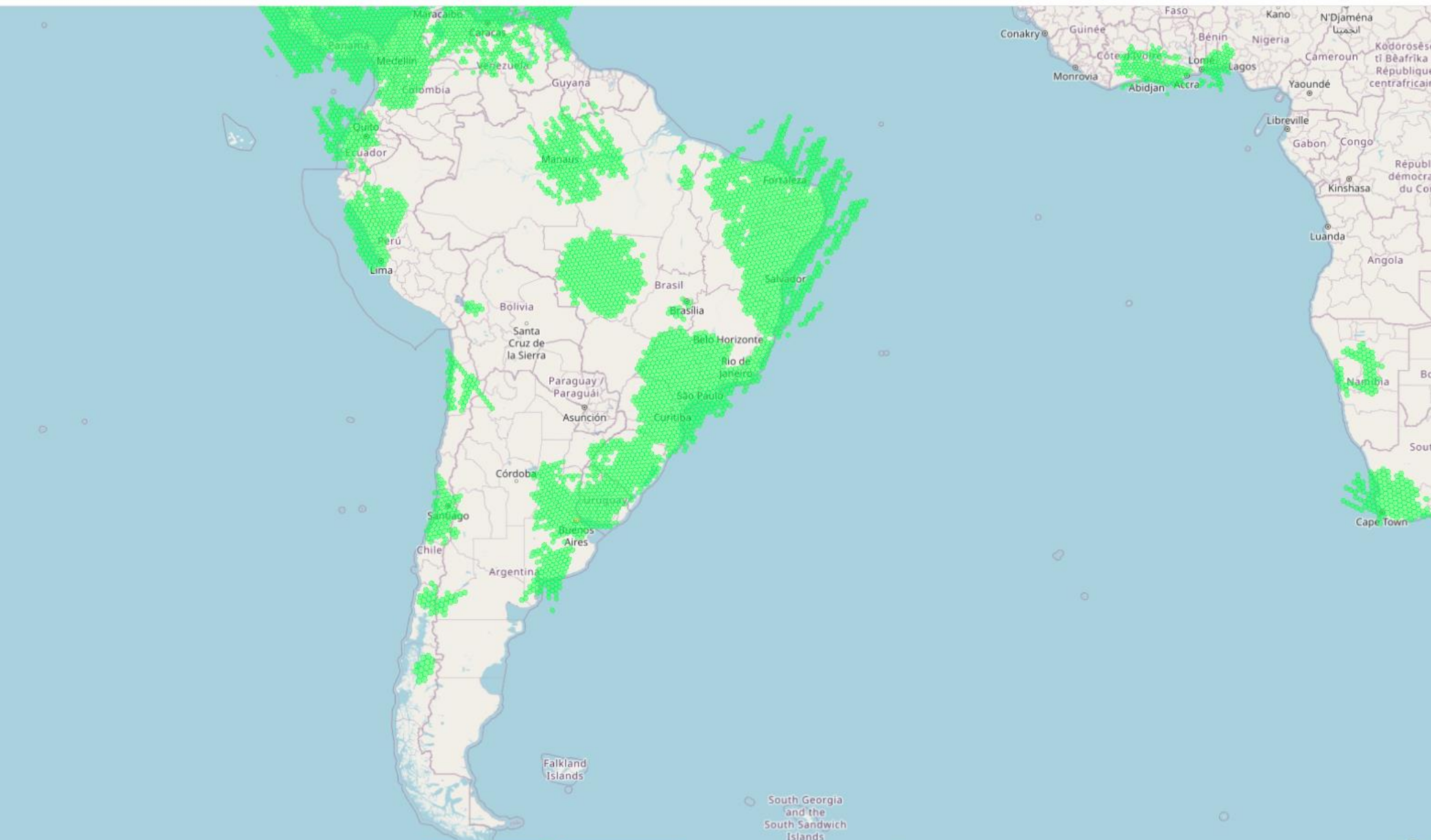
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# GPSJAM

Daily maps of GPS interference

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01/03/2025

More



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Daily maps of GPS interference

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01/04/2025

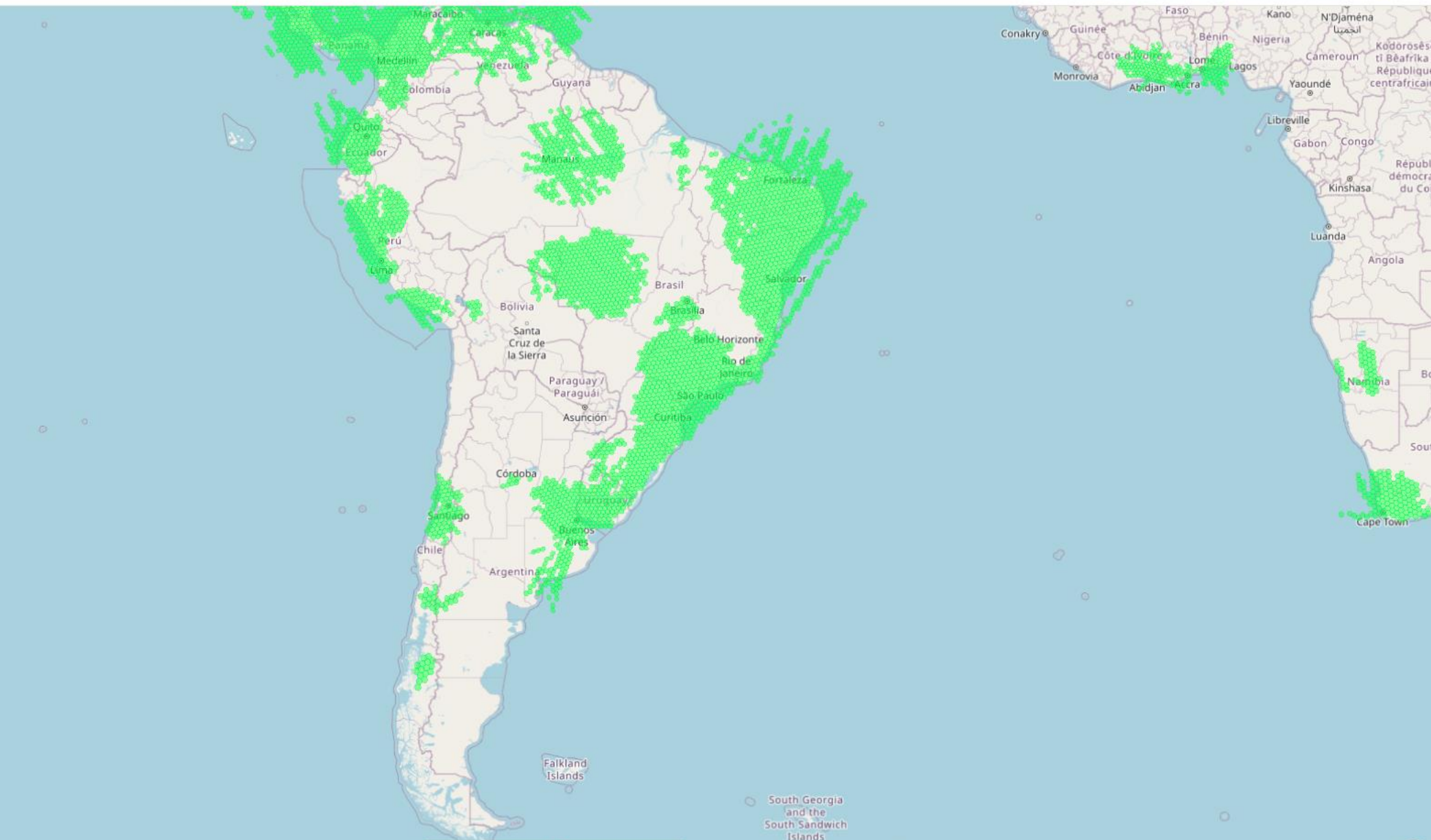
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Daily maps of GPS interference

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01/05/2025

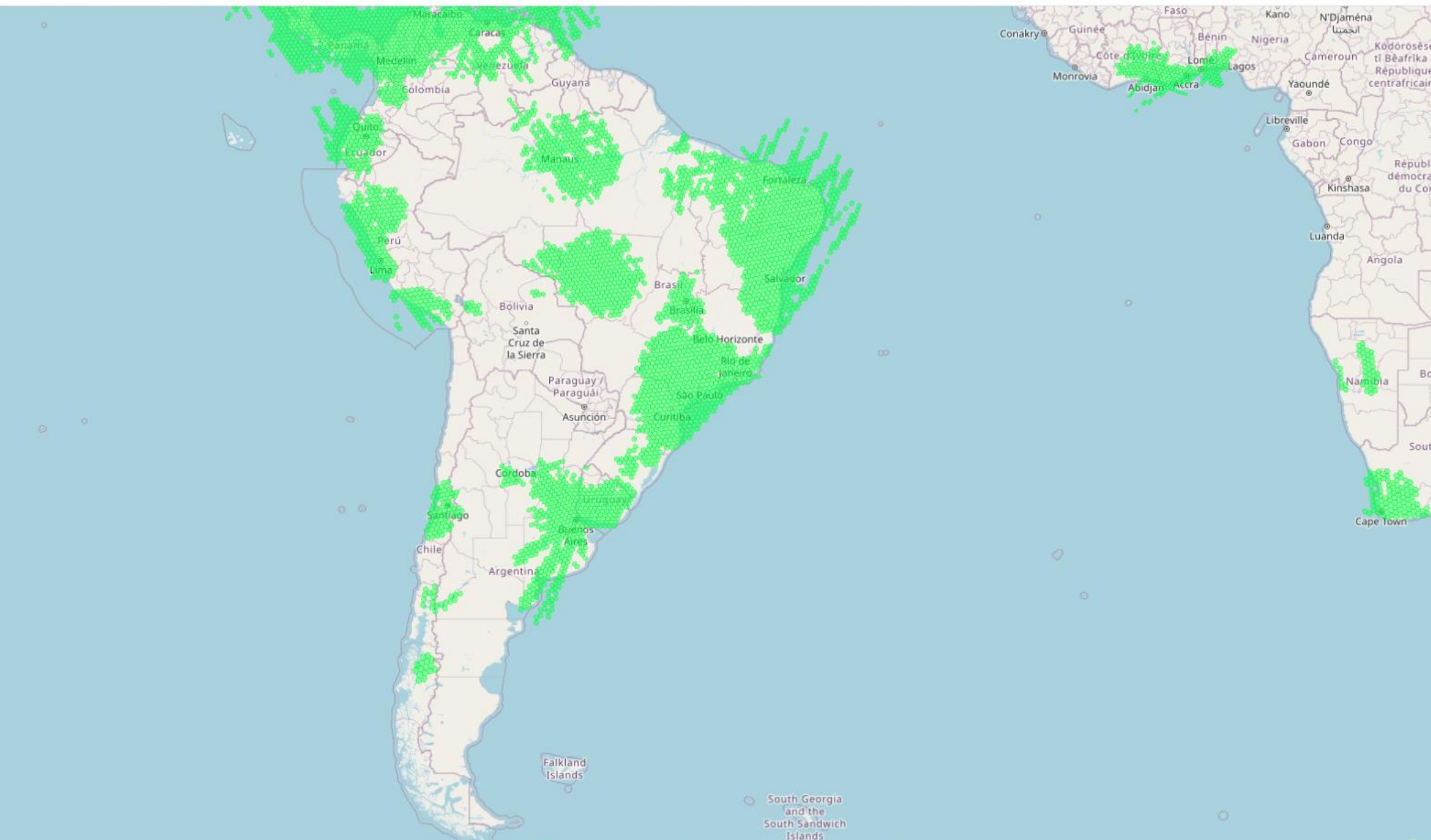
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Daily maps of GPS interference

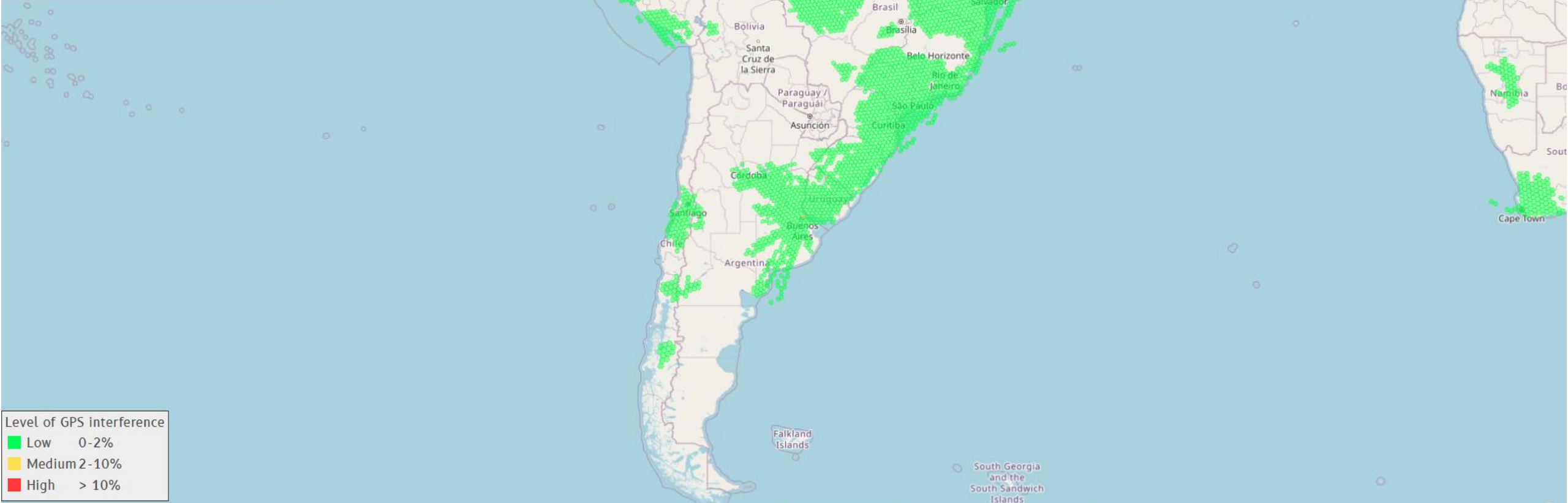
[About](#) | [FAQ](#)

01/07/2025

Search for a place

Traffic threshold

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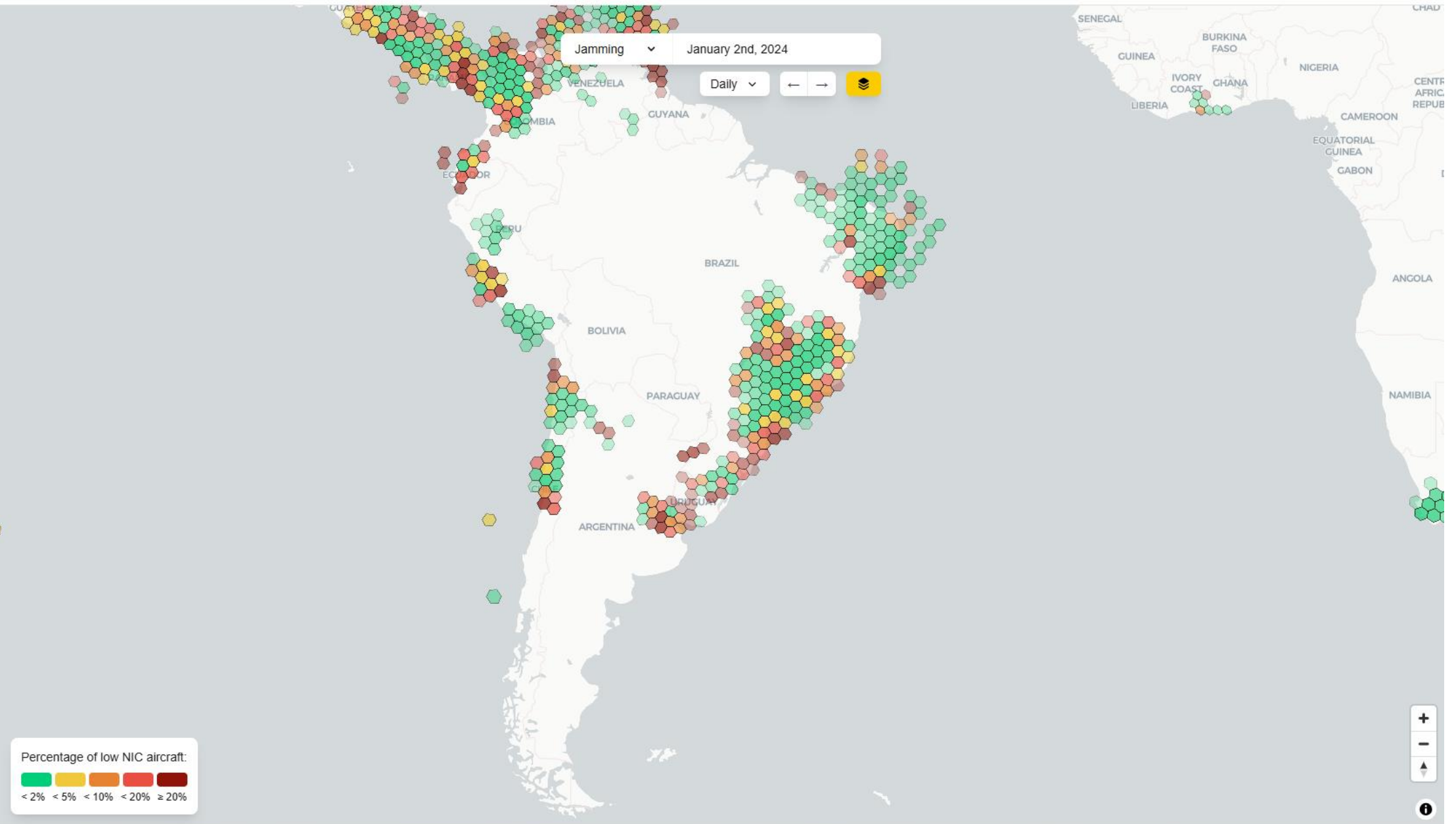
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Data provided by [adsbexchange.com](https://adsbexchange.com)

### GNSS Interference Detection using ADS-B

- Map
- Statistics
- Resources



### GNSS Interference Detection using ADS-B

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**AEROSPACE**



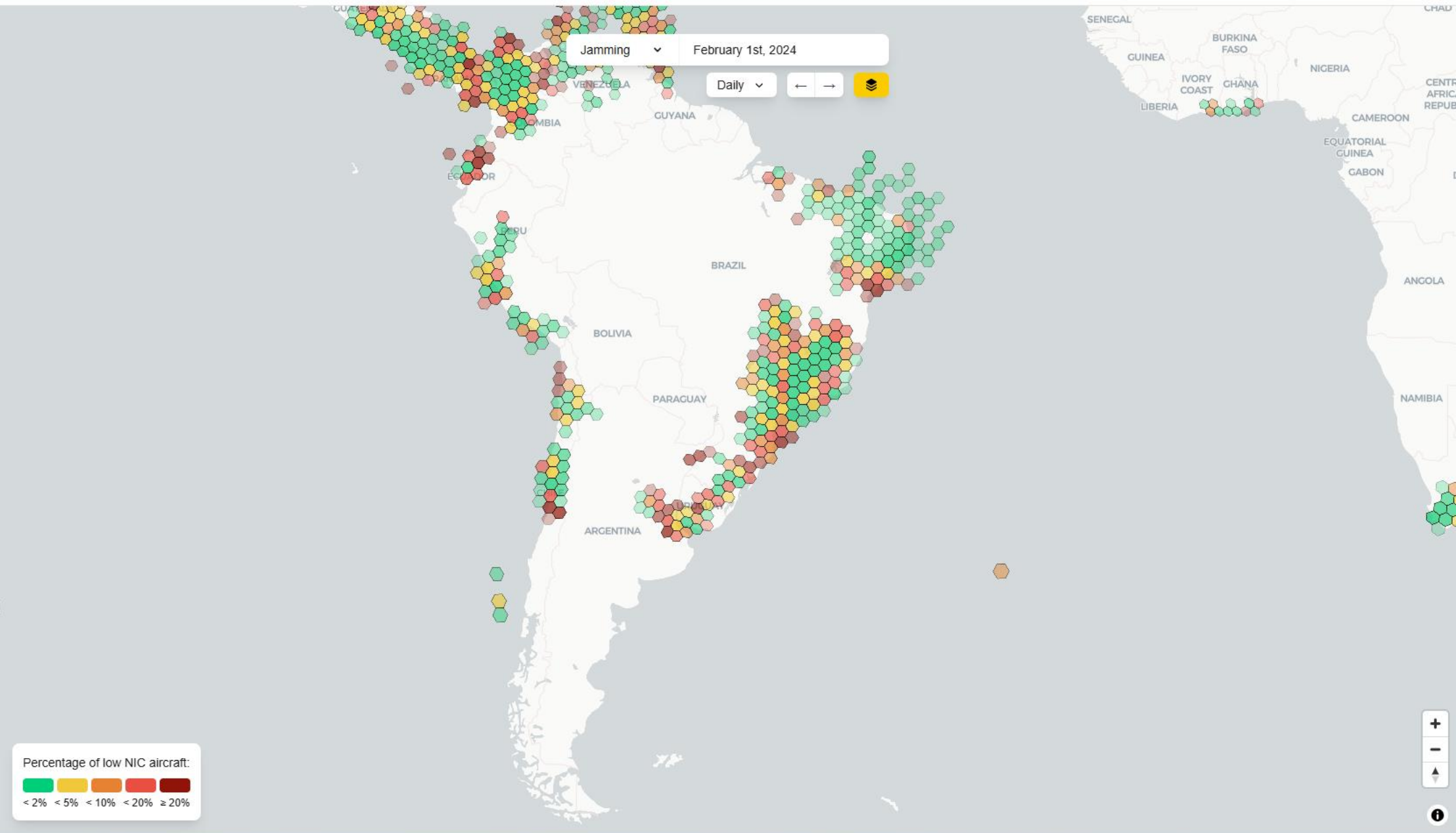
**CARNATIONS**  
Center for Research and Analysis in Transportation Systems



Federal Aviation Administration



**Stanford University**



### GNSS Interference Detection using ADS-B

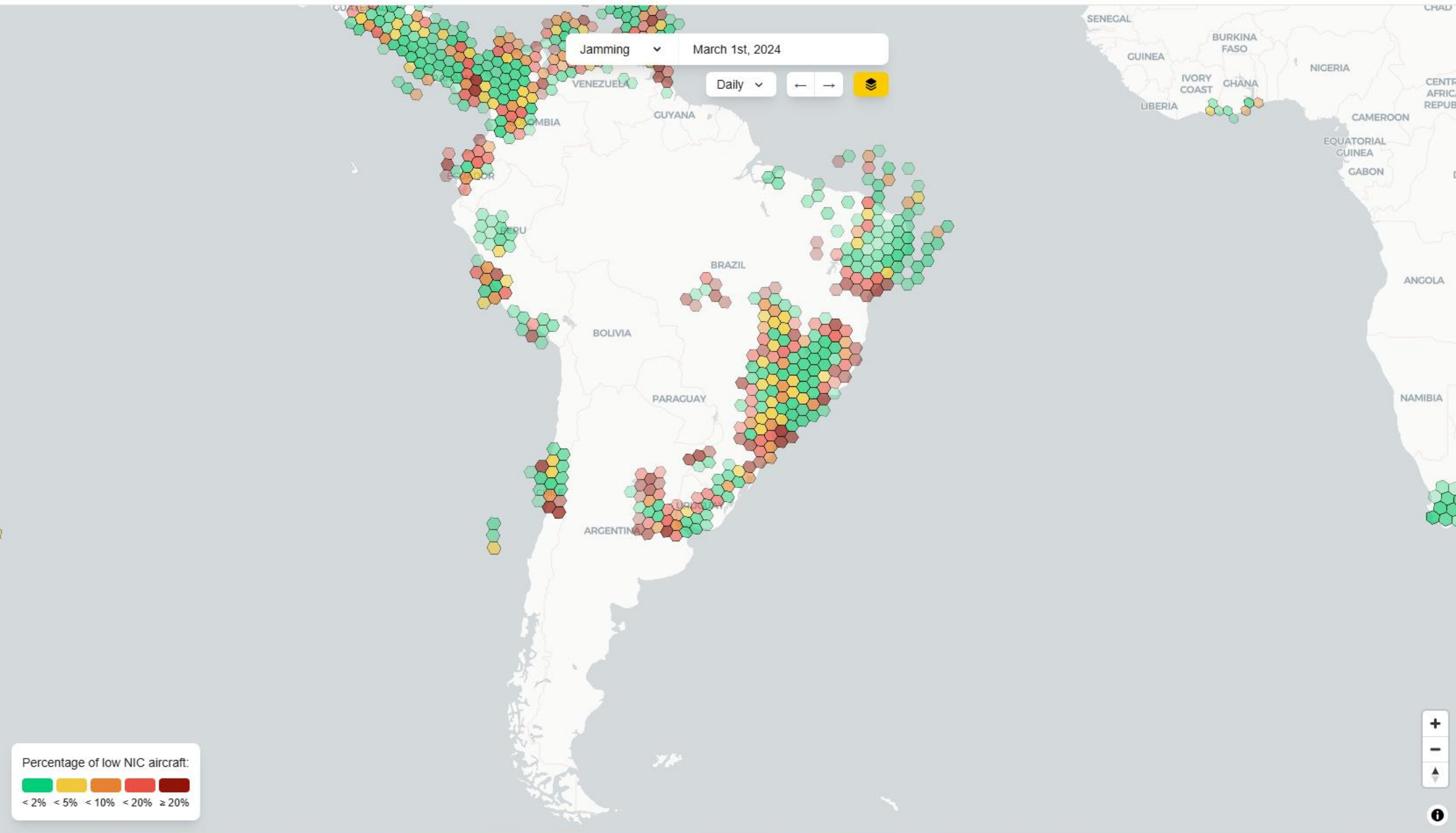
- Map
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AEROSPACE

CARNATIONS

Federal Aviation Administration

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### GNSS Interference Detection using ADS-B

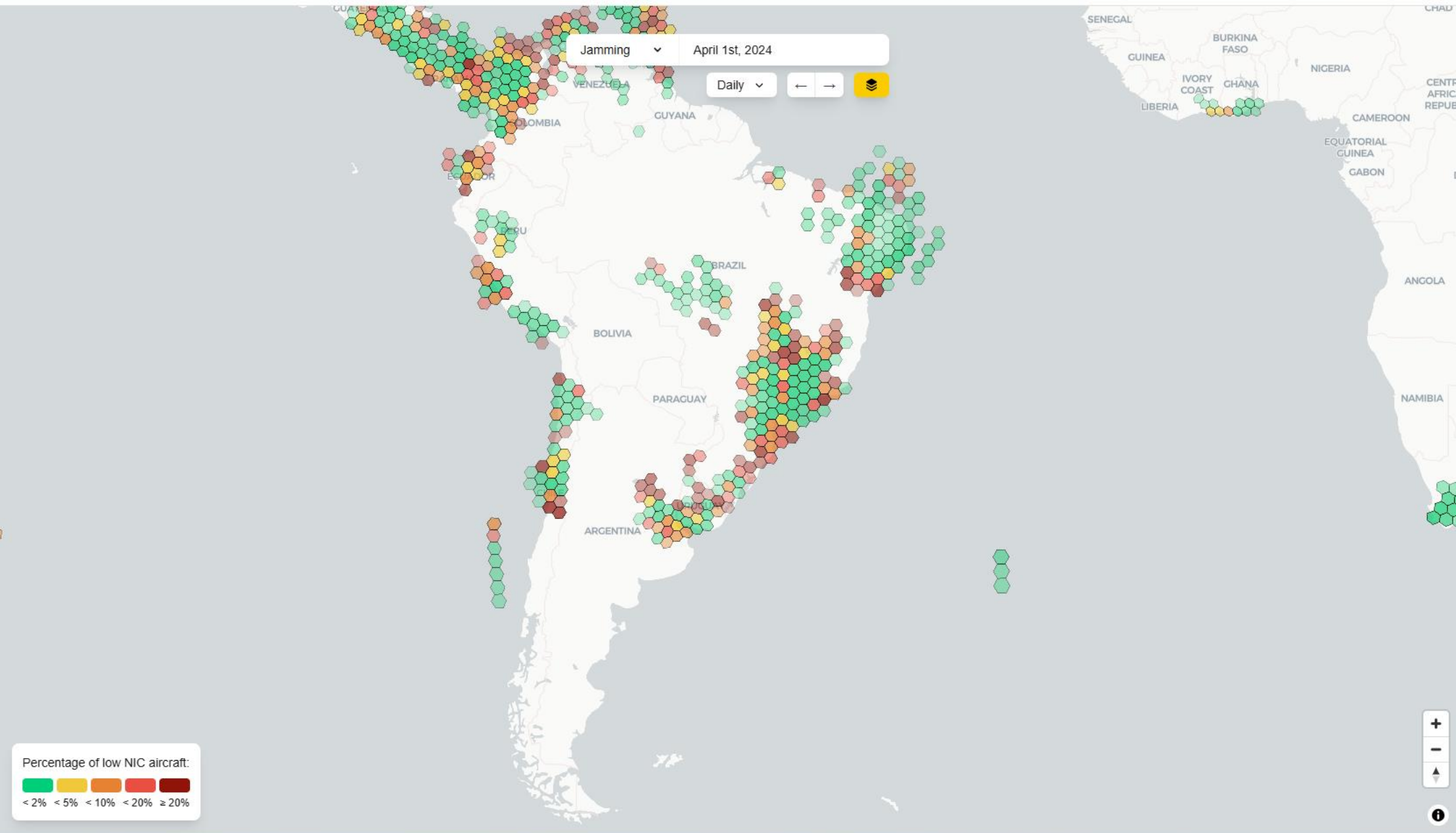
- Map
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**CARNATIONS**  
Center for Research and Analysis in Networked Systems

Federal Aviation Administration

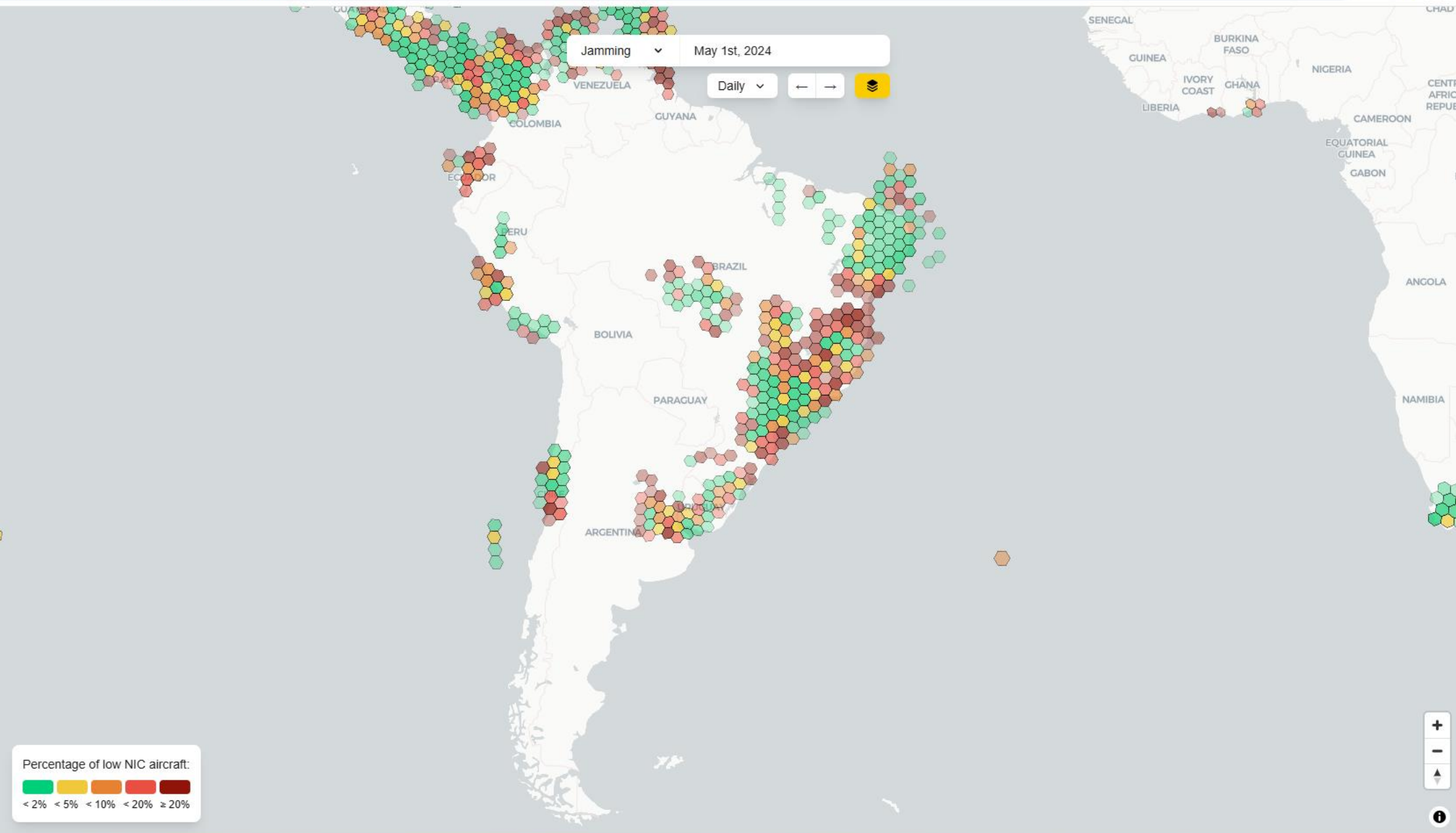
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### GNSS Interference Detection using ADS-B

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- Statistics
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### GNSS Interference Detection using ADS-B

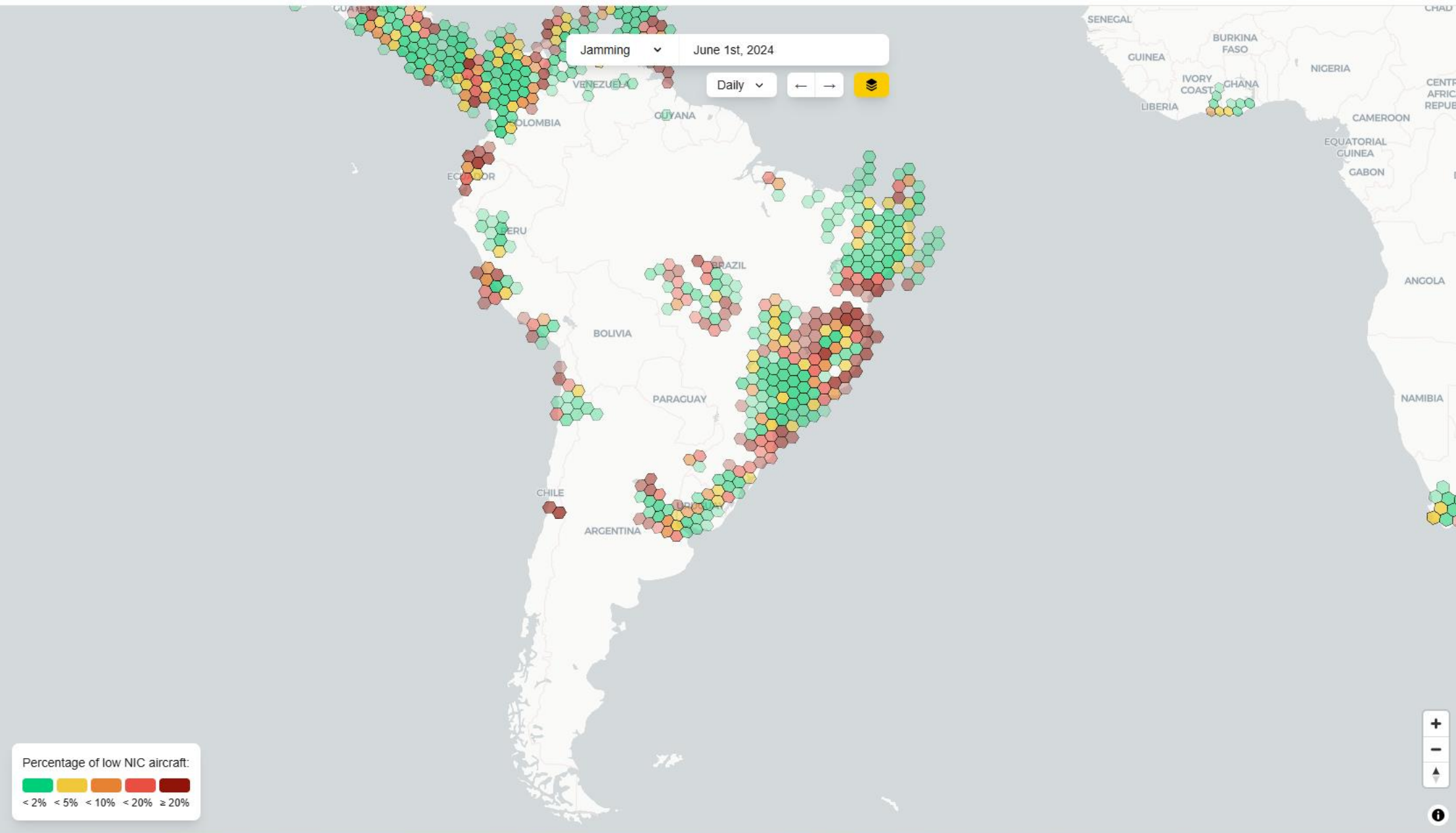
- Map
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Federal Aviation Administration

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### GNSS Interference Detection using ADS-B

Map

Uso de memoria: 419 MB

Statistics

Resources

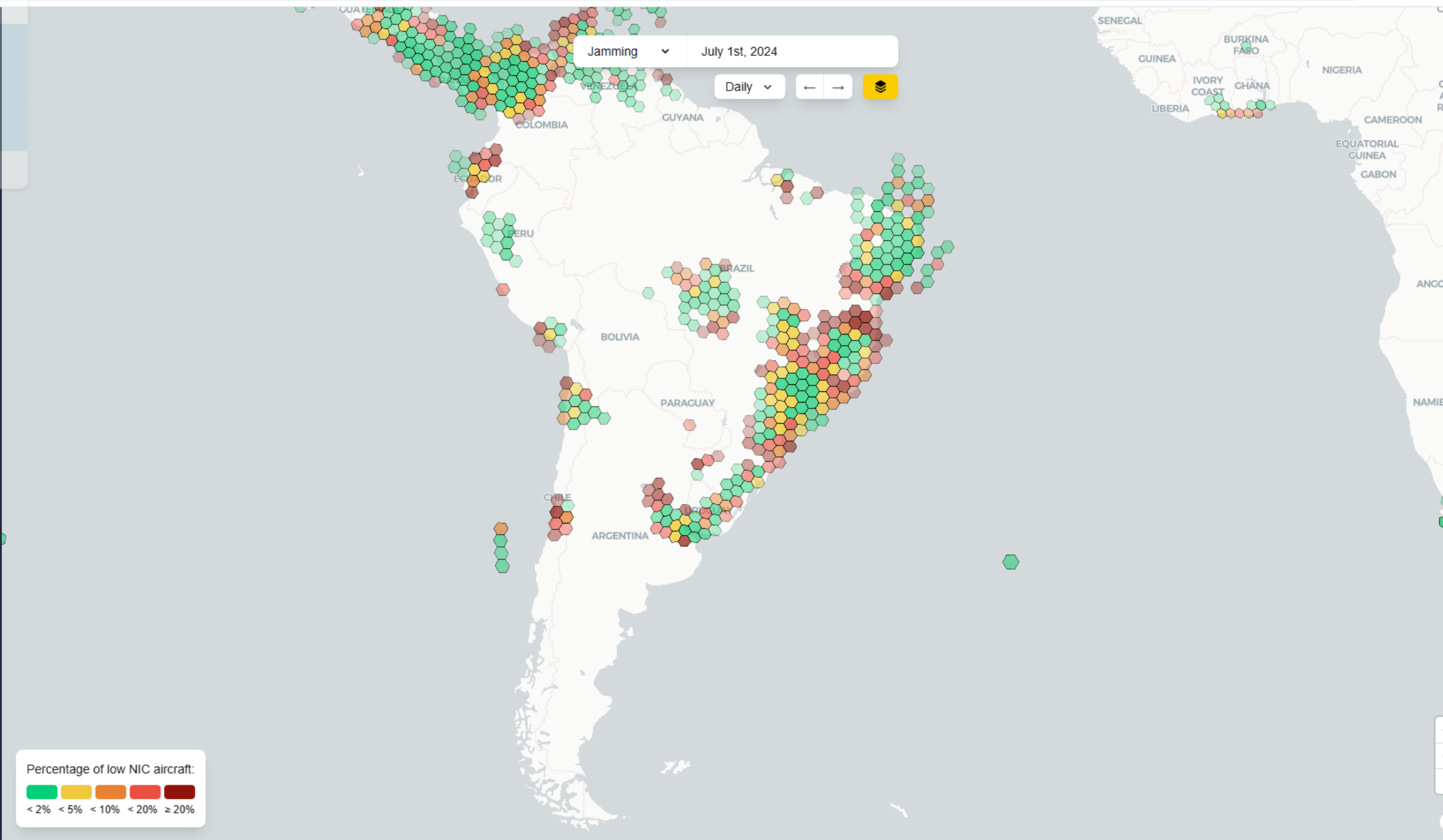


Aerospace

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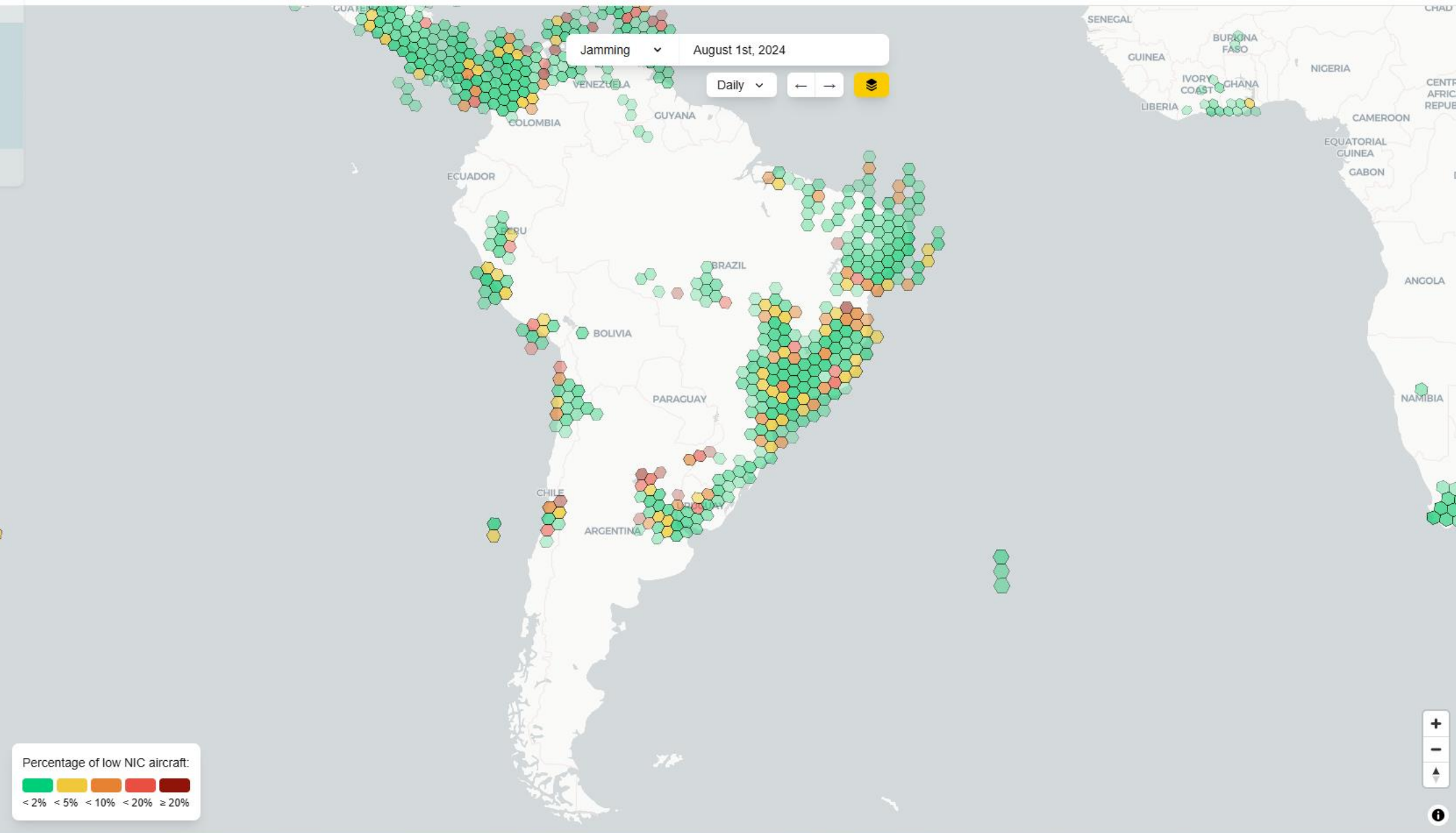


**GNSS Interference Detection using ADS-B**

Map  
Usado de memoria: 419 MB

Statistics

Resources

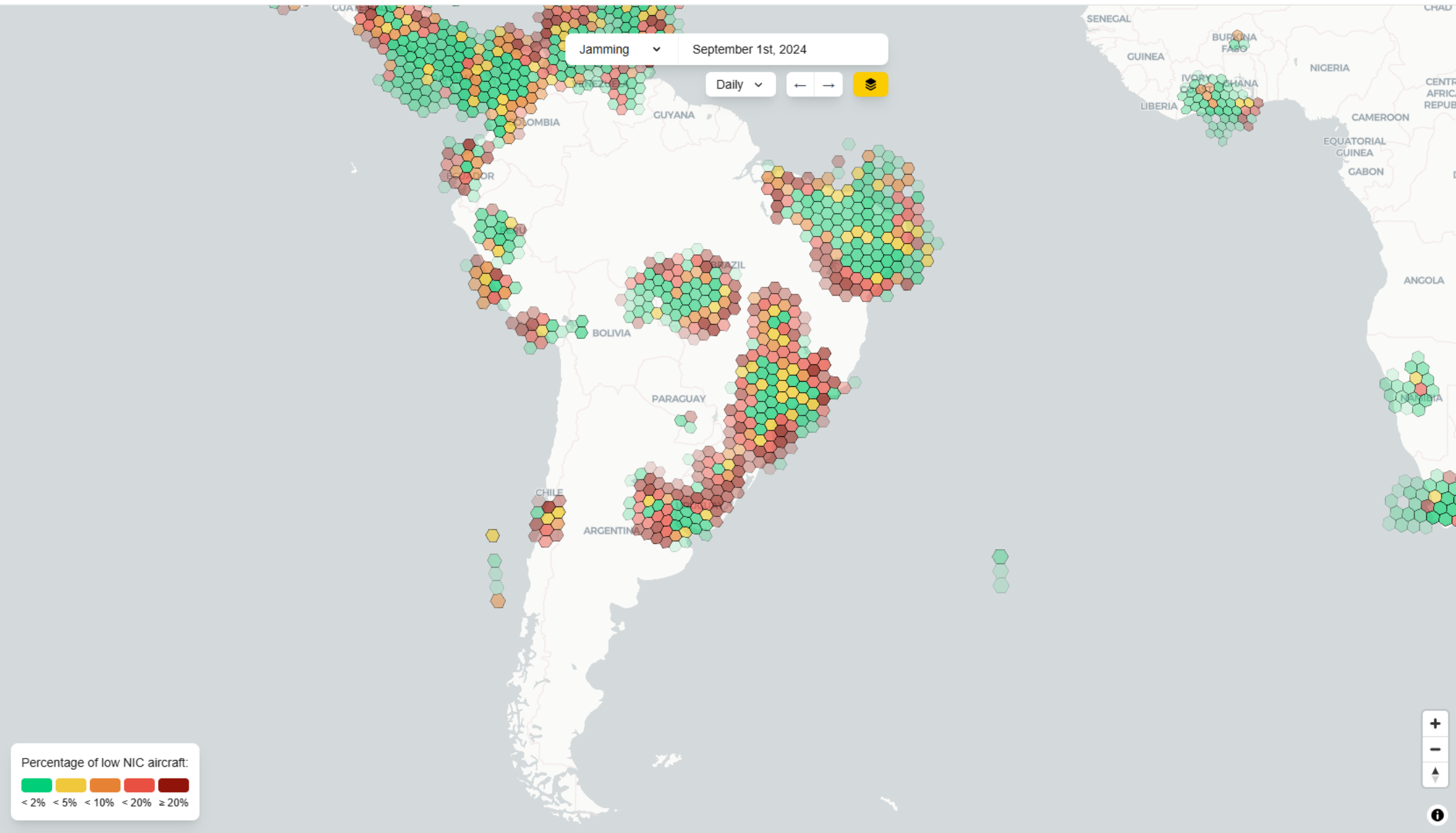


### GNSS Interference Detection using ADS-B

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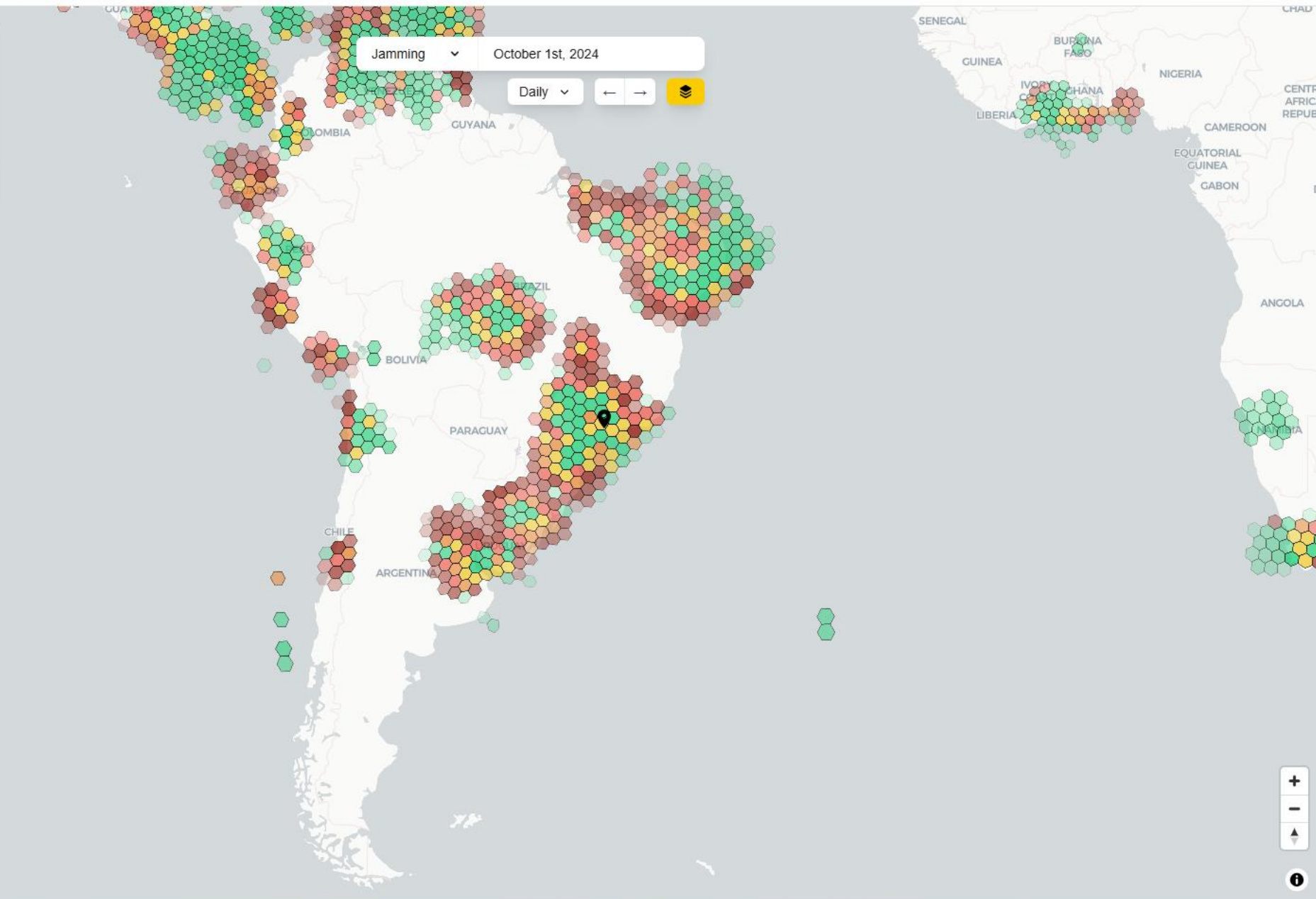
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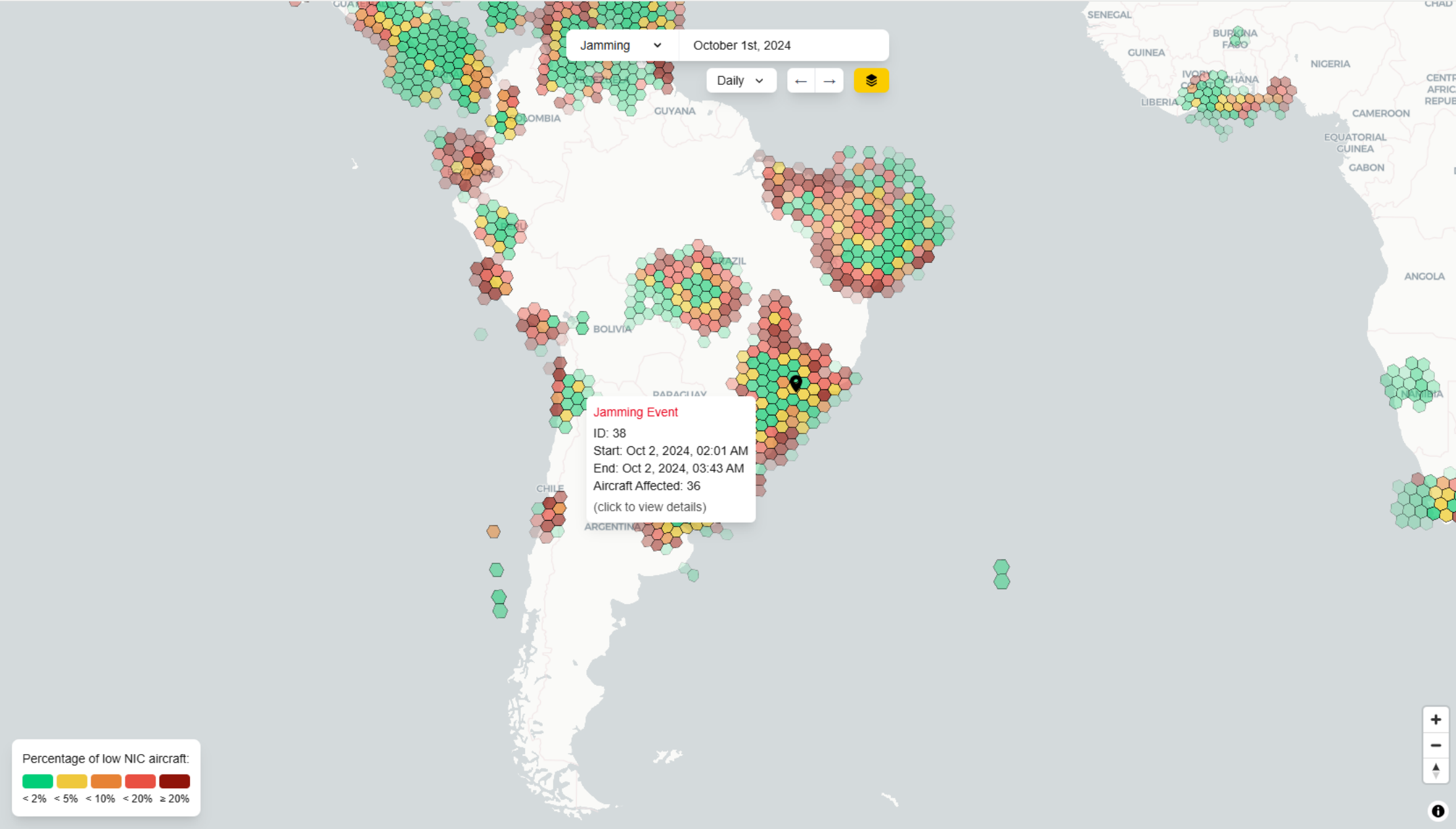
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Usado de memoria: 18,6 MB



### GNSS Interference Detection using ADS-B

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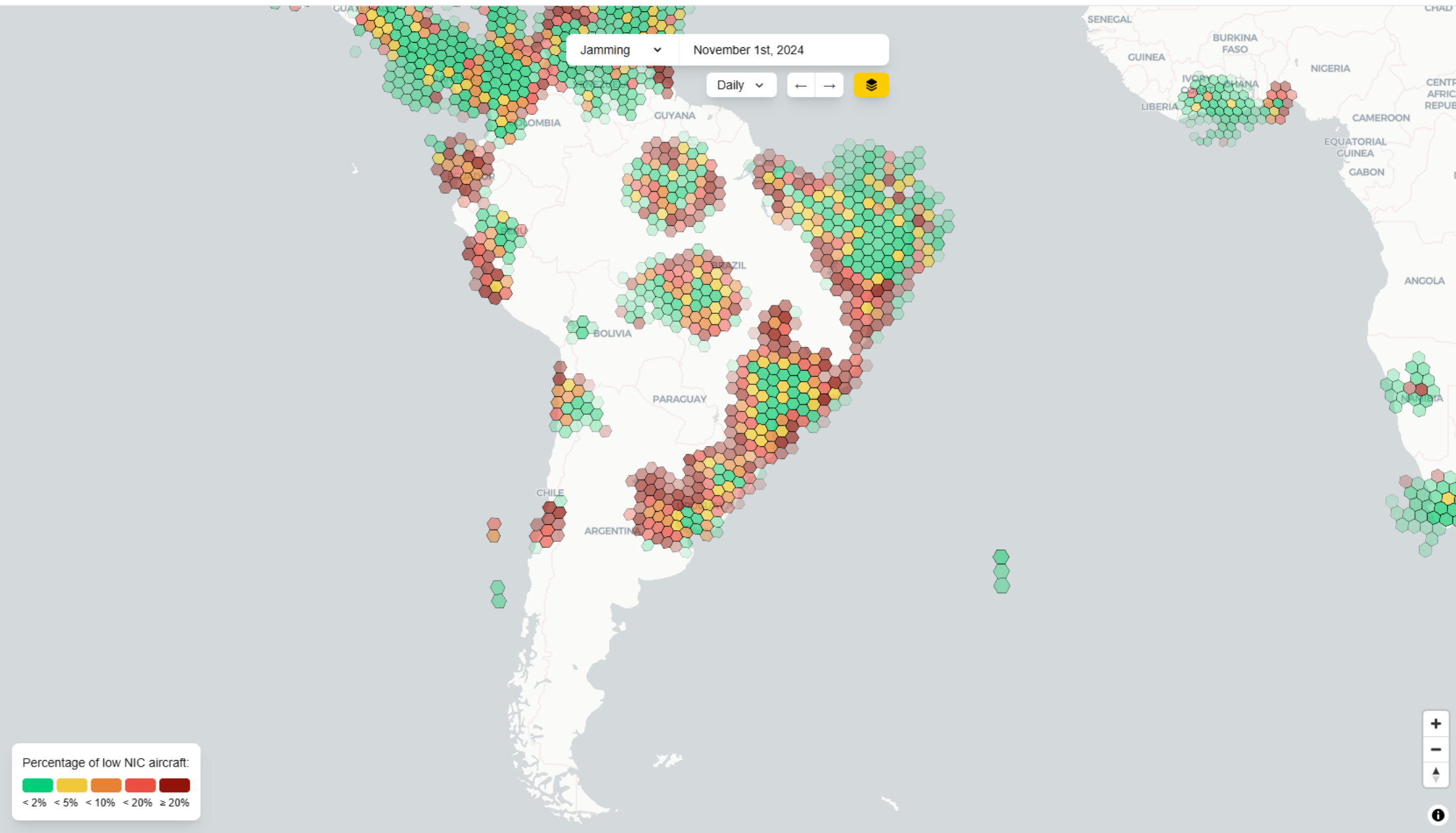
**CARNATIONS**  
Center for Research & Modern Navigation  
in Advanced Transportation Systems



Federal Aviation Administration

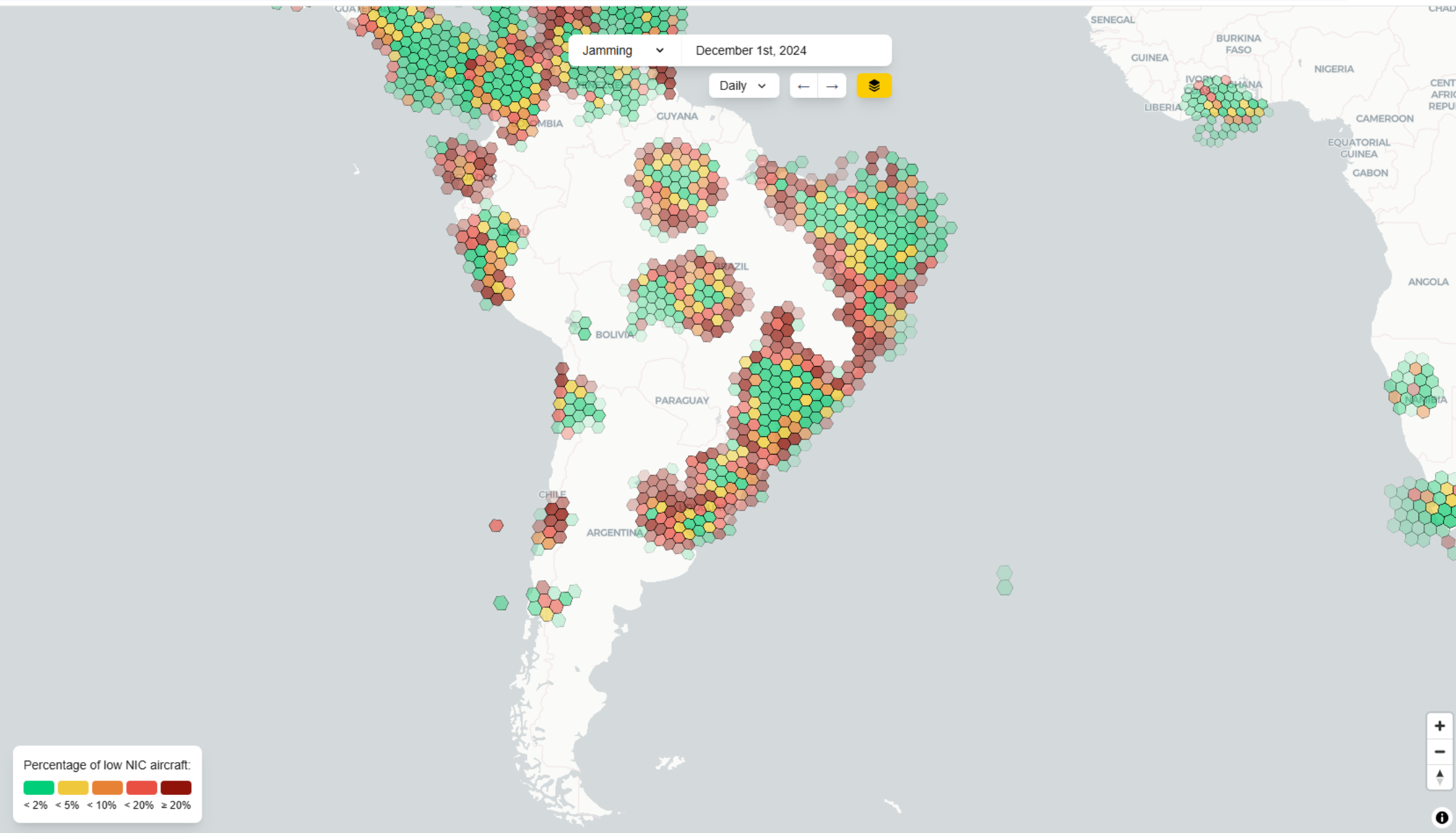


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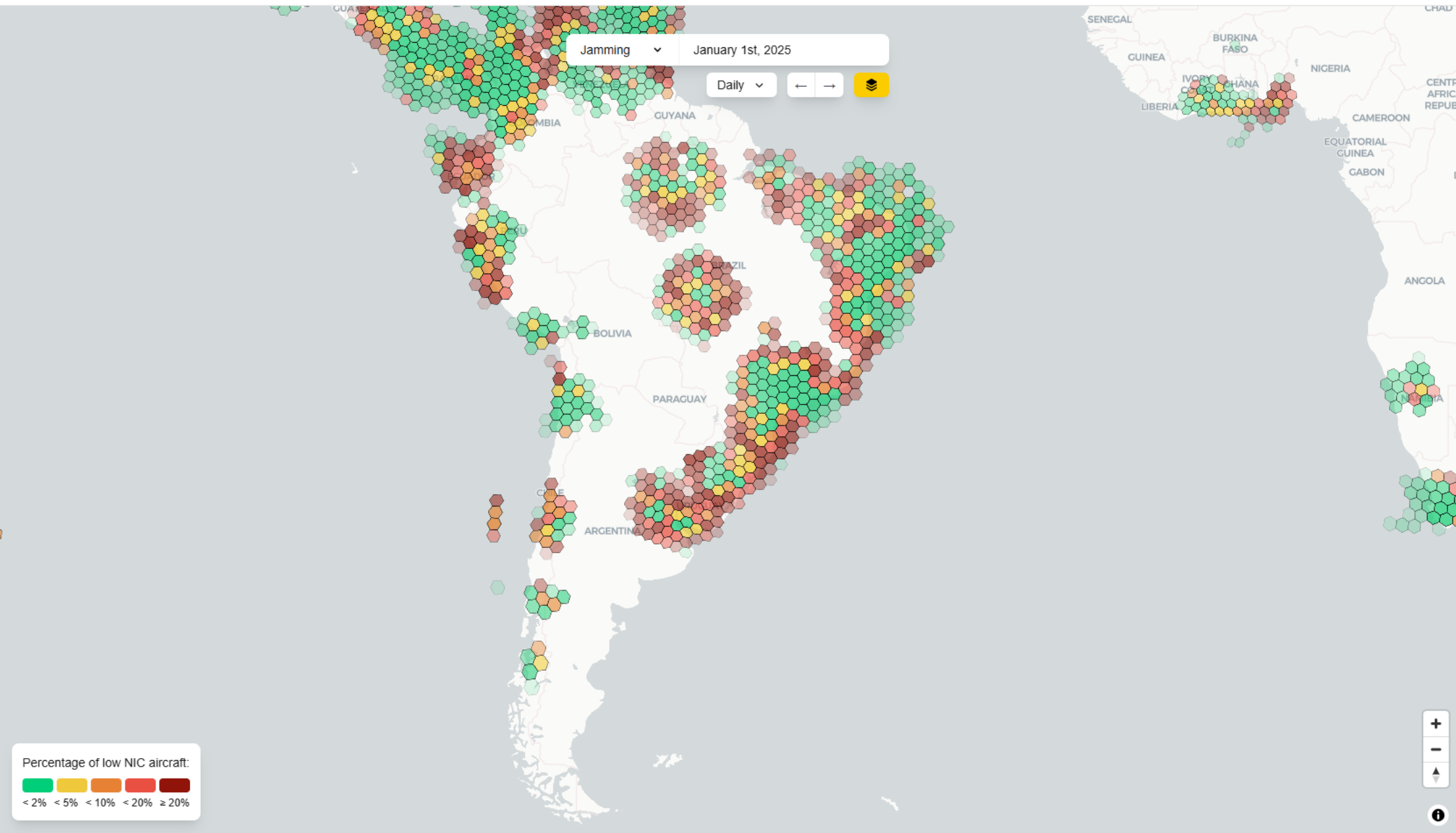


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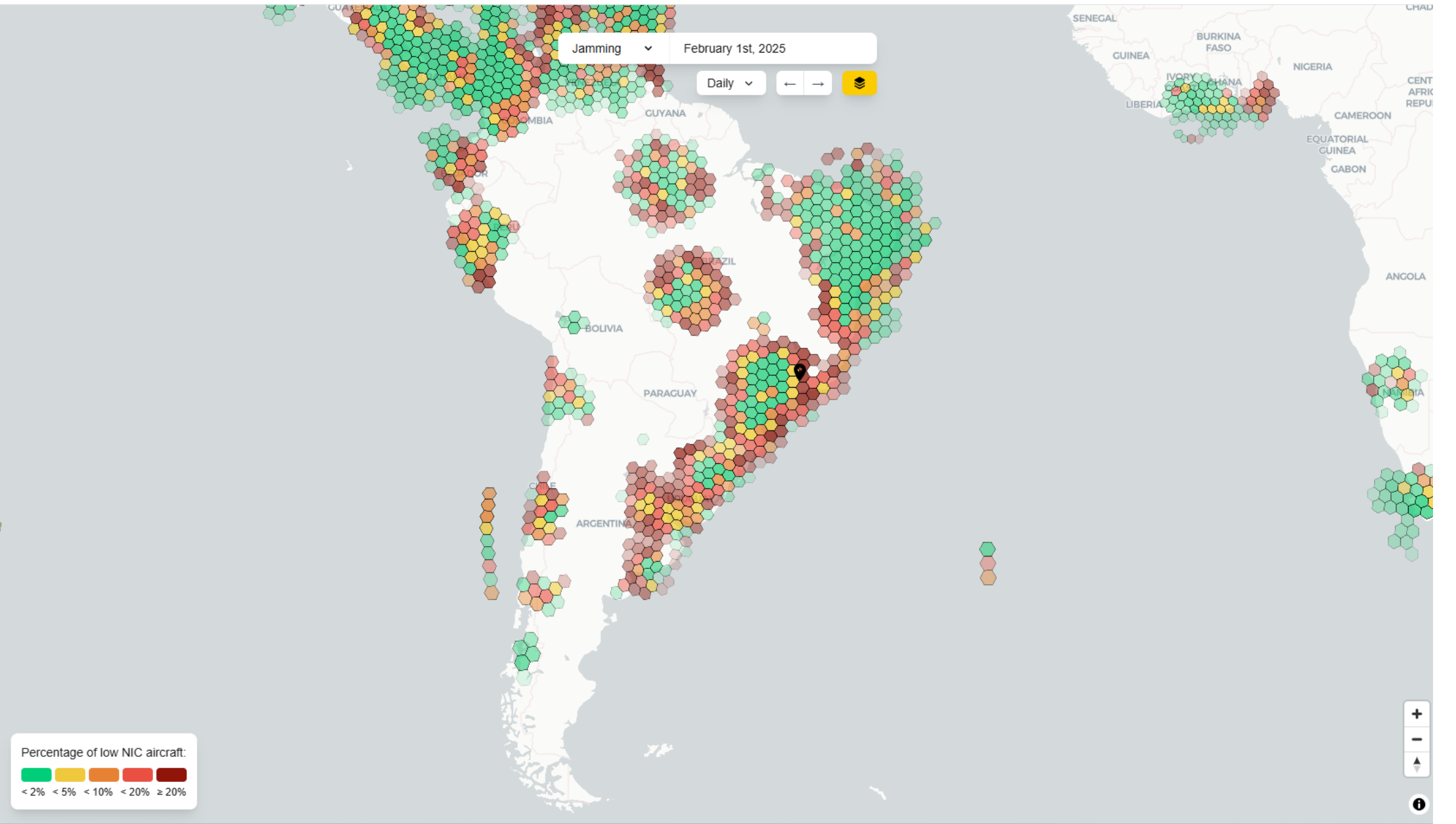


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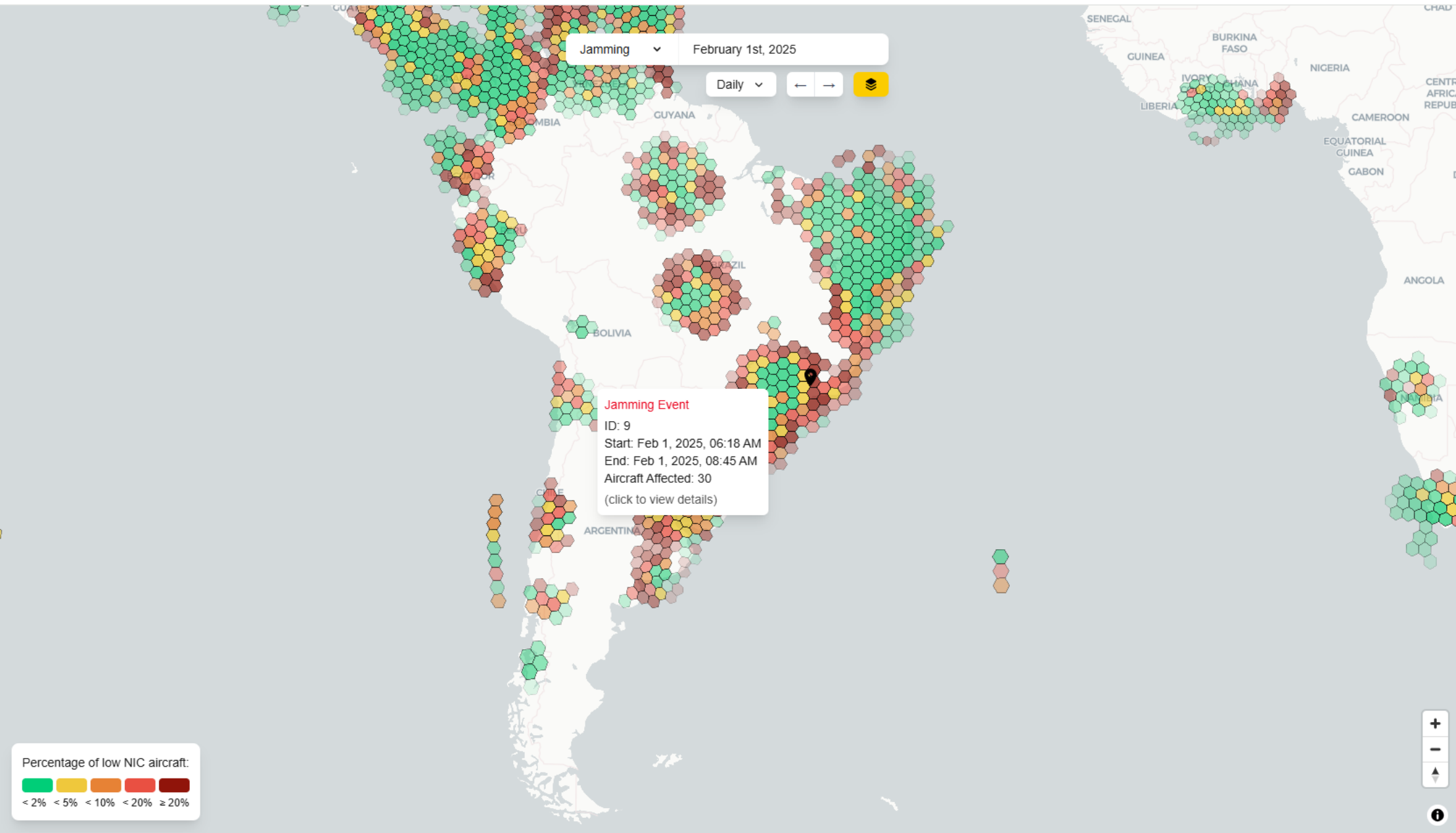


### GNSS Interference Detection using ADS-B

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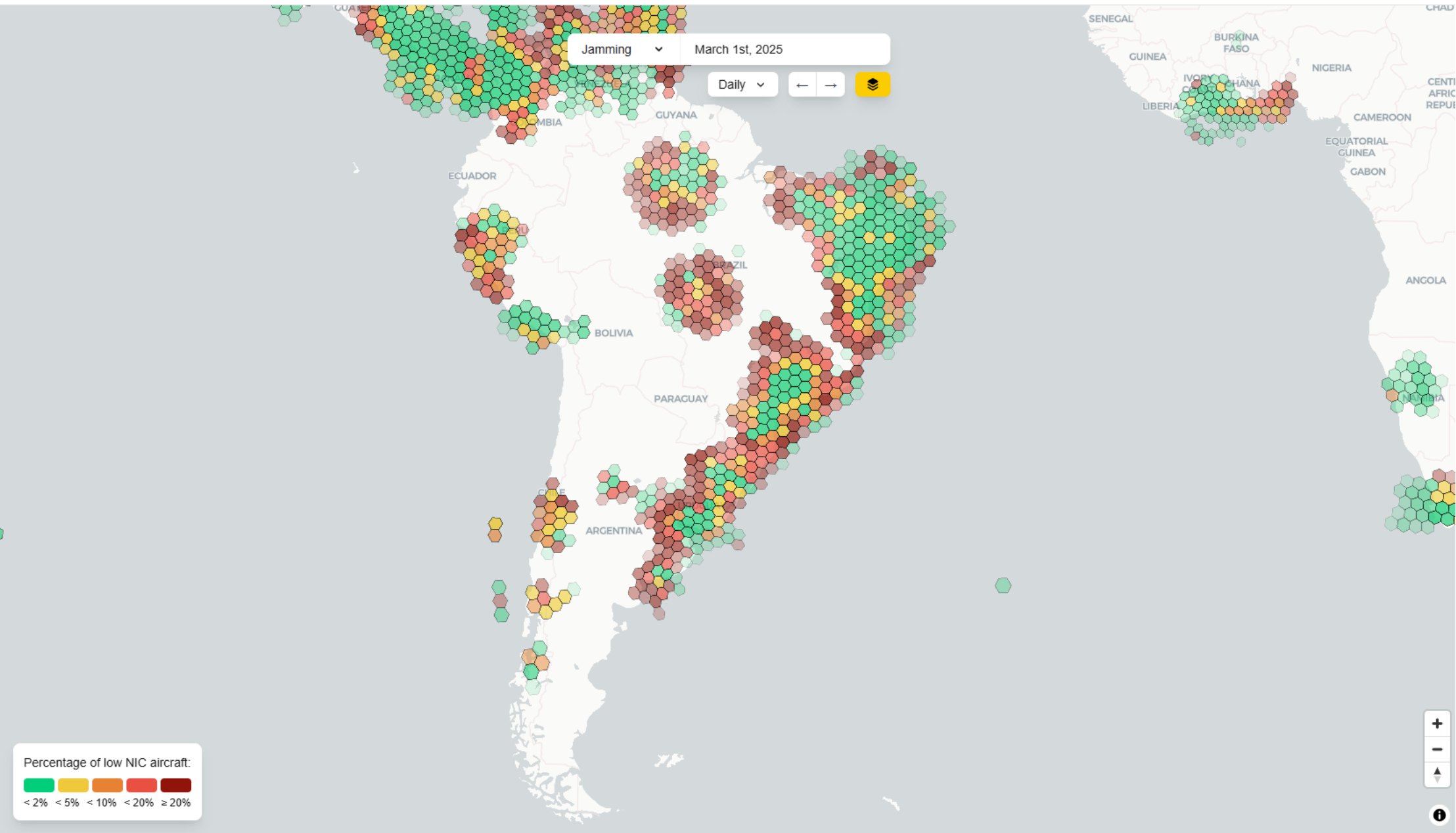


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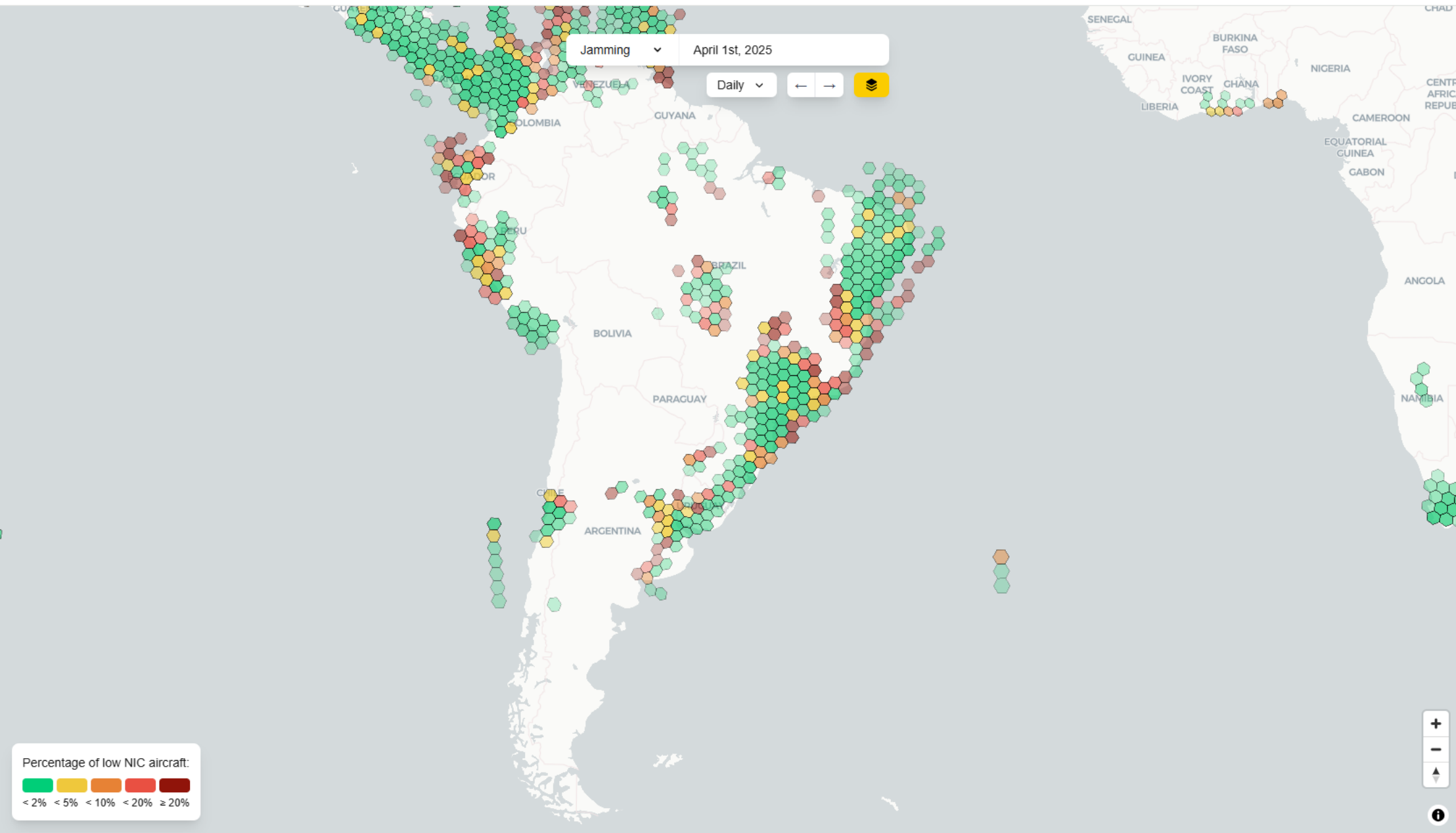
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### GNSS Interference Detection using ADS-B

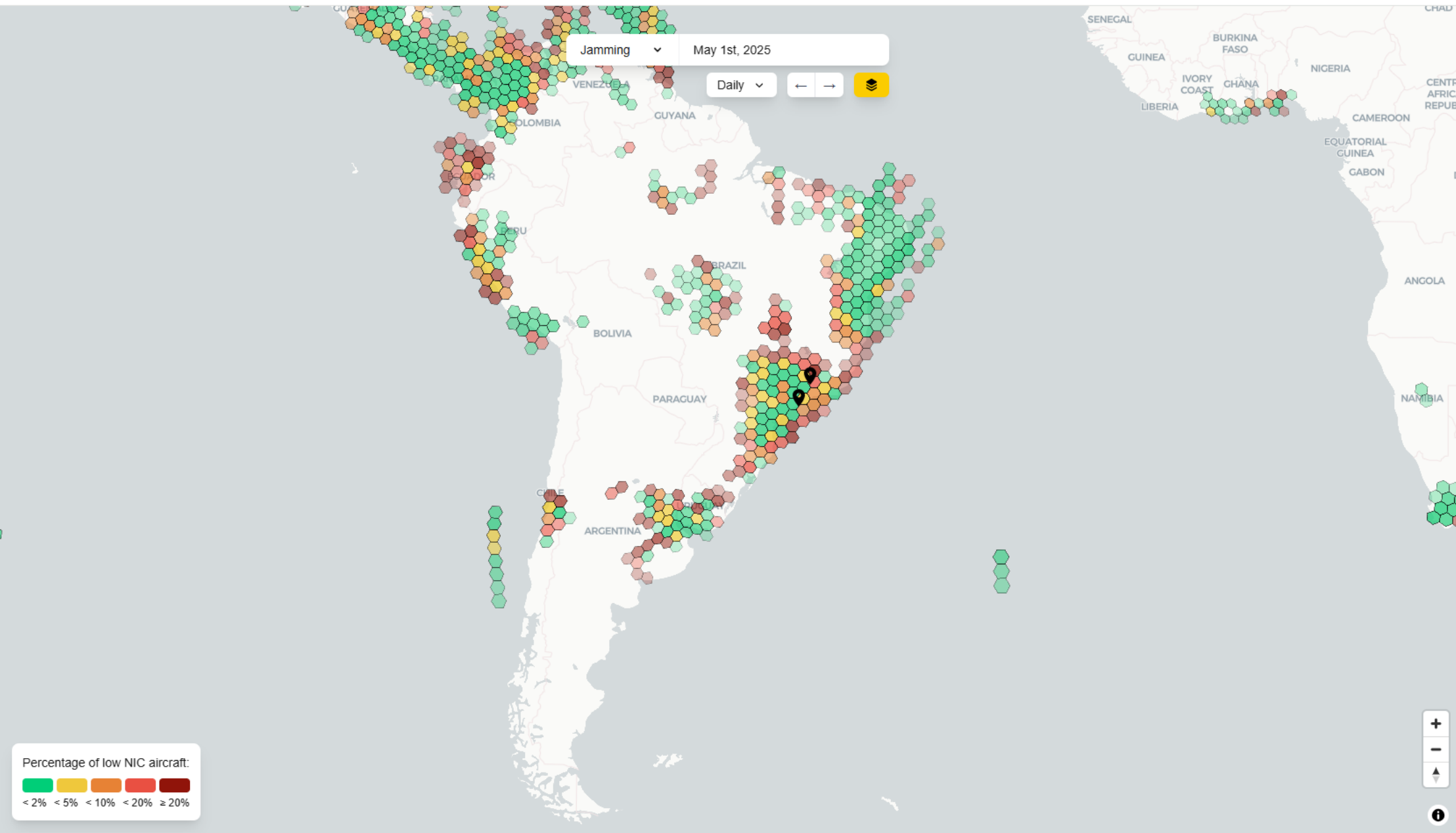
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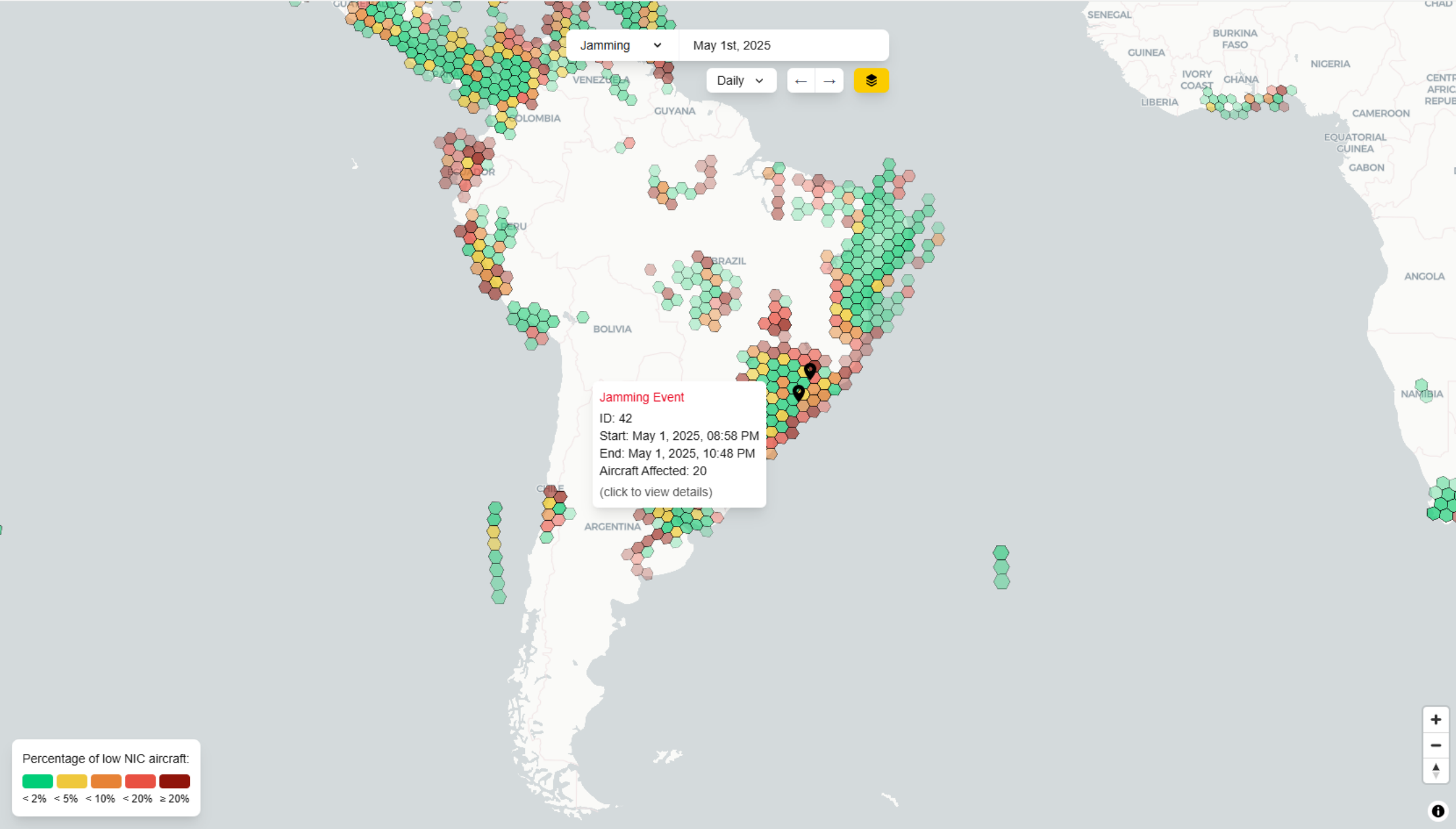
Stanford University



### GNSS Interference Detection using ADS-B

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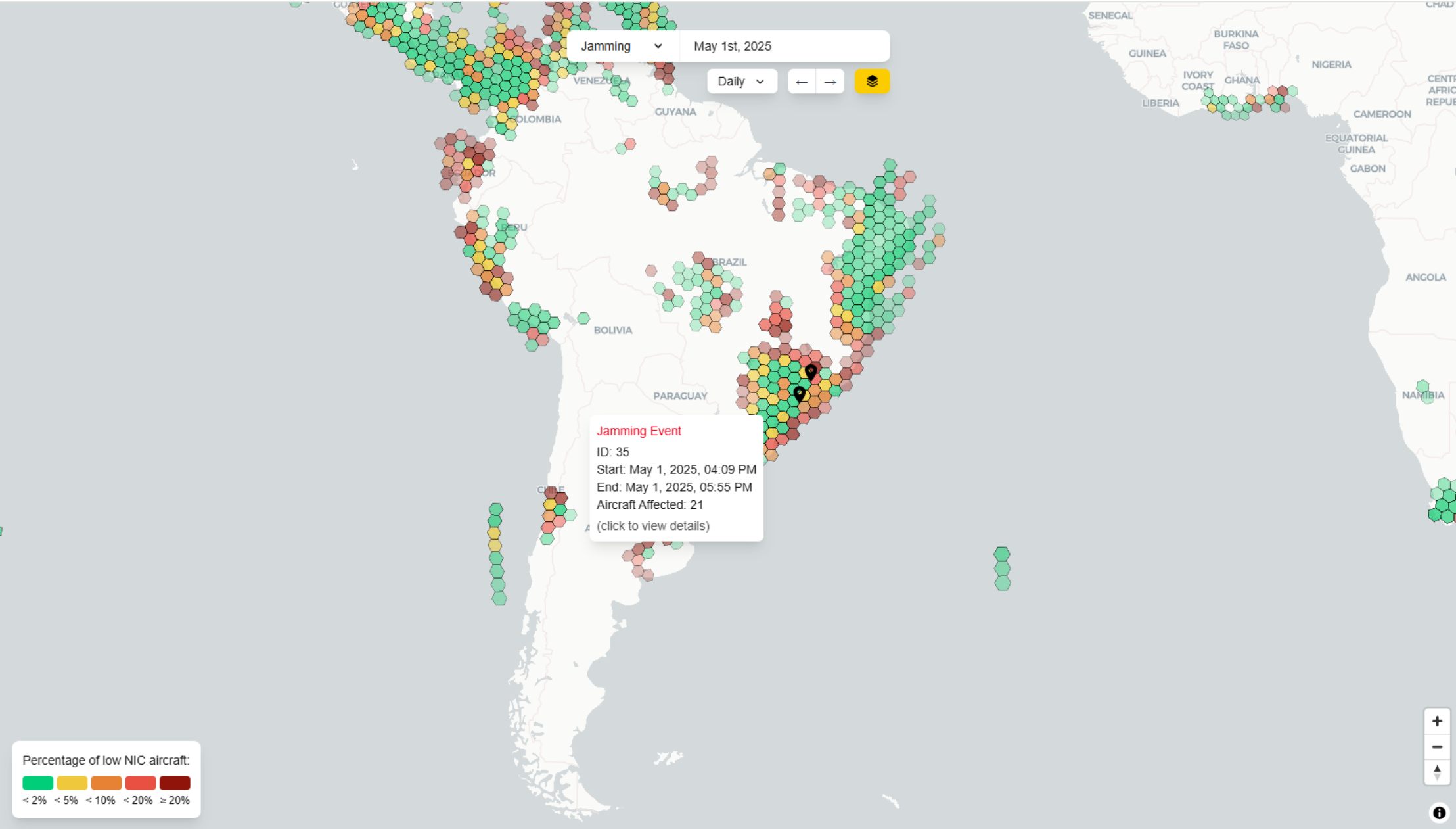
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### GNSS Interference Detection using ADS-B



- Map
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### GNSS Interference Detection using ADS-B

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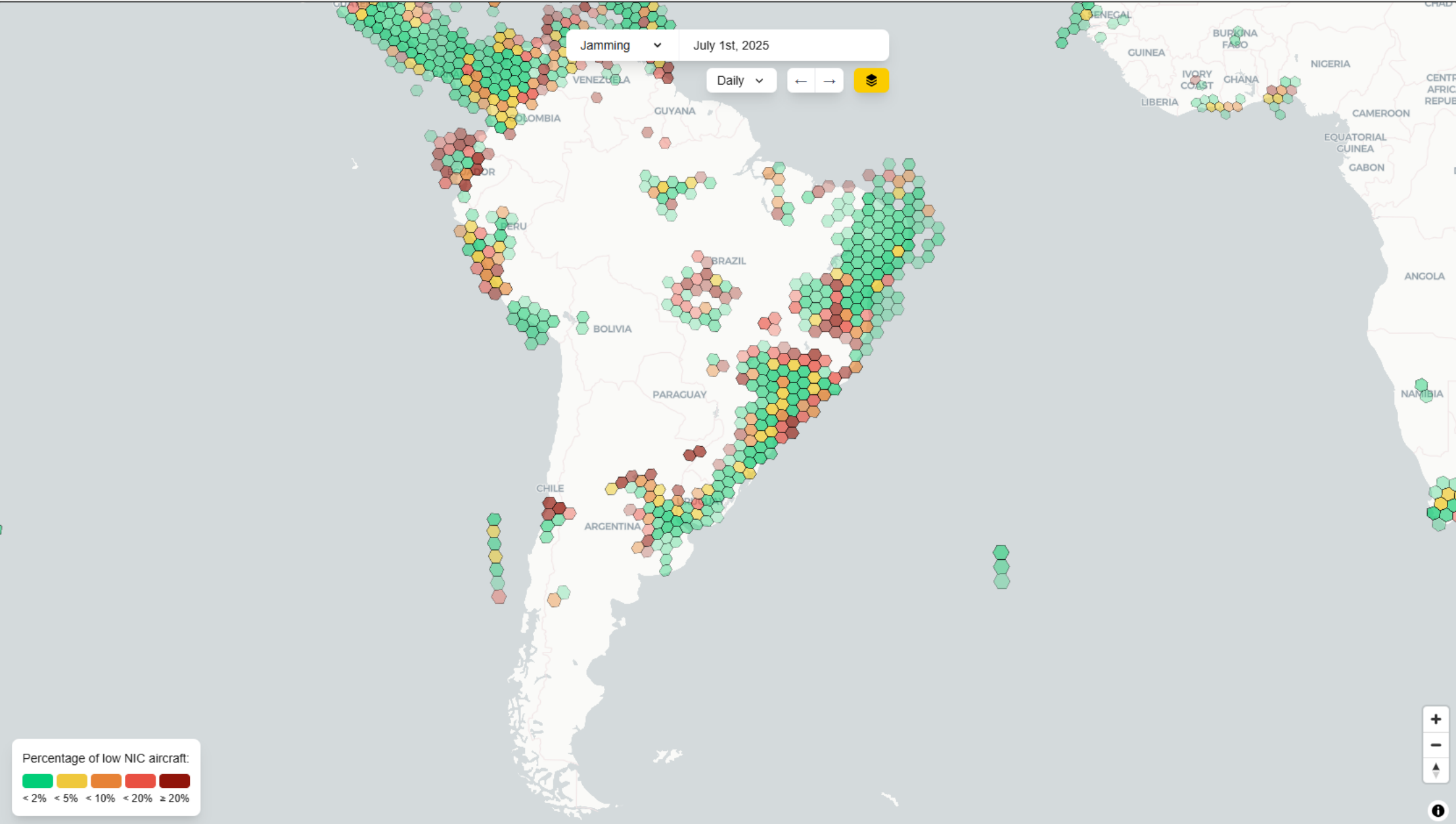
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# Evolution of GNSS events in the SAM Region



## CONCLUSIONS:

- Identification of the most recurrent points with GNSS events
- Extension of the pattern of events in South America in the last year
  - Few cases of spoofing/jamming at the regional level
  - Need to maintain the conventional radio aid network as a contingency
- This pattern of events can be considered as an input for studies of rationalization of radio aids to support the network of routes based on satellite navigation.



# Comparative ARG DME-DME coverage and performance with GNSS events

Period: MARCH 2025

Radio Navigation Workshop for NAM and SAM Regions  
Mexico City, Mexico. 2 to 4 September 2025

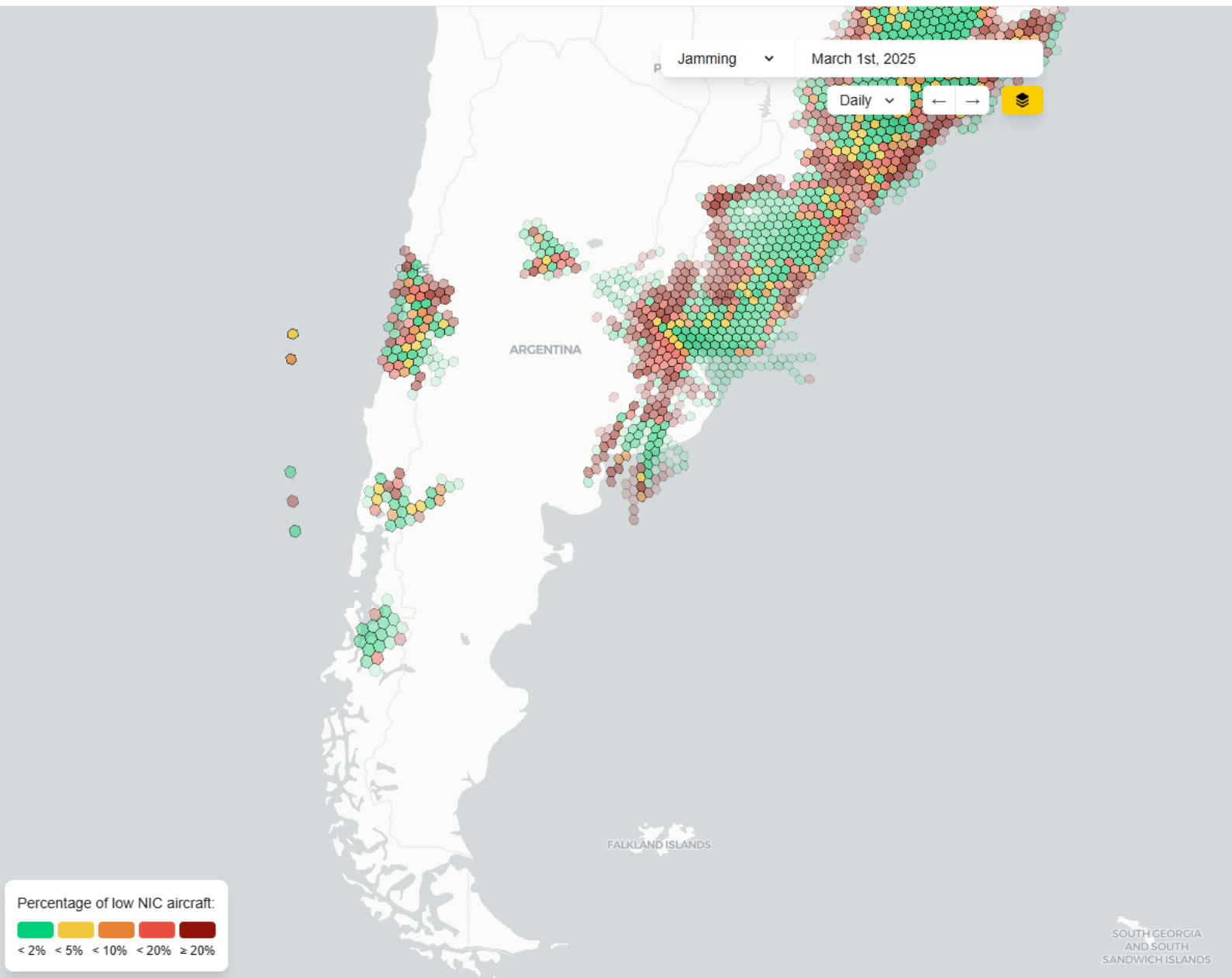
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Secretaría  
de Transporte  
Ministerio de Economía

### GNSS Interference Detection using ADS-B

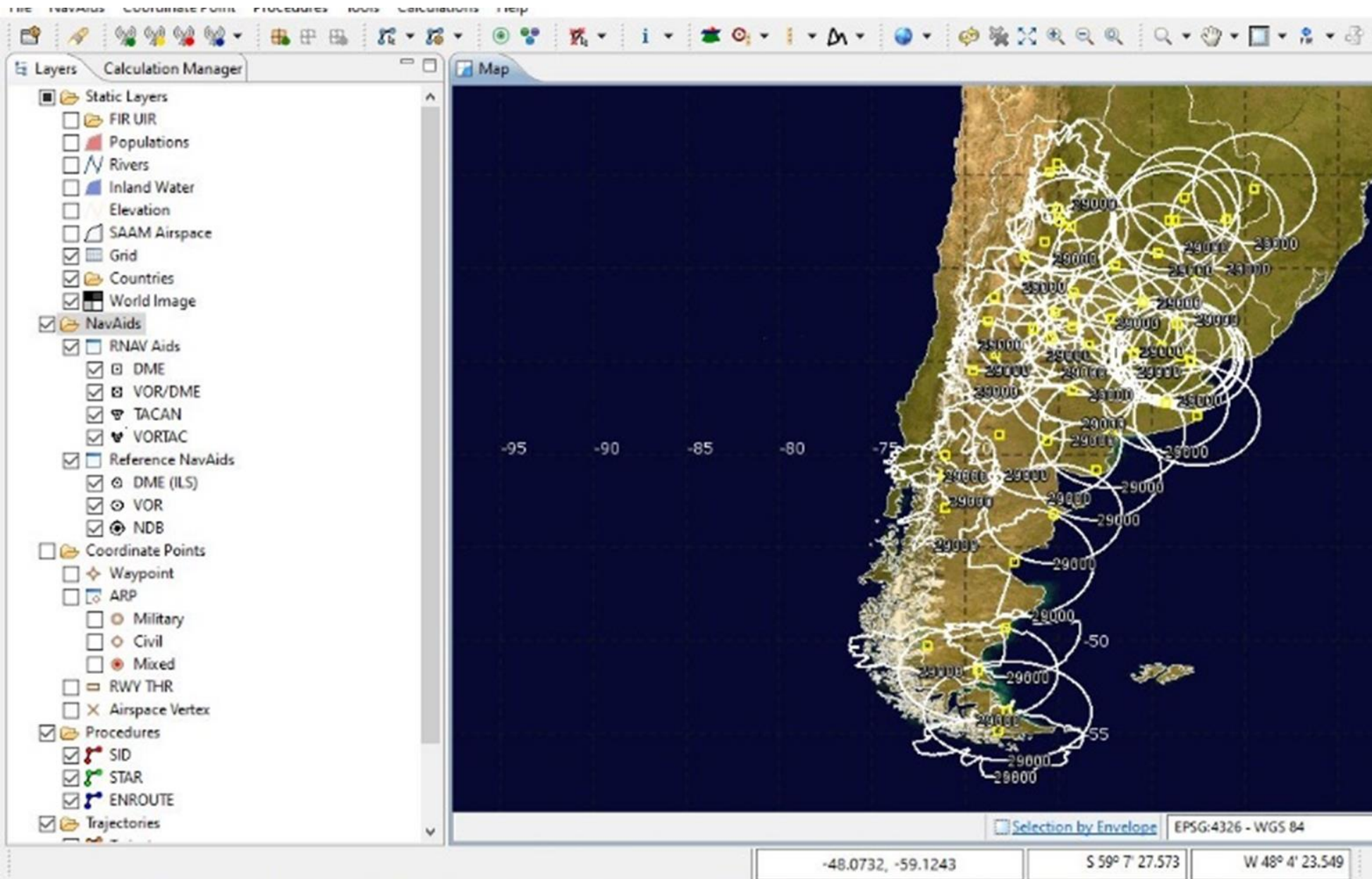
- Map
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- Resources



# GNSS Events Argentina

## MAR 2025

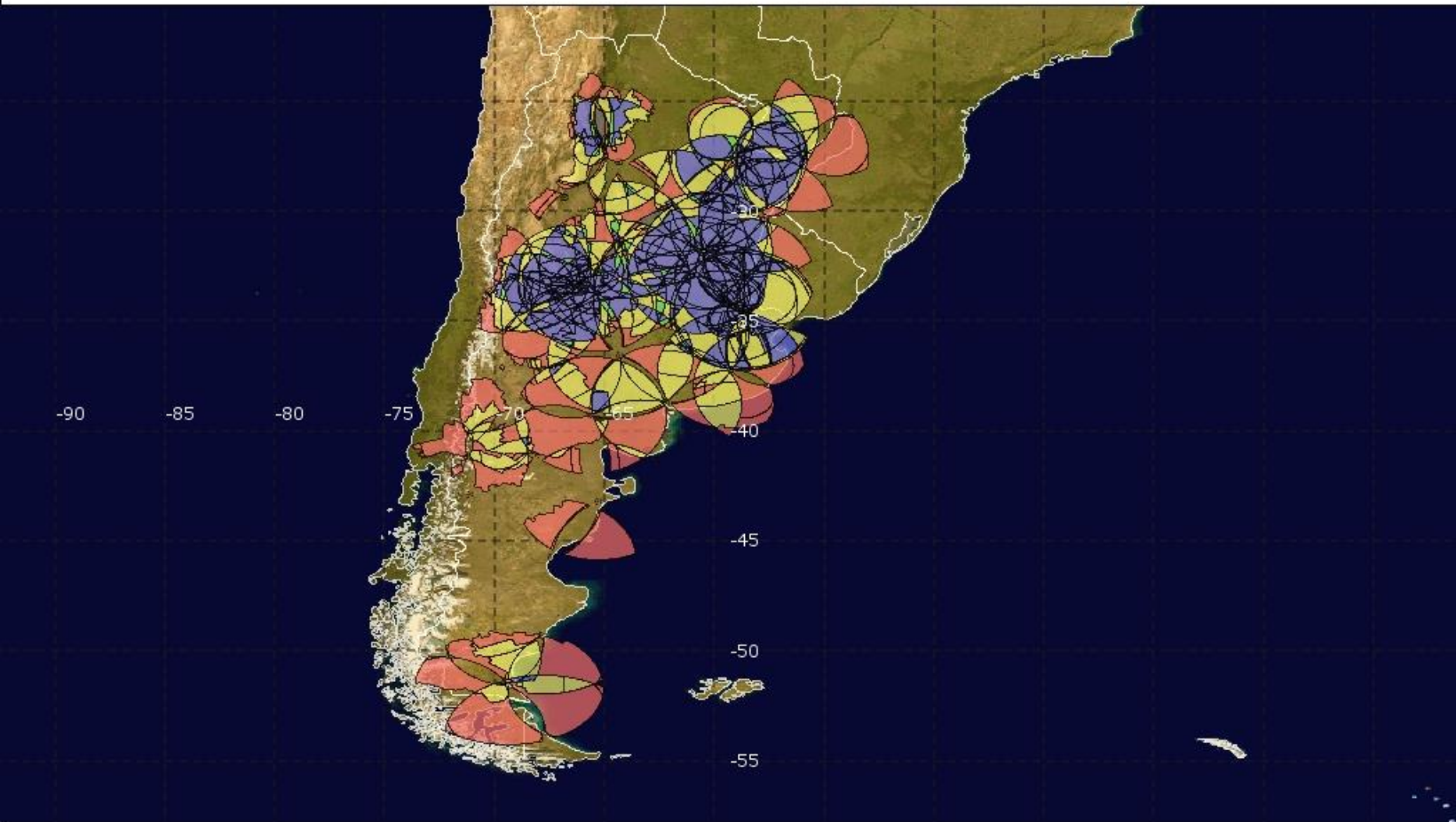




Calculation  
DME  
Coverages  
Argentina  
(software  
DEMETER)



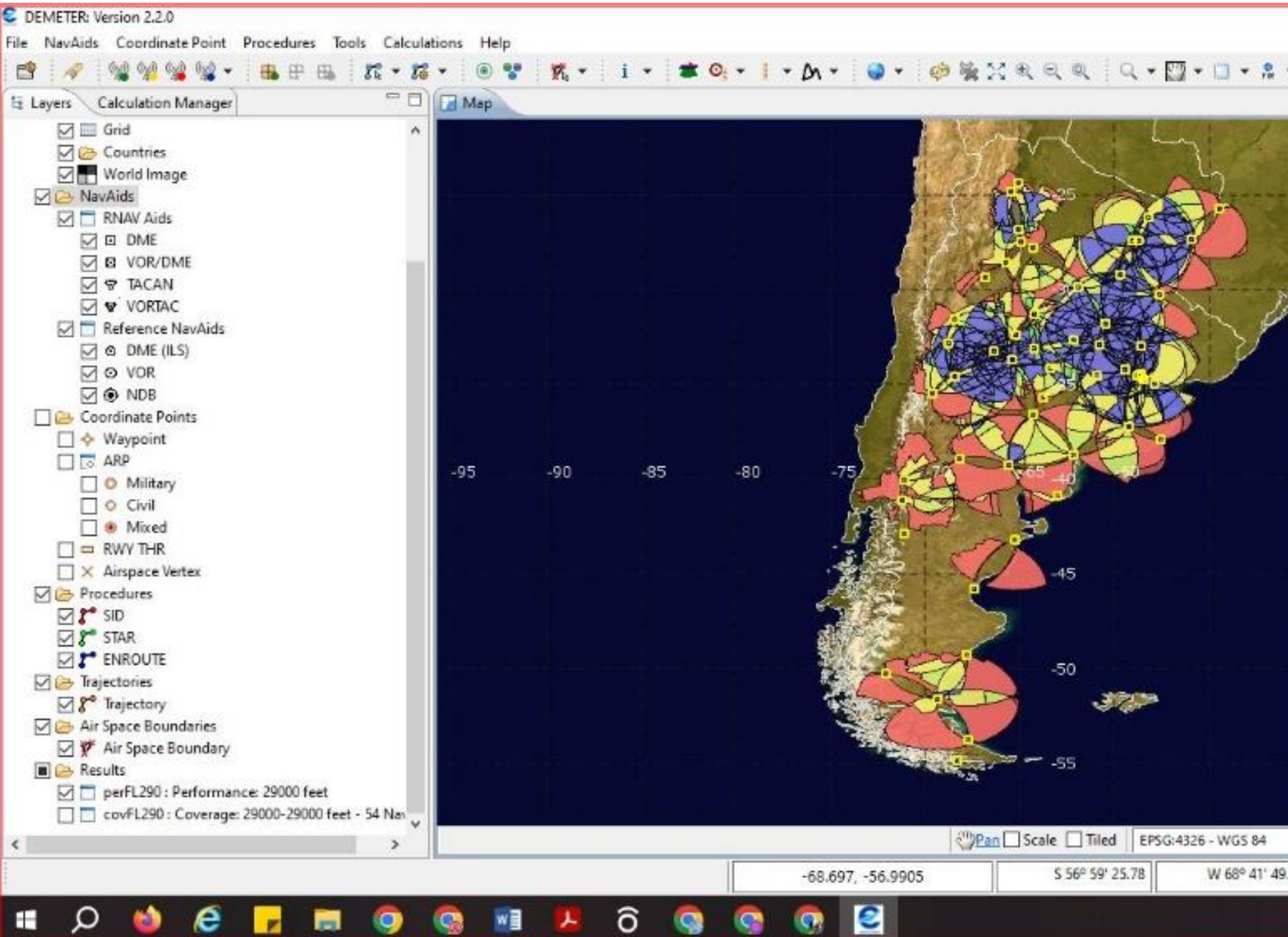
# ARG FL290 Performance



## Legend:

- Results/Performance: 29000 feet/Available Pairs - EUROCONTROL/DEMETER[2025\_07\_31 18:41:18, 236]
- No Coverage
- No Redundancy
- Limited Redundancy
- Full Redundancy
- Excessive Redundancy
- NavAids/RNAV Aids/VOR/DME/User defined
- NavAids/Reference NavAids/VOR/User defined

Calculation  
Performance  
DME-DME  
Argentina  
(software  
DEMETER)

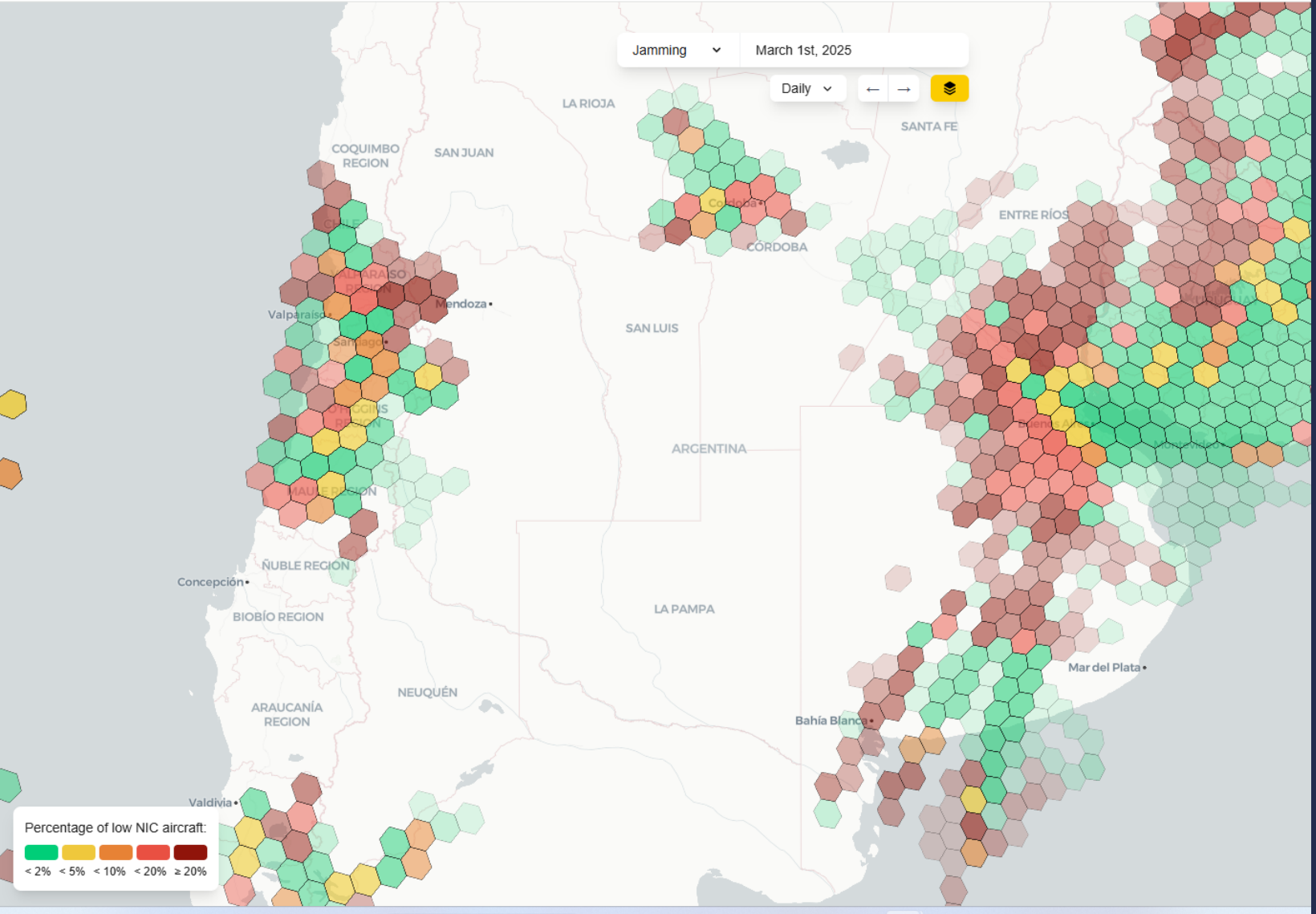


**Calculation  
Performance  
DME-DME  
Argentina  
(software  
DEMETER)**

### GNSS Interference Detection using ADS-B

- Map
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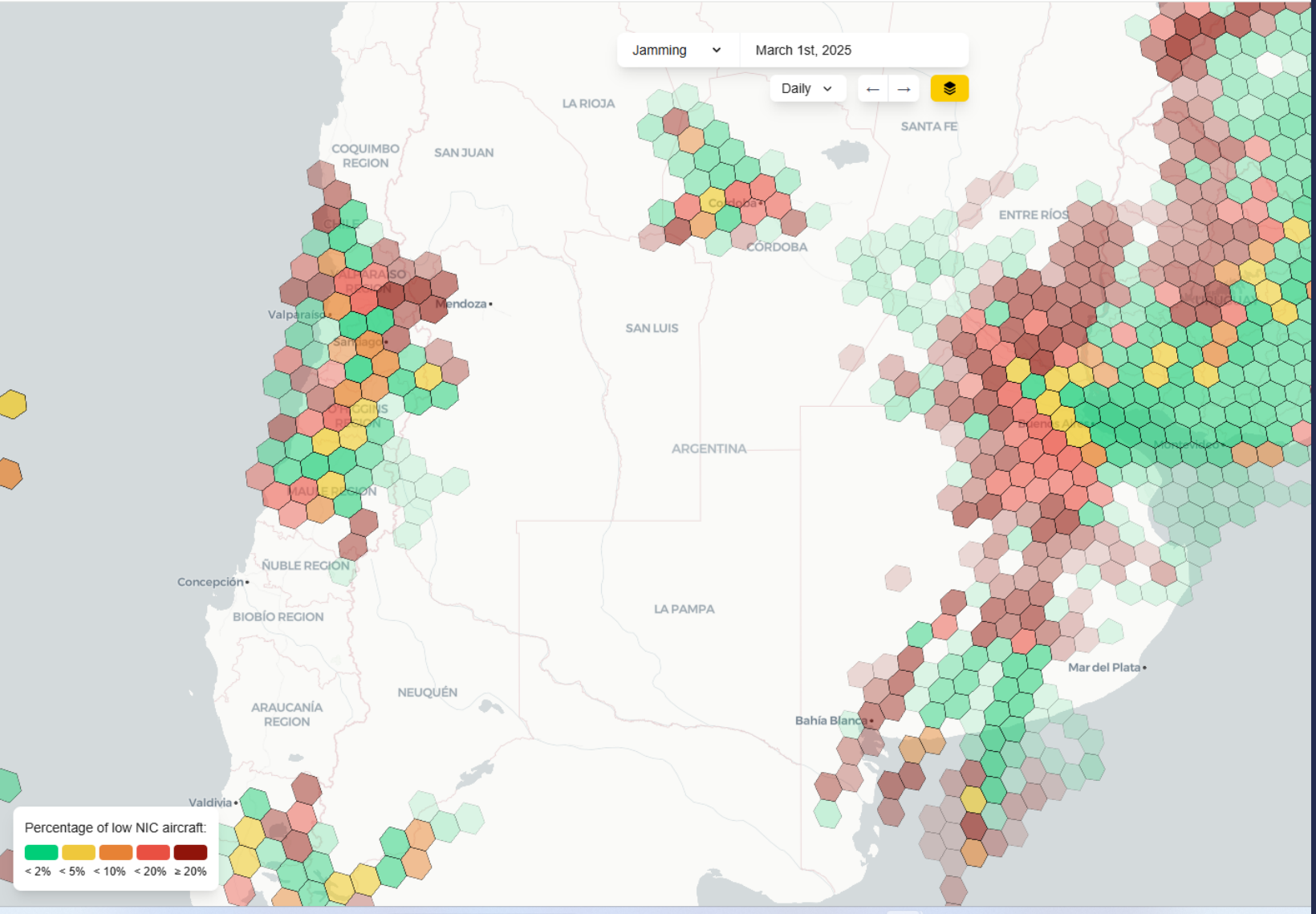
# GNSS Events Central Region Argentina

## MAR 2025

### GNSS Interference Detection using ADS-B

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Federal Aviation Administration  
Stanford University

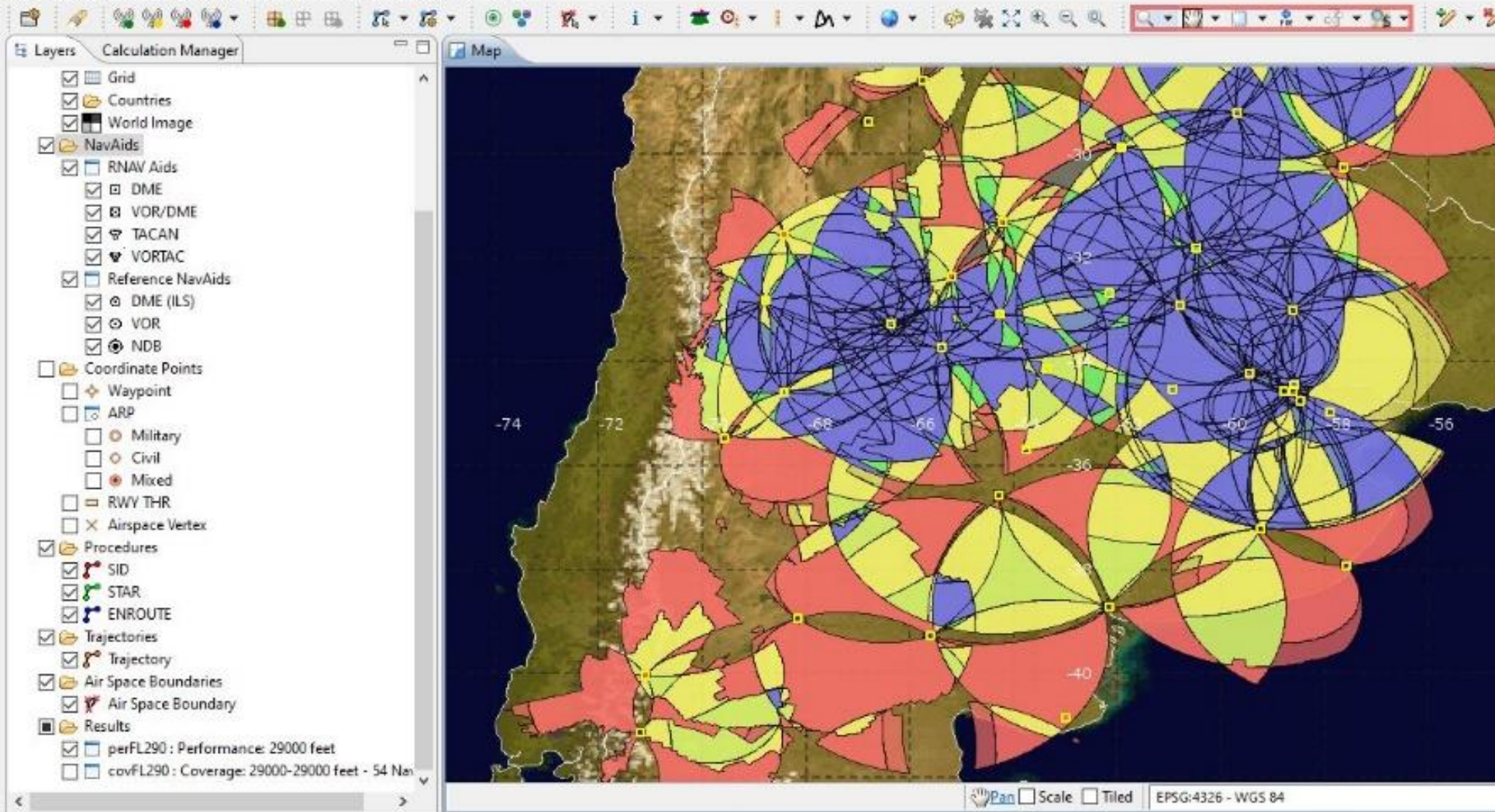


# GNSS Events Central Region Argentina

## MAR 2025

DEMETER: Version 2.2.0

File NavAids Coordinate Point Procedures Tools Calculations Help

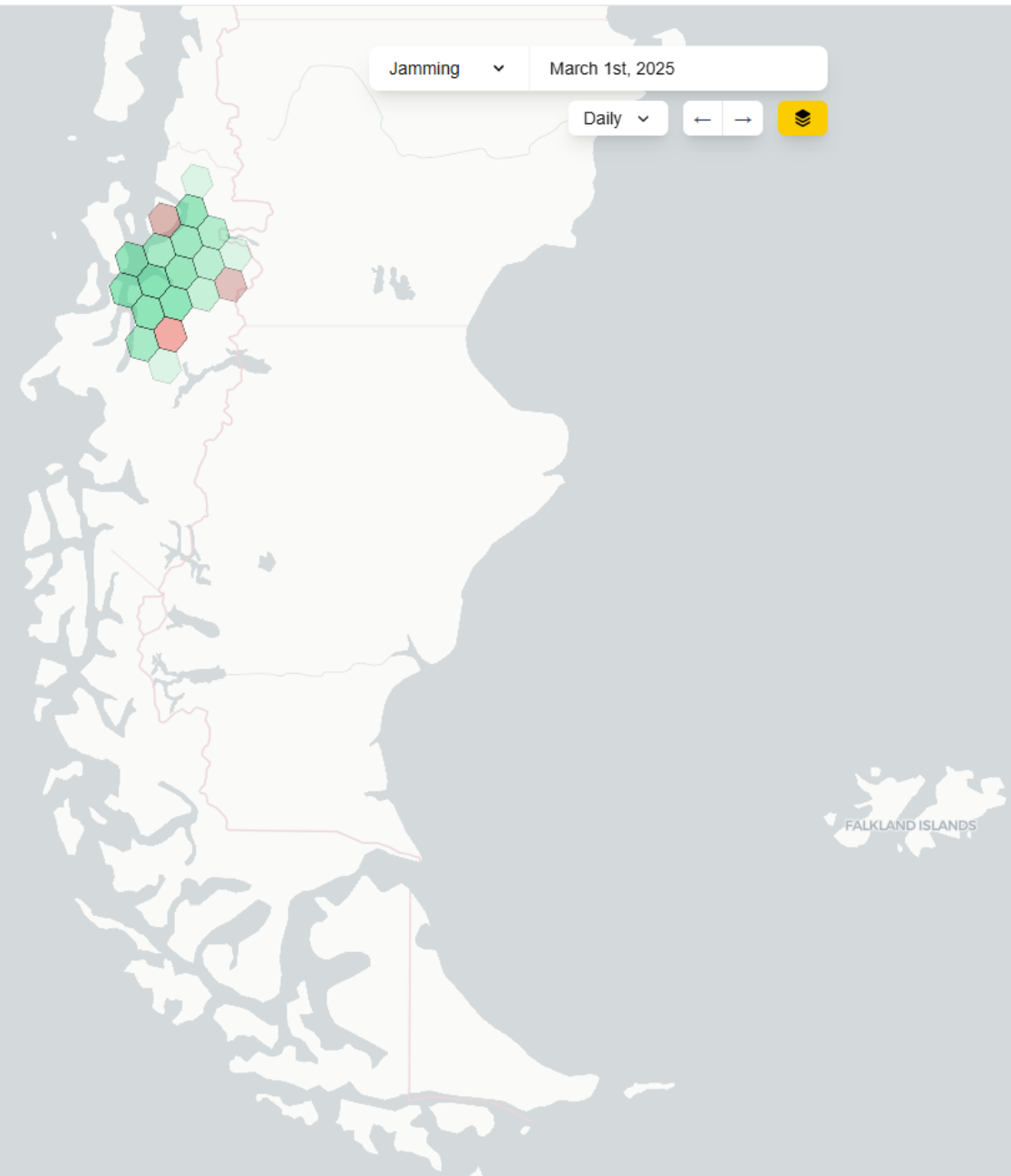


Performance  
calculation  
DME-DME  
Central Region  
Argentina

(software  
DEMETER)

### GNSS Interference Detection using ADS-B

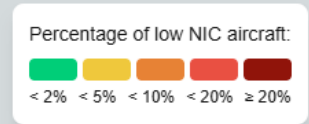
- Map
- Statistics
- Resources

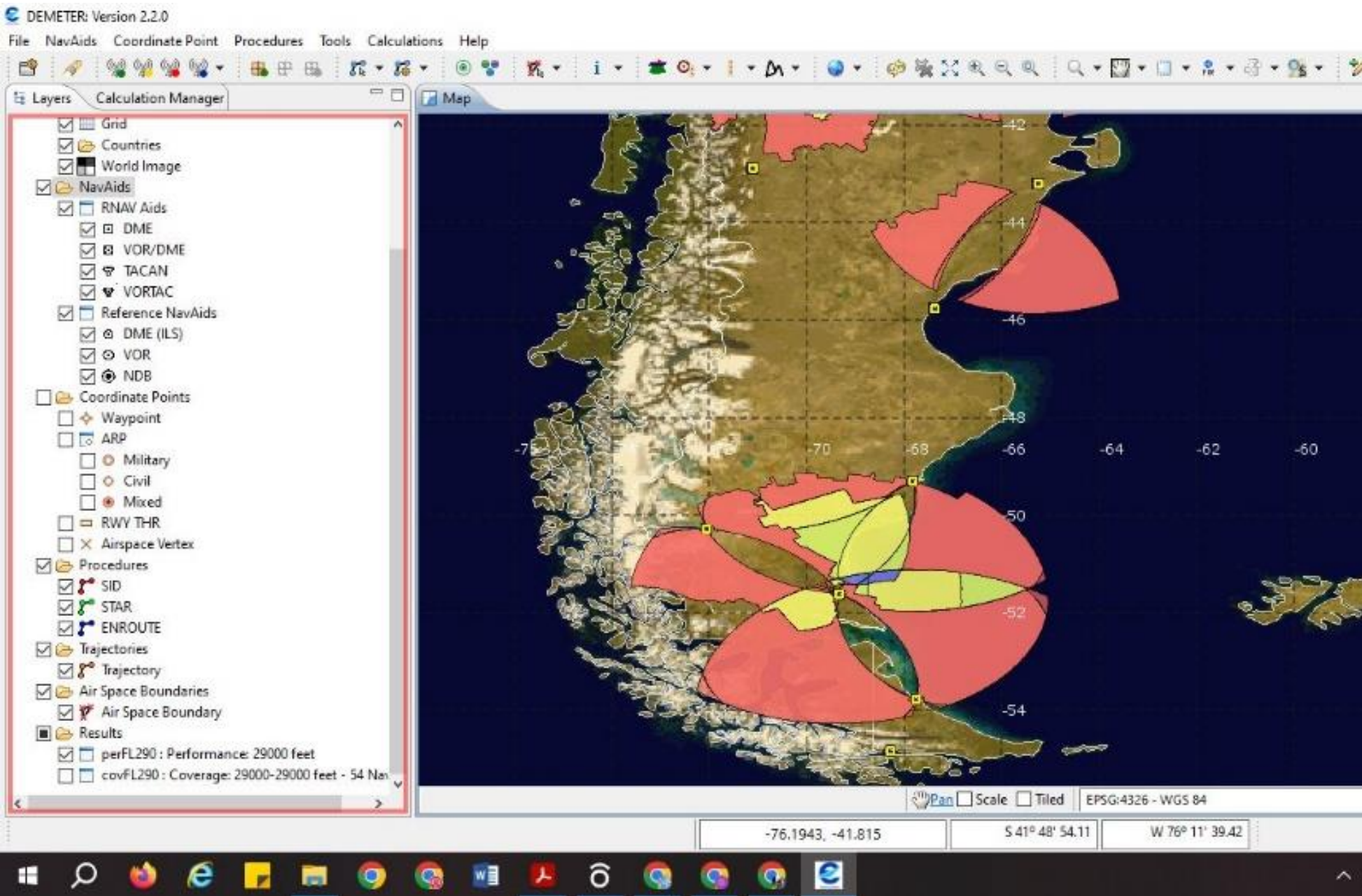


# GNSS Events South Region Argentina

MAR 2025

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# Calculo performance DME-DME South Region Argentina

(software  
DEMETER)

# EUROCONTROL Airspace Risk Assessment



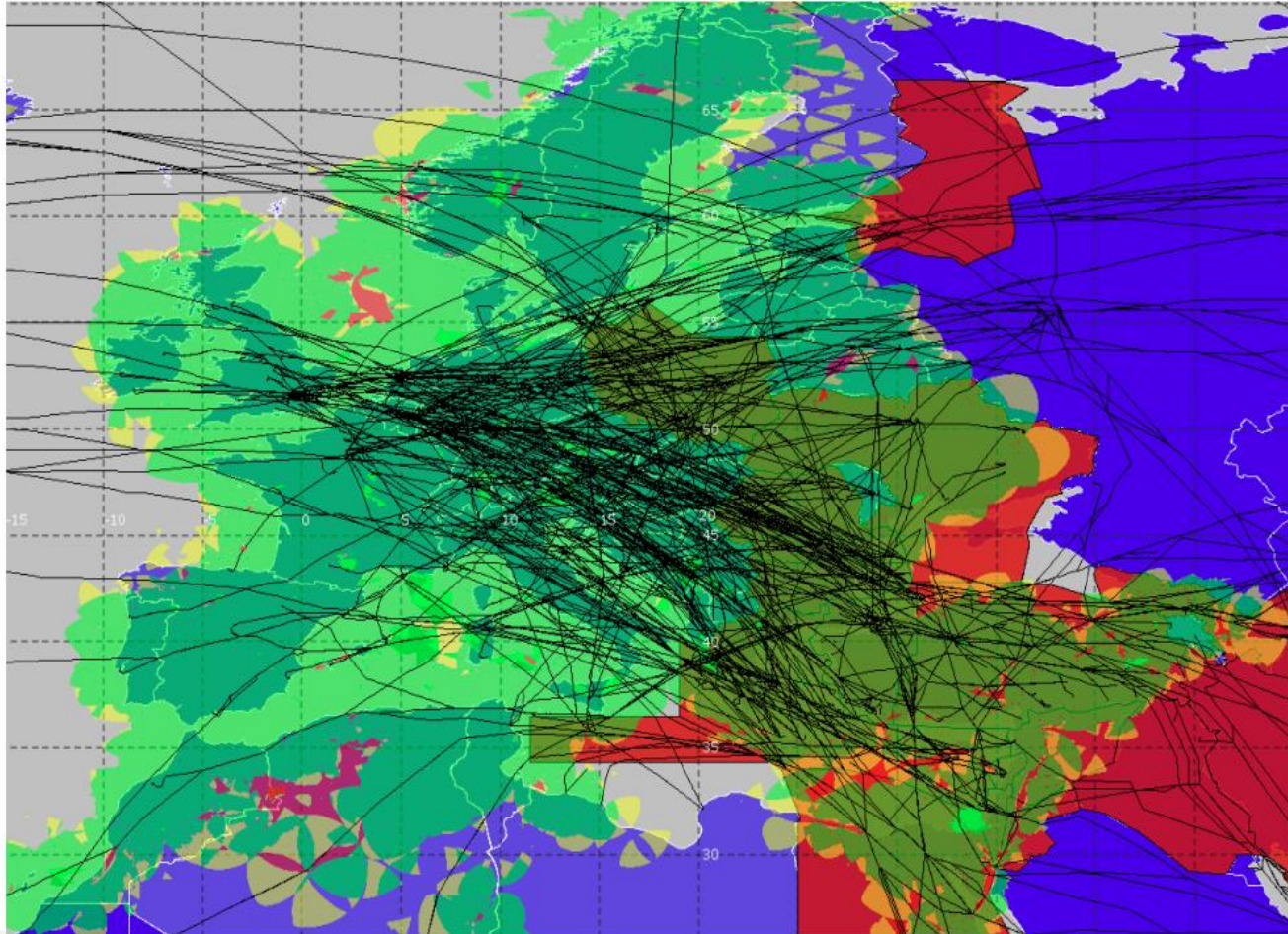
**Dark RED:** FIR affected by GNSS RFI

**Black:** Flights crossing affected FIRs

**Green:** Alternative DME/DME RNAV Coverage Available

**Yellow/orange:** DME/DME RNAV Coverage Available but no redundancy

**Light red:** No DME/DME RNAV Coverage



## Calculation Performance Europe

### EUROCONTROL STAKEHOLDER FORUM

# Comparison ARG ADS-B with GNSS Events

Period: MARCH 2025

Workshop on Air Navigation Systems for the NAM/CAR/SAM regions  
Mexico City, Mexico, September 2-4, 2025

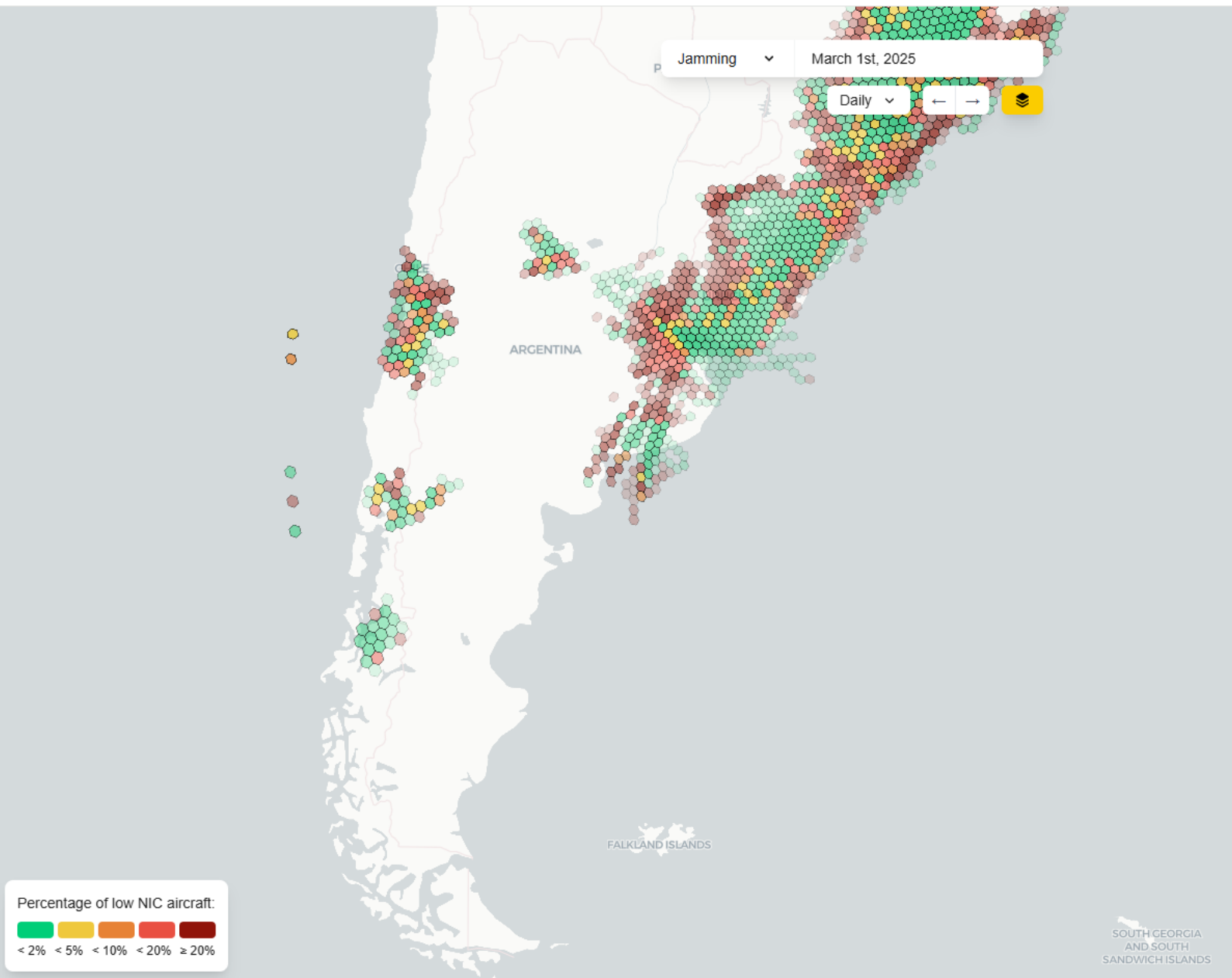
**ANAC** | AVIACIÓN CIVIL  
ARGENTINA



Secretaría  
de Transporte  
Ministerio de Economía

### GNSS Interference Detection using ADS-B

- Map
- Statistics
- Resources



# GNSS Events Argentina

## MAR 2025




Percentage of low NIC aircraft:  
< 2% < 5% < 10% < 20% ≥ 20%

### GNSS Interference Detection using ADS-B

Map

Statistics

Resources

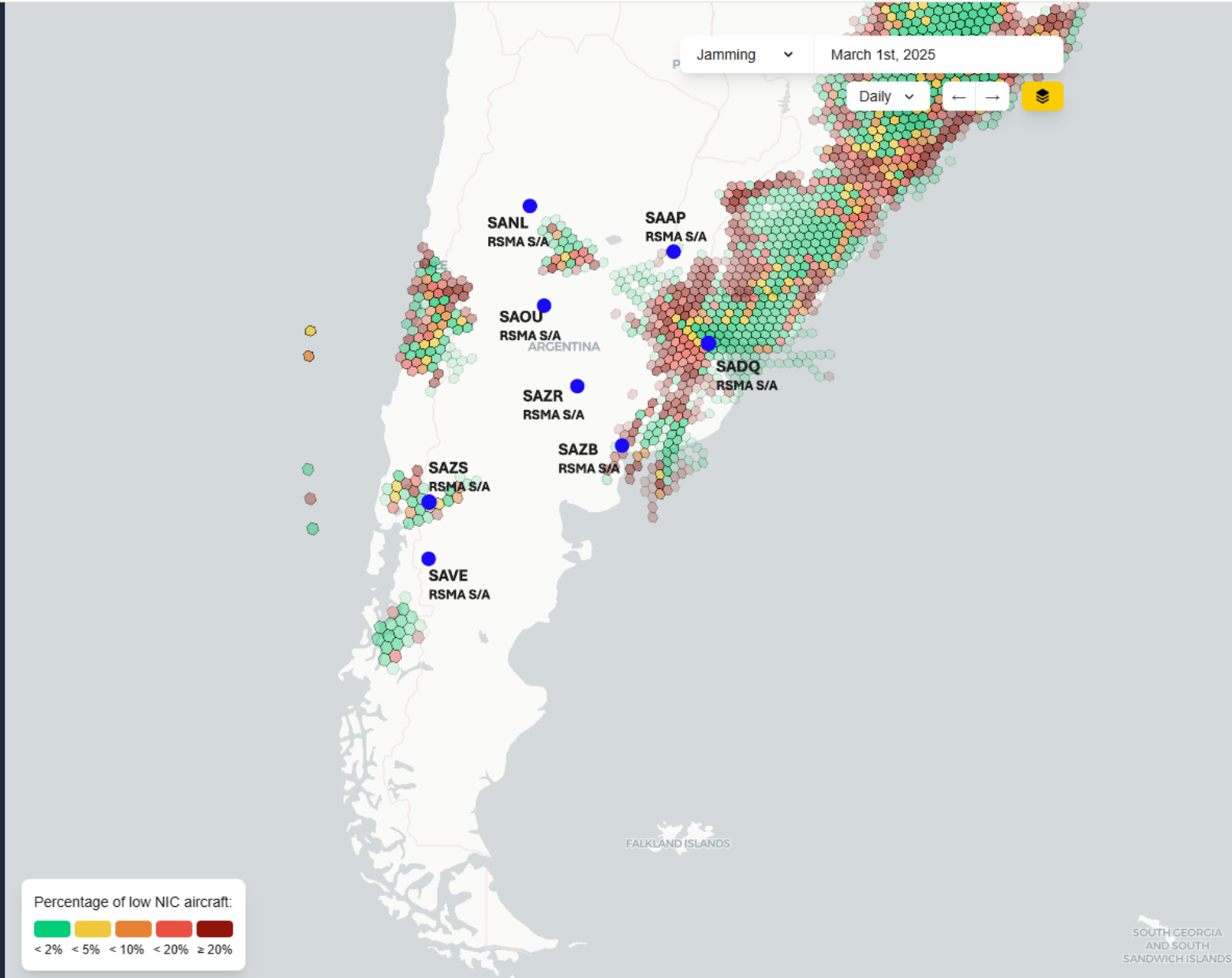


AEROSPACE

CARNATIONS

Federal Aviation Administration

Stanford University



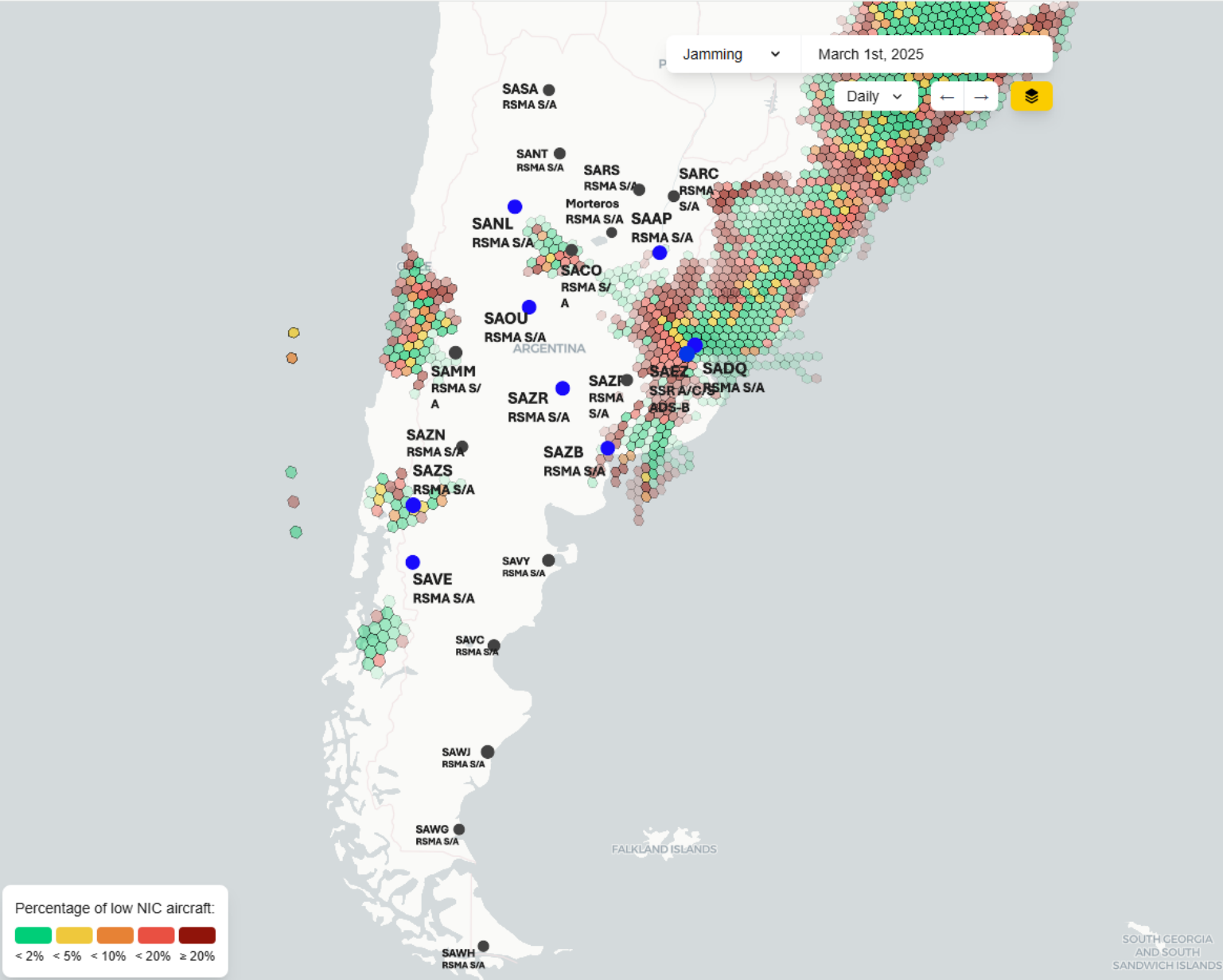
# RSMA Systems S/A S Mode and ADS-B Capability Argentina

JUL 2025

### GNSS Interference Detection using ADS-B

- Map
- Statistics
- Resources

AEROSPACE  
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Federal Aviation Administration  
Stanford University



# RSMA Systems S/A S Mode and ADS-B Capability Argentina JUL 2025

# Comparative ARG radionavigation systems with GNSS events



## CONCLUSIONS:

- **Continue with the studies of GNSS interference cases, to detect and correct interference situations caused by external sources in the different phases of flight, and determine preventive actions to avoid future interference situations that could be caused by various external sources.**
- **Consolidate an orientation guide that compiles the recommended preventive measures and the corrective actions applied, to provide reference material with the particularities of the Region.**



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**Thank you very much for your  
attention. [cns@anac.gob.ar](mailto:cns@anac.gob.ar).**

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