What Is Old Is Now New Again:

Radar's Critical Role in Today's Remote Sensing Renaissance

Brian Timoney

March 2021

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LinkedIn: brian-timoney-a760534

Happy to be “virtually” visiting Switzerland again

Counting Things

Another Day in The Global Economy

Markets

Brazil Soy Shipments Snagged by 18.6-Mile Traffic Jam in North

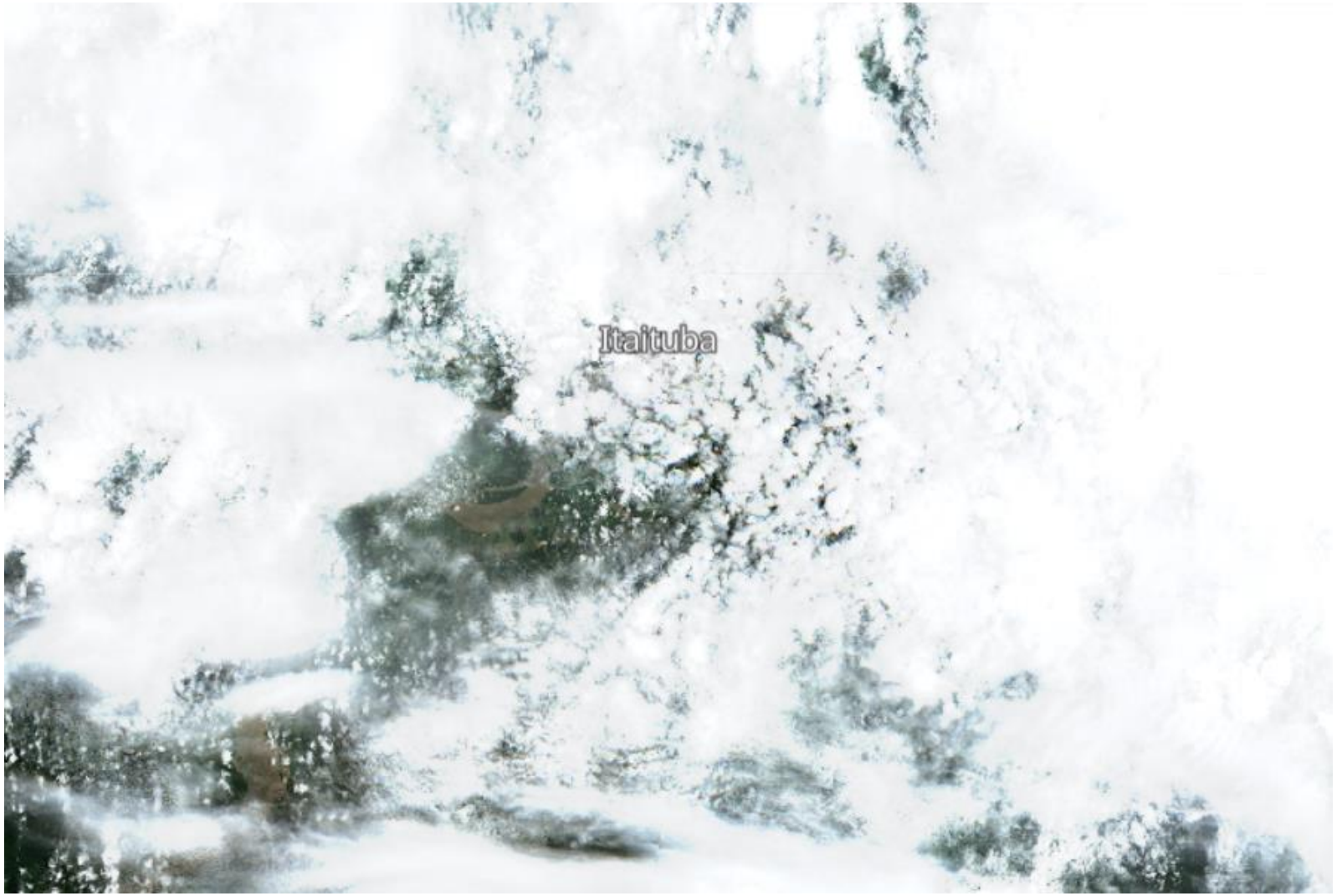
By Tatiana Freitas
February 19, 2021, 11:35 AM MST

- Late harvest led to backlog of trucks carrying soy to port
- Rains stalled traffic at unpaved stretch near key terminal

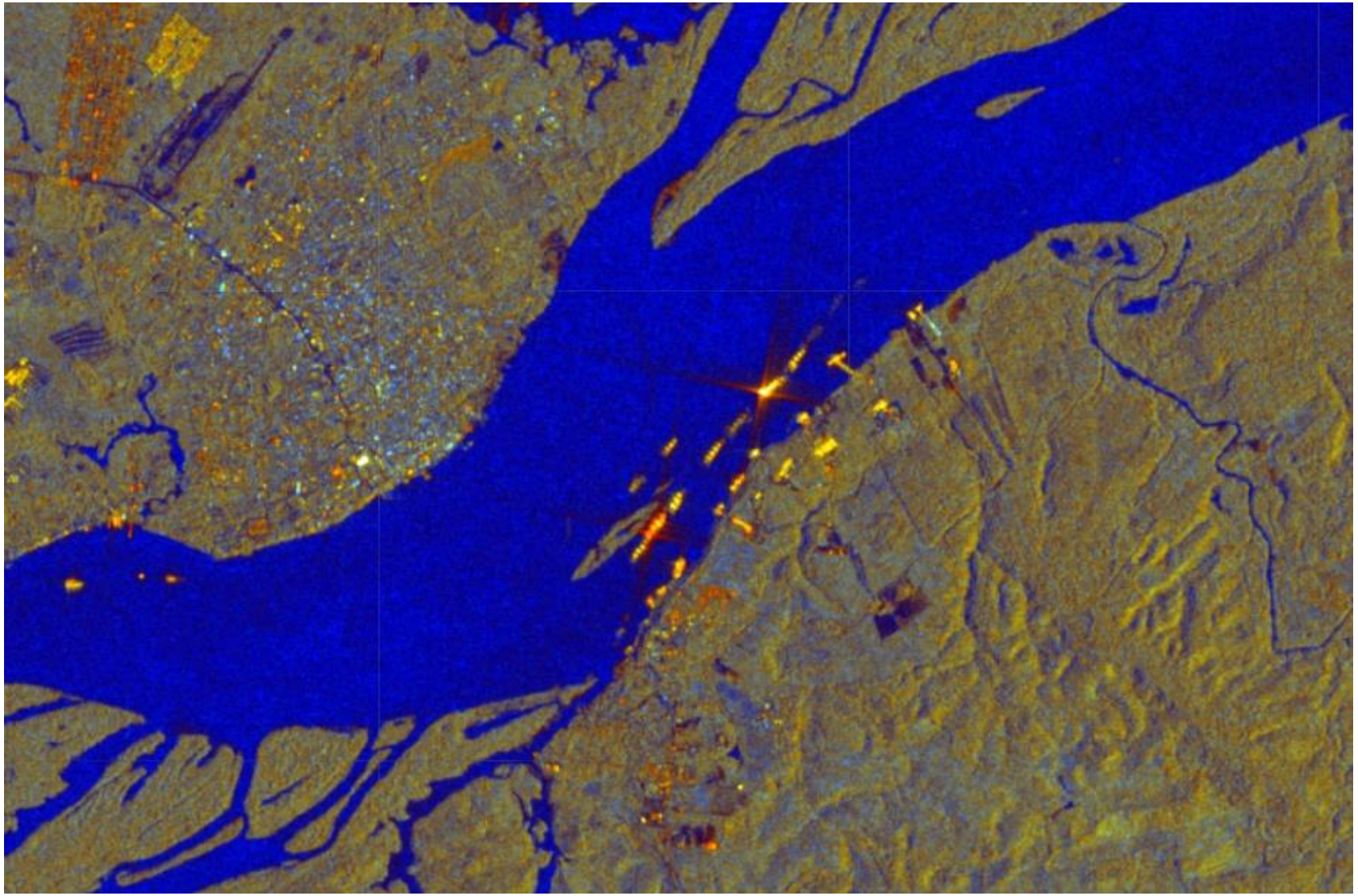
The impact of Brazil's late soybean harvest has hit the roads of the nation's northern export route, ensnaring truckers in long lines and threatening further delays of shipments to China.

Latitude Is An Attitude

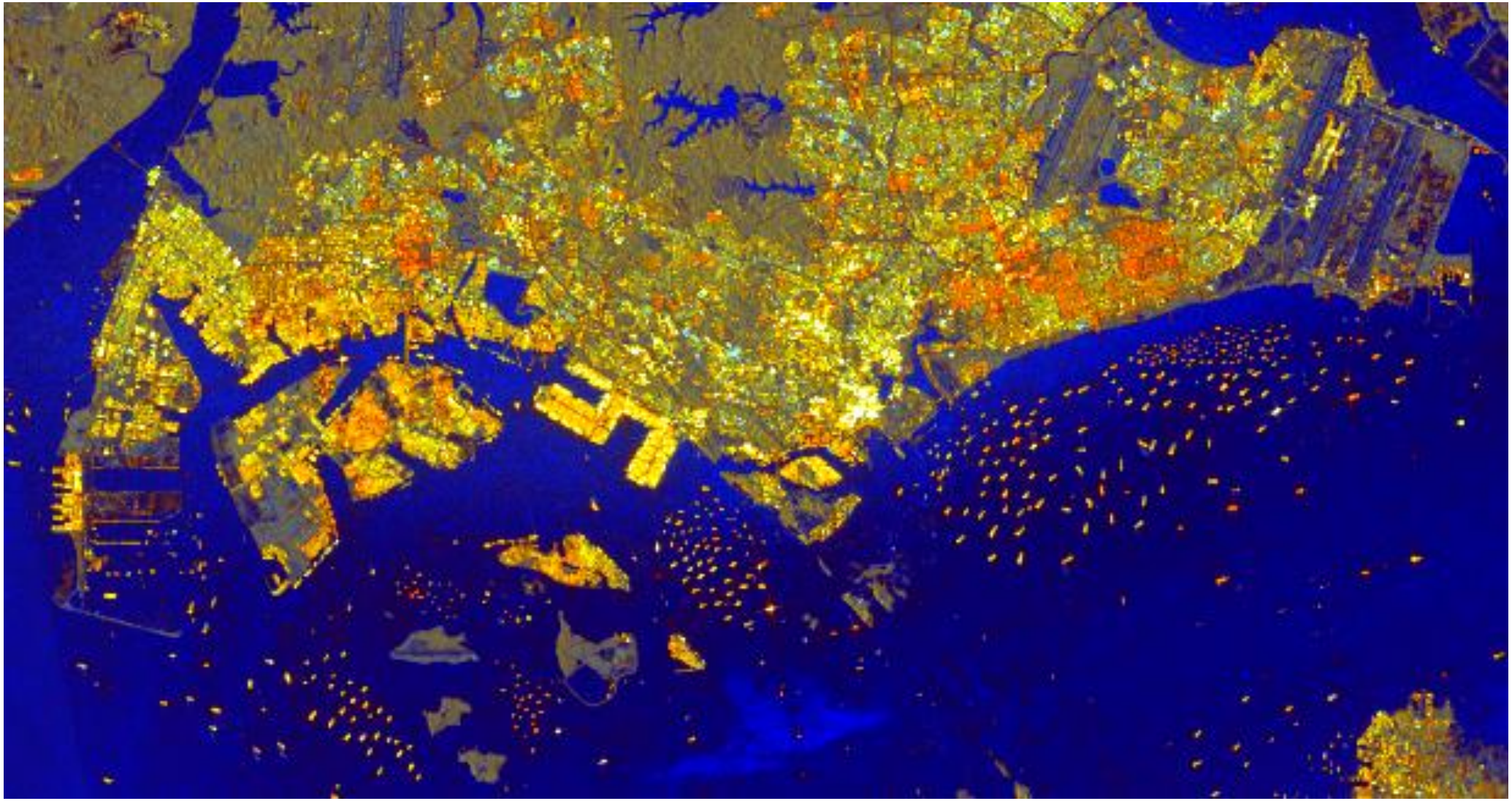
Optical In Tropical (February 21,2021)



What SAR “Sees” (February 18, 2021)

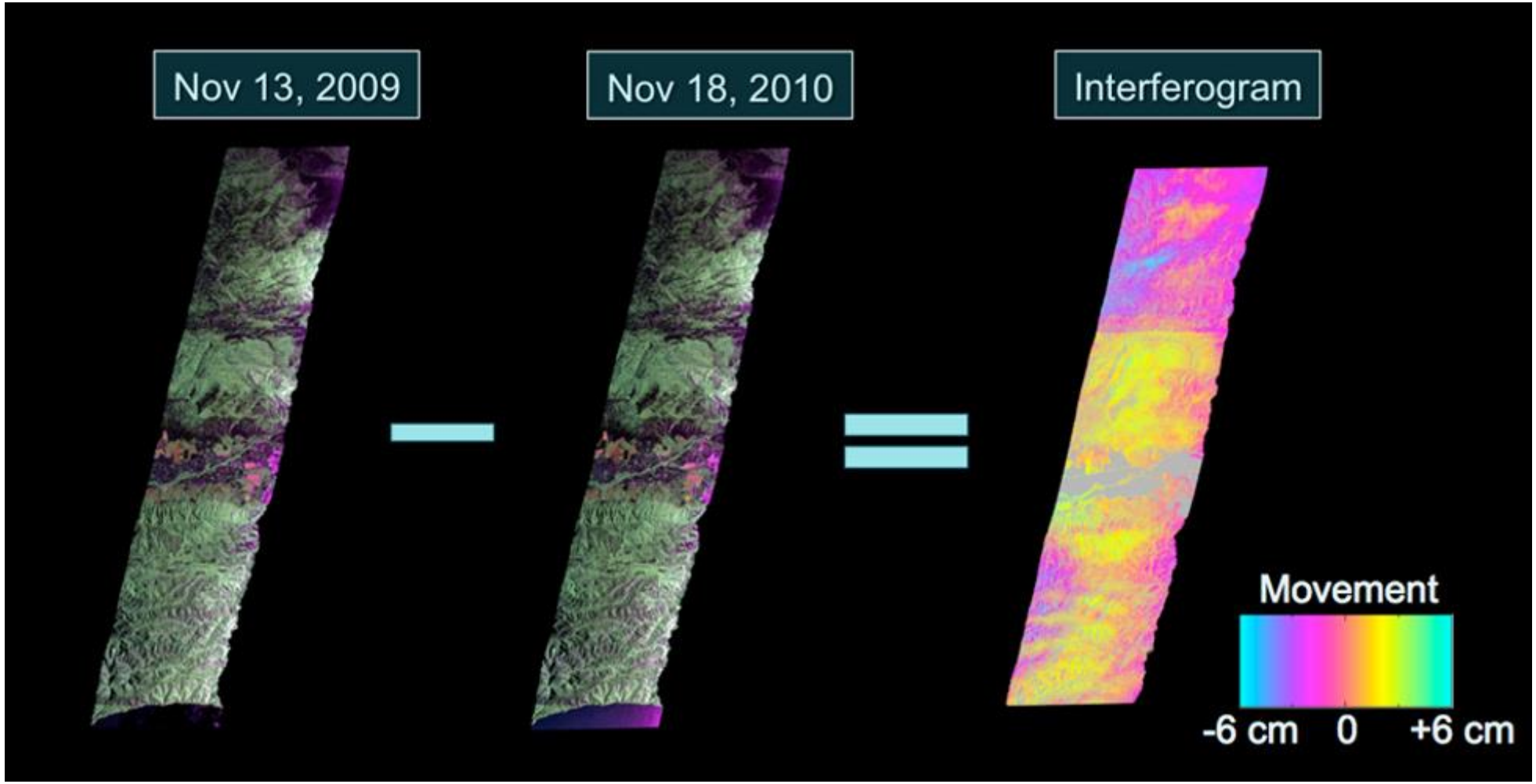


Counting Things Is (Extremely) Valuable

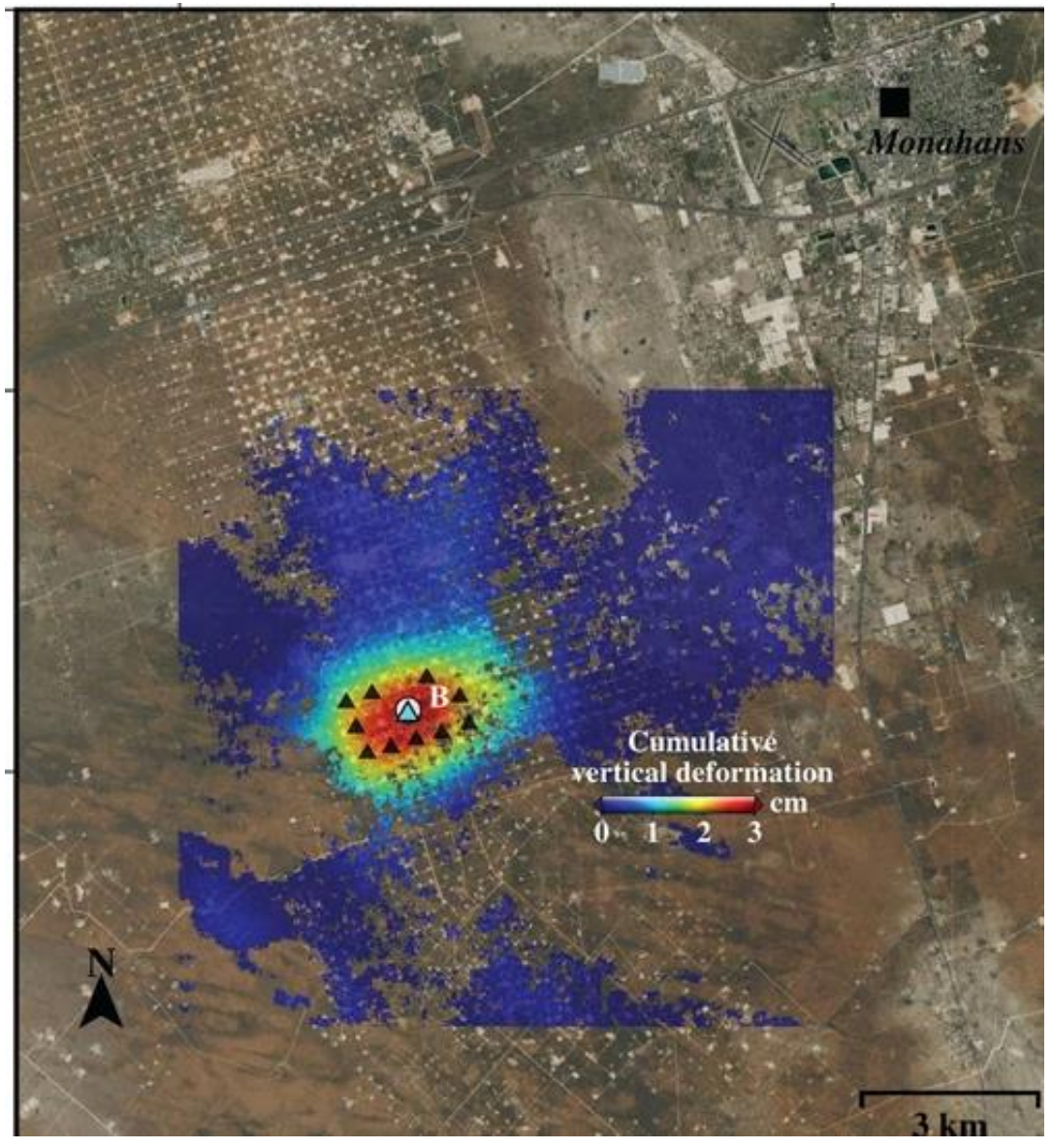


Detecting (Very) Small Changes

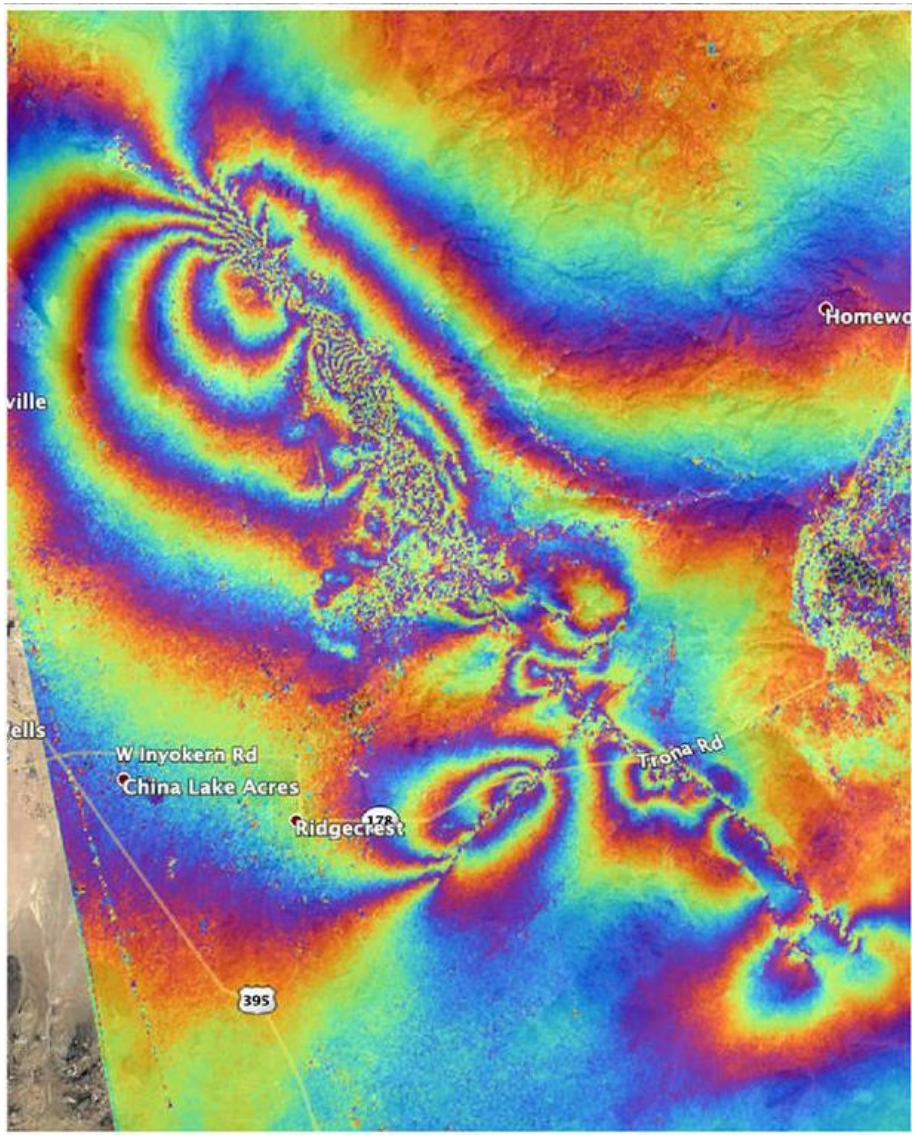
Interferometry: Change Over Time



Fracking Wastewater Injection Deformation



Earthquake Displacement (1 color cycle = 12cm)



Commercial Interest

ICEYE

Capella Space

Synspective

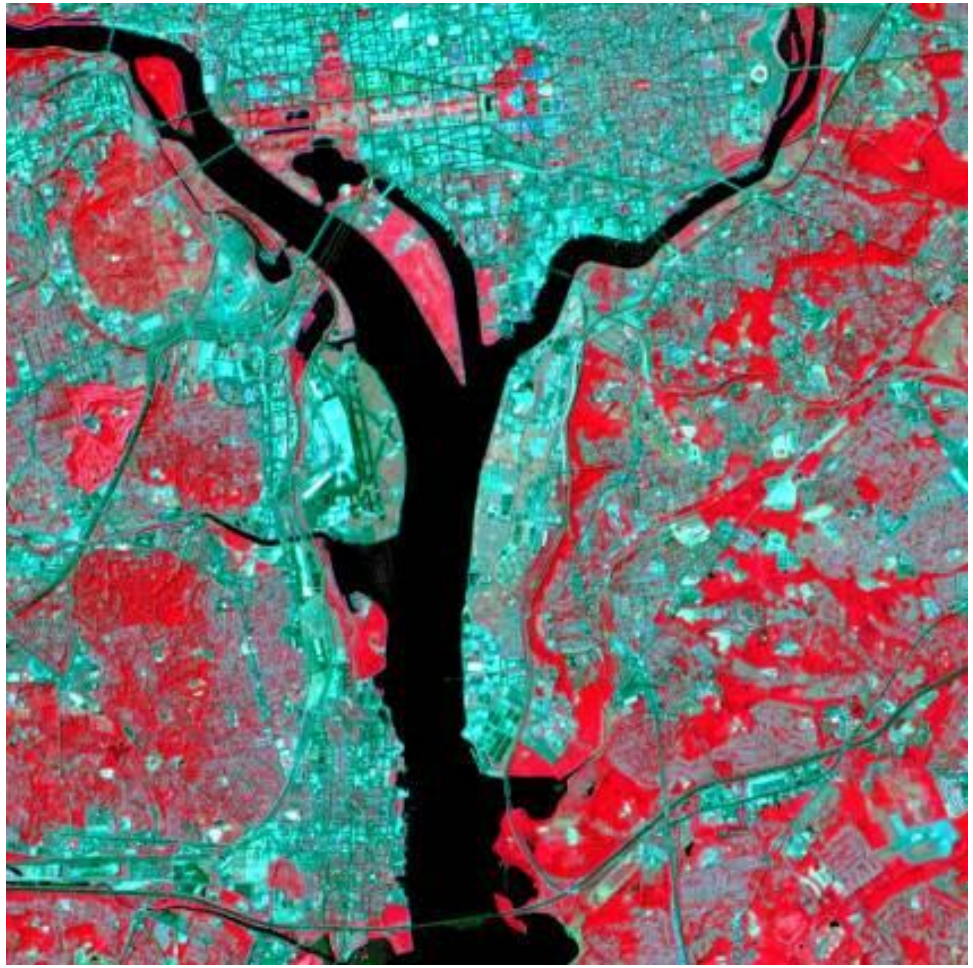
UMBRA

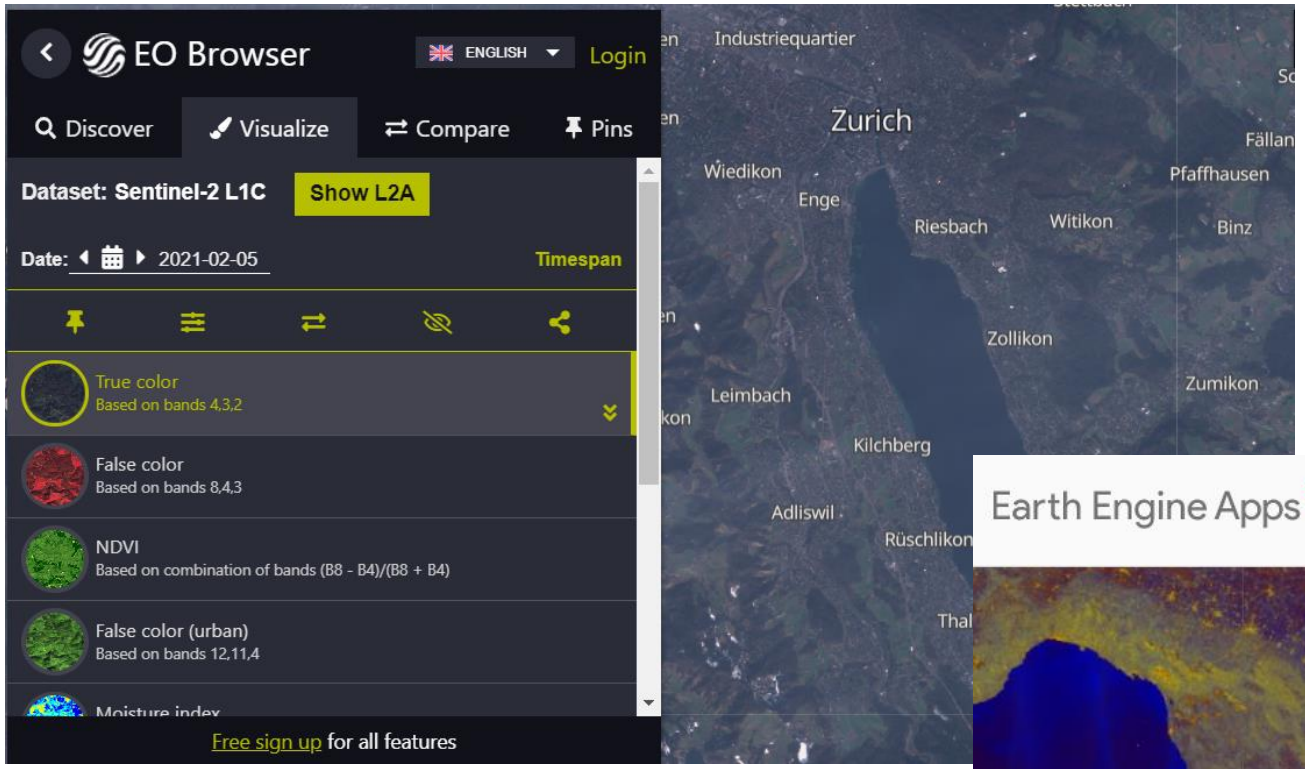
Swiss Re

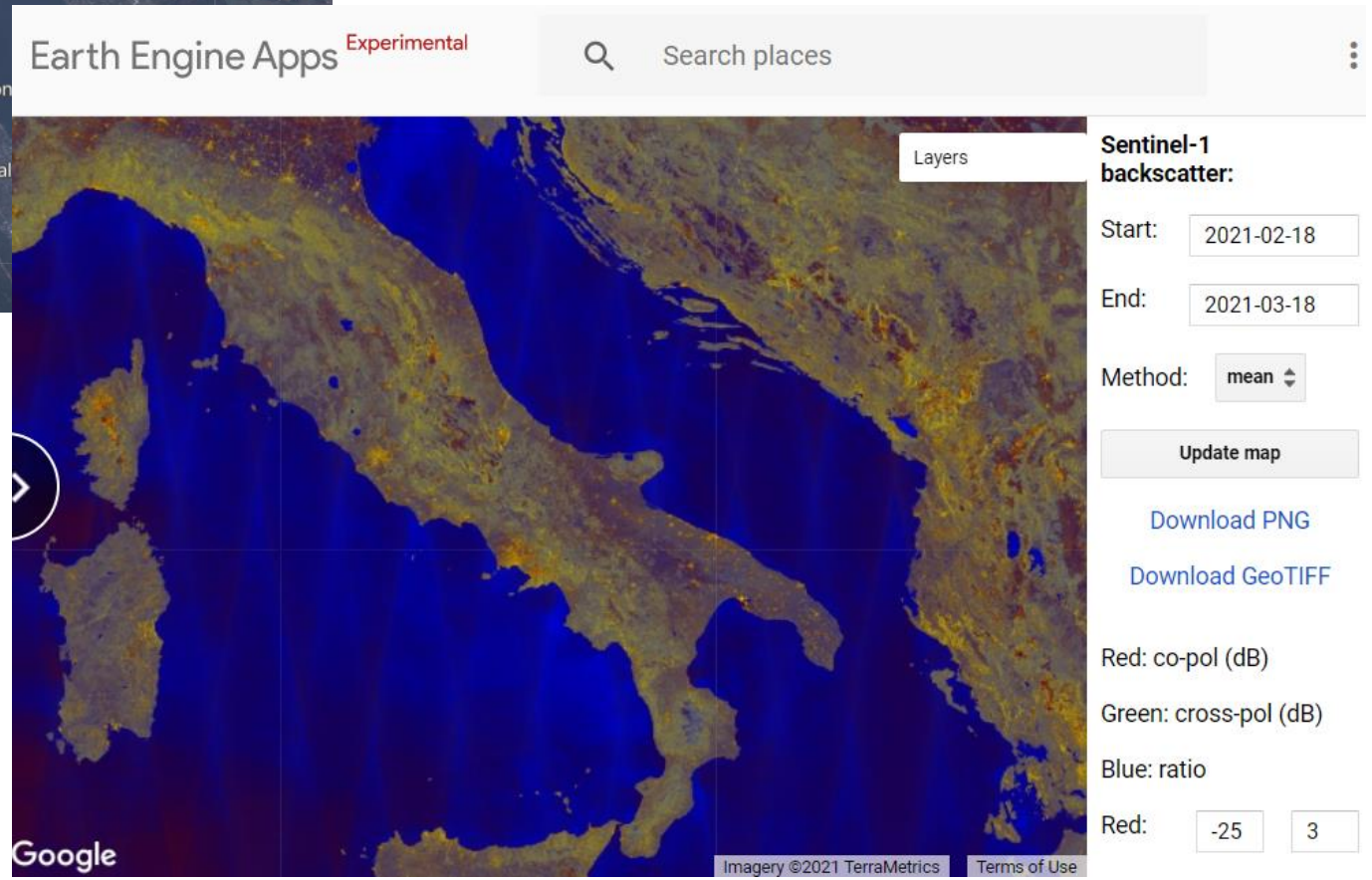
Swiss Re announces strategic partnership with radar satellite-based flood monitoring provider ICEYE

A New Era of Remote Sensing

No More of This




EO Browser
ENGLISH
Login
Discover
Visualize
Compare
Pins
Dataset: Sentinel-2 L1C
Show L2A
Date: 2021-02-05
Timespan
True color
Based on bands 4,3,2
False color
Based on bands 8,4,3
NDVI
Based on combination of bands (B8 - B4)/(B8 + B4)
False color (urban)
Based on bands 12,11,4
Free sign up for all features
Industriequartier
Zurich
Wiedikon
Enge
Riesbach
Witikon
Fällan
Pfaffhausen
Binz
Zollikon
Zumikon
Leimbach
Kilchberg
Adliswil
Rüschlikon


Earth Engine Apps
Experimental
Search places
Layers
Sentinel-1 backscatter:
Start:
2021-02-18
End:
2021-03-18
Method:
mean
Update map
Download PNG
Download GeoTIFF
Red: co-pol (dB)
Green: cross-pol (dB)
Blue: ratio
Red:
-25
3
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Final Thanks

AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY

MOVEMENT DATA IN GIS

Geobeer Switzerland 2021-03-18

Anita Graser

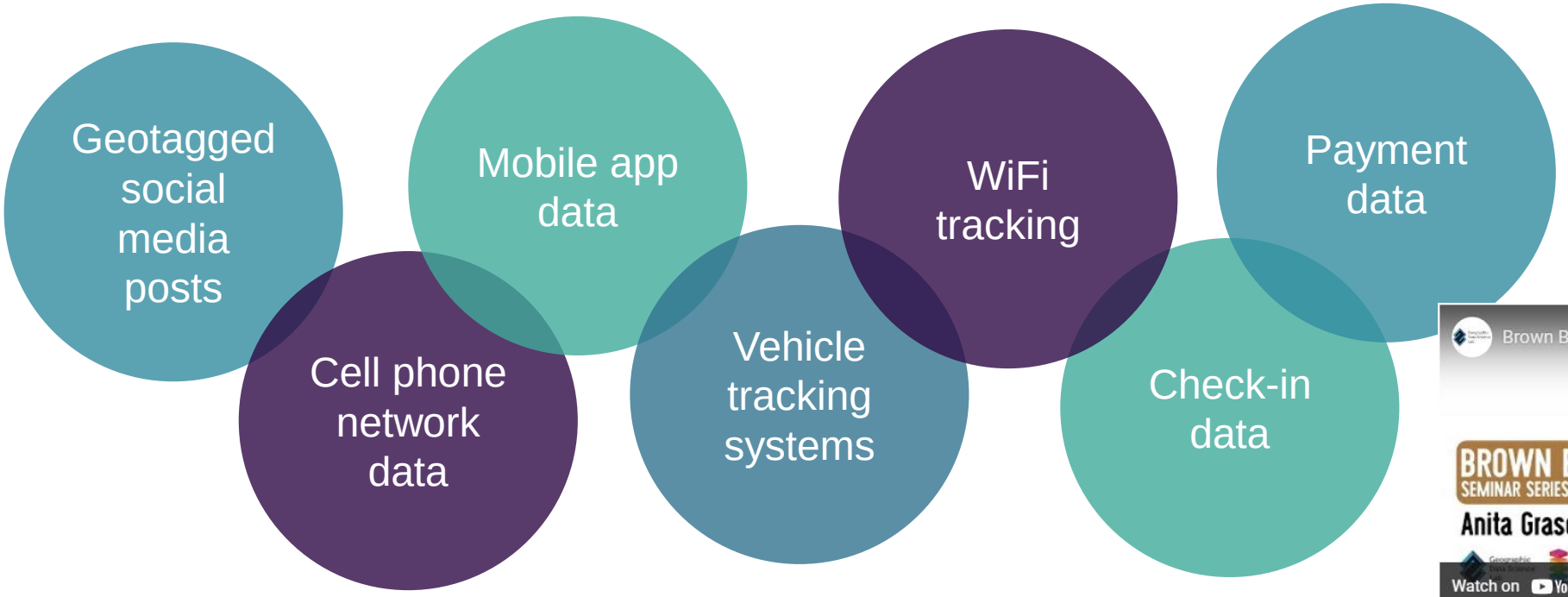
MOVEMENT DATA SCIENCE

- ✓ **Opportunistic reuse** of data

  → Black box / undocumented data collection

  → Usually biased & messy data

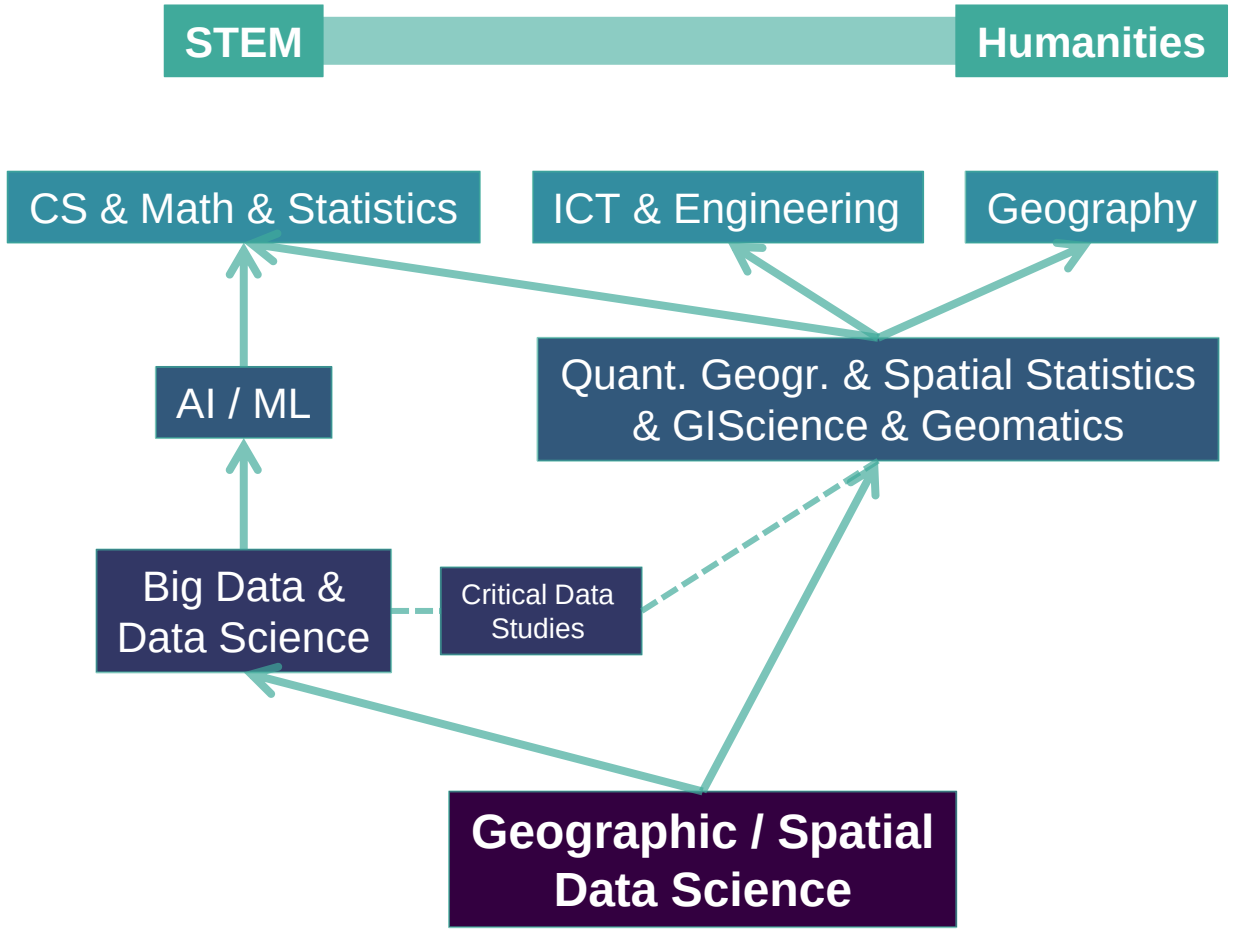
"All metadata records are incomplete as it is impossible to foresee future uses" Janowicz et al. (2020) GeoAI



https://www.youtube.com/watch?v=mIktJKbj8Ms

GEOGRAPHIC DATA SCIENCE

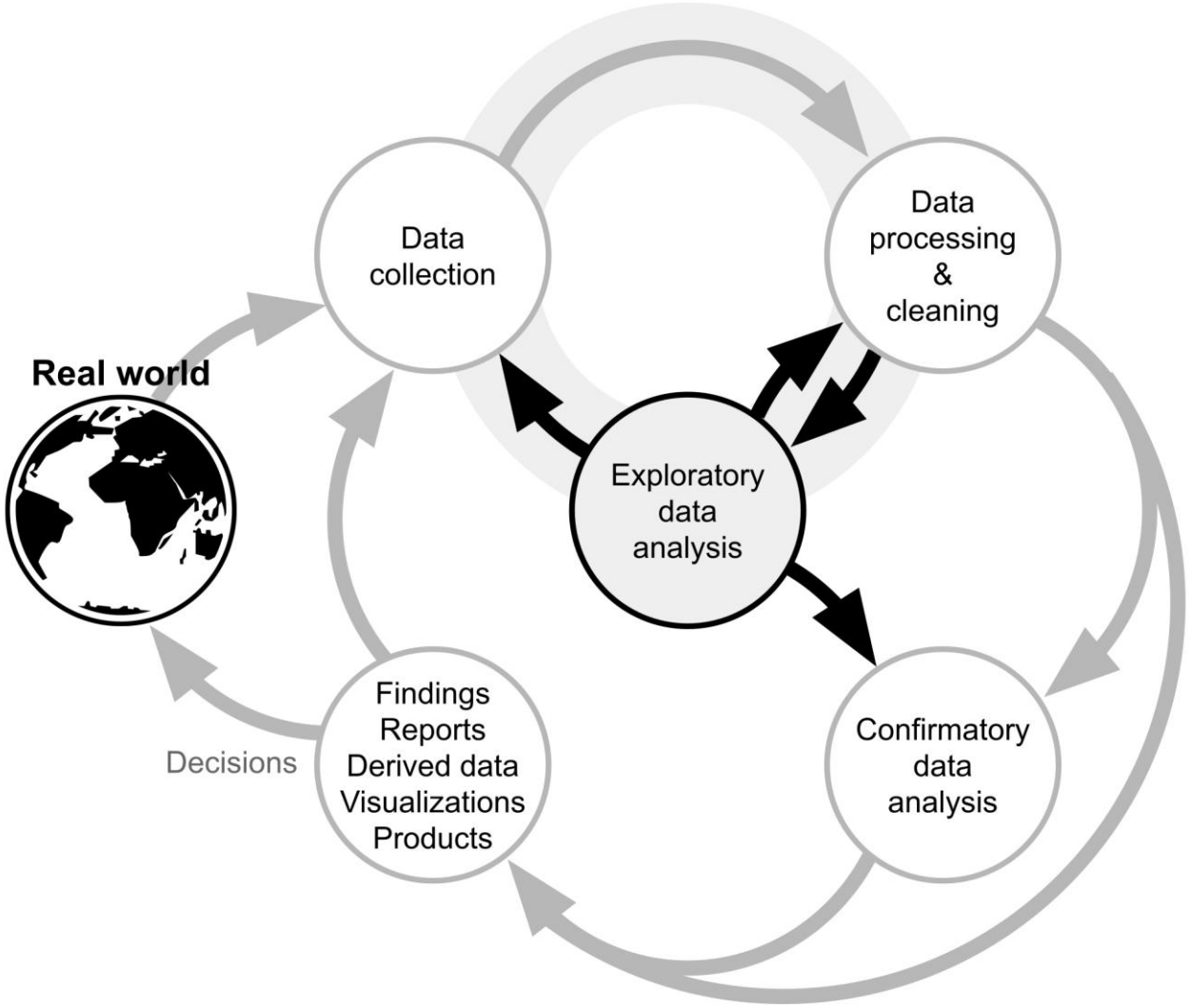
- ✓ **Gathering** data, **massaging** it into a tractable form, making it **tell its story**, and **presenting** that story to others
- ✓ Dealing with data that incorporates **spatial and often temporal elements**
- ✓ Turning **Big Spatiotemporal Data** into **insight and understanding**



Andrienko et al. (2017) Geographic Data Science
Singleton & Arribas-Bel (2021) Geographic Data Science

CHALLENGES

- ✓ Accept **messiness** in data
- ✓ Need to understand
  - ✓ **Causes** of bias & messiness
  - ✓ **Consequences** of using such data in analyses
  - ➔ Data visualization & exploratory approaches



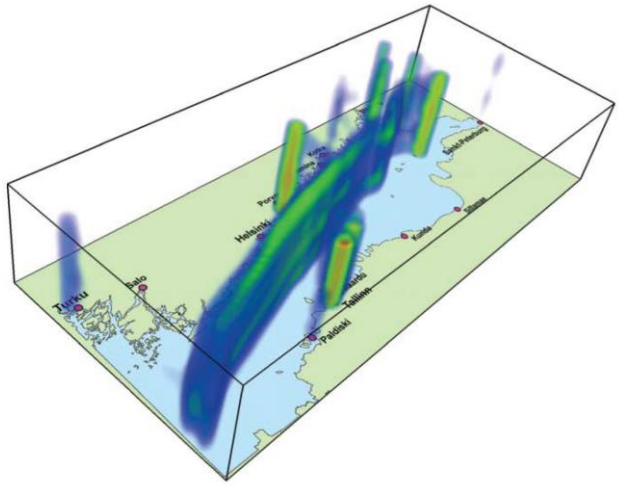
Brunsdon & Comber (2020) Big issues for big data

Graser & Dragaschnig (2020) Open Geospatial Tools for Movement Data Exploration

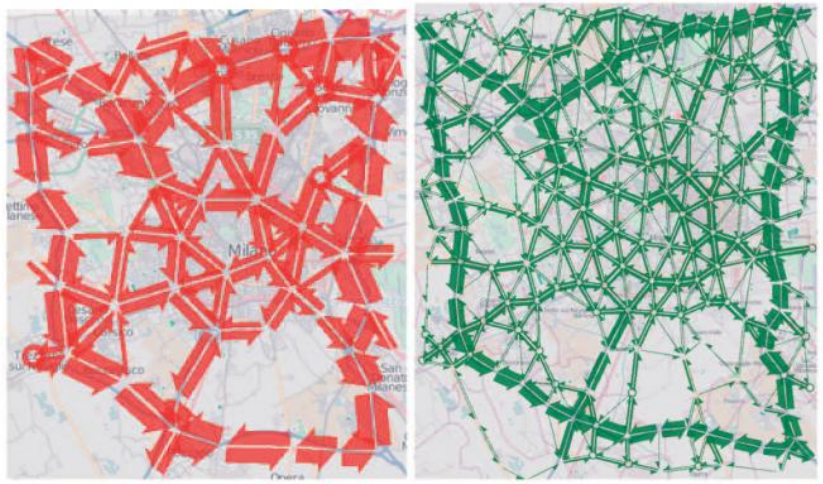
EXPLORING MOVEMENT DATA

- ✓ Complex spatiotemporal phenomena
- ✓ Context & scale dependent
- ✓ Spatial, temporal & attribute uncertainty

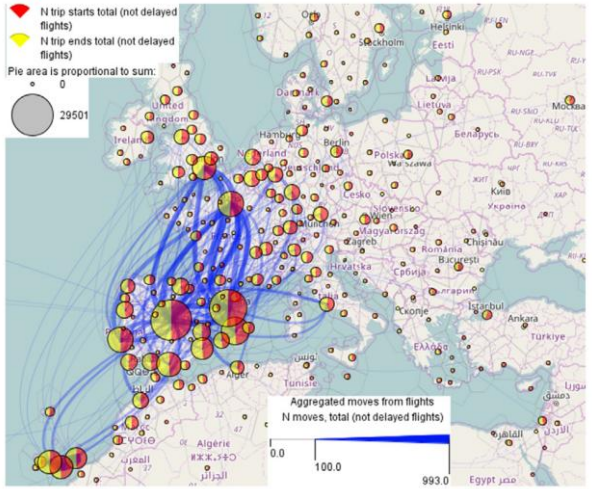
+ Lack of established tools & practices



Demšar & Virrantaus (2010)
Space-time density of trajectories

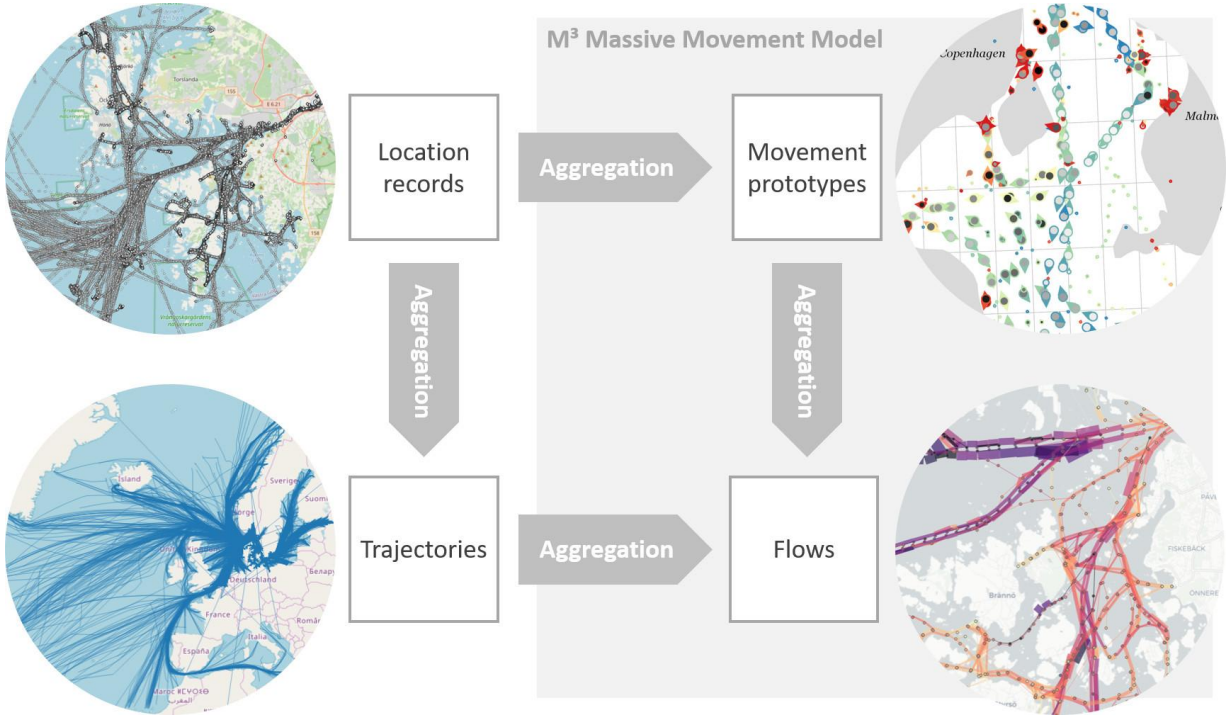


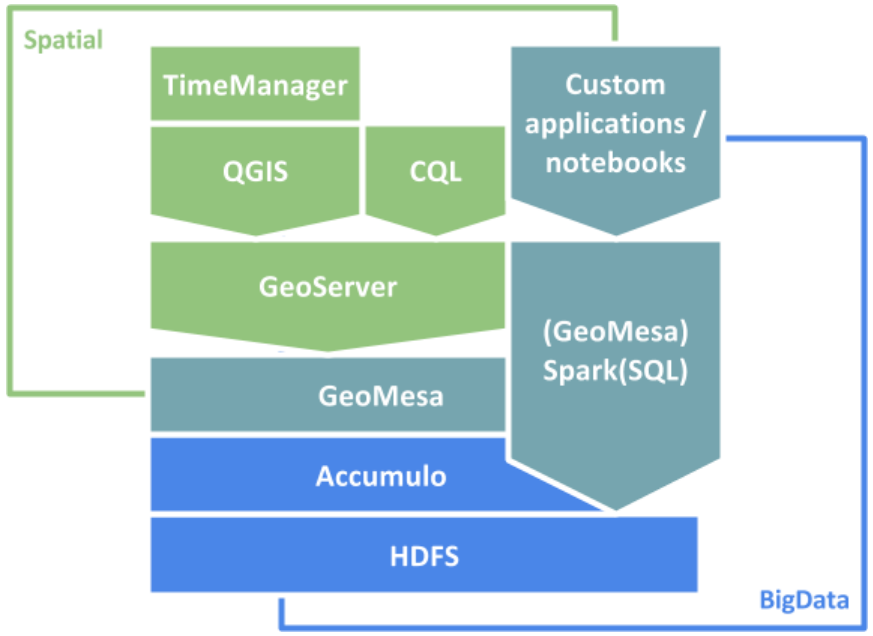
Andrienko & Andrienko (2011)
Spatial generalization and aggregation of massive movement data



Andrienko et al. (2017)
Visual exploration of movement and event data with interactive time masks

AGGREGATING MOVEMENT DATA





Graser et al. (2020) The M³ massive movement model
Graser et al. (2020) Exploratory Trajectory Analysis for Massive Historical AIS Datasets
Graser et al. (2020) Extracting Patterns from Large Movement Datasets

https://www.youtube.com/watch?v=dRE9Zl7jpUA

jupyter protocol (autosaved)

Logout

File Edit View Insert Cell Kernel Help Trusted Python 3

Run Markdown

A protocol for identifying problems in continuous movement data

This notebook provides an open-source implementation of the protocol presente

Graser, A. (2021) An exploratory data analysis protocol for identifying problems i
movement data. *Journal of Location Based Services*.
http://dx.doi.org/10.1080/17489725.2021.1900612.

The individual protocol steps are demonstrated using a dataset of vessel tracking
published by the Danish Maritime Authority. The demo data covers two days (Jul
January, 1st 2018). Since the datasets are too large for Github, they have been r
via Figshare: https://doi.org/10.6084/m9.figshare.11577543

Content

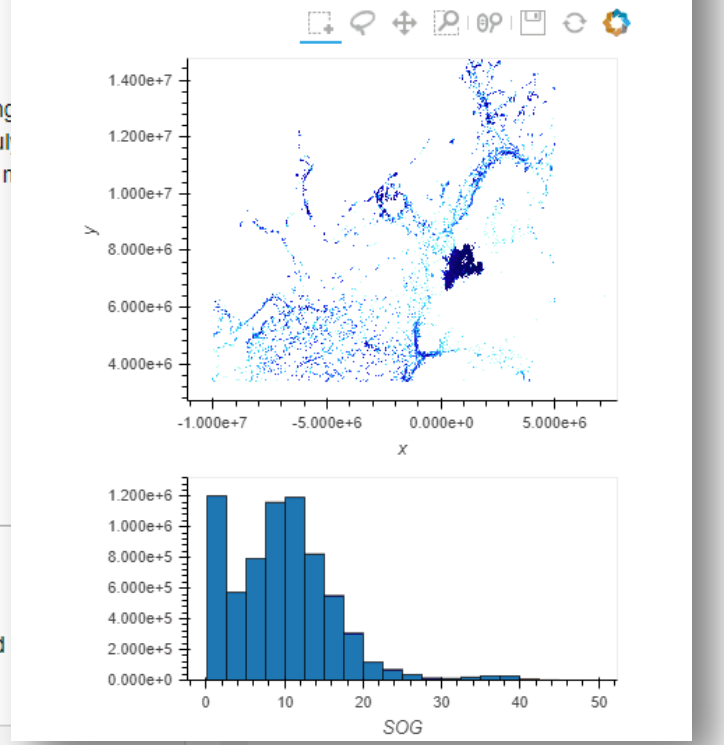
- Setup
- A. Missing data
- B. Precision problems
- C. Consistency problems
- D. Accuracy problems

Setup

Before running this notebook, make sure to download *dk_csv_20170701.7z* and
dk_csv_20180101.7z and unzip the files into the data directory:

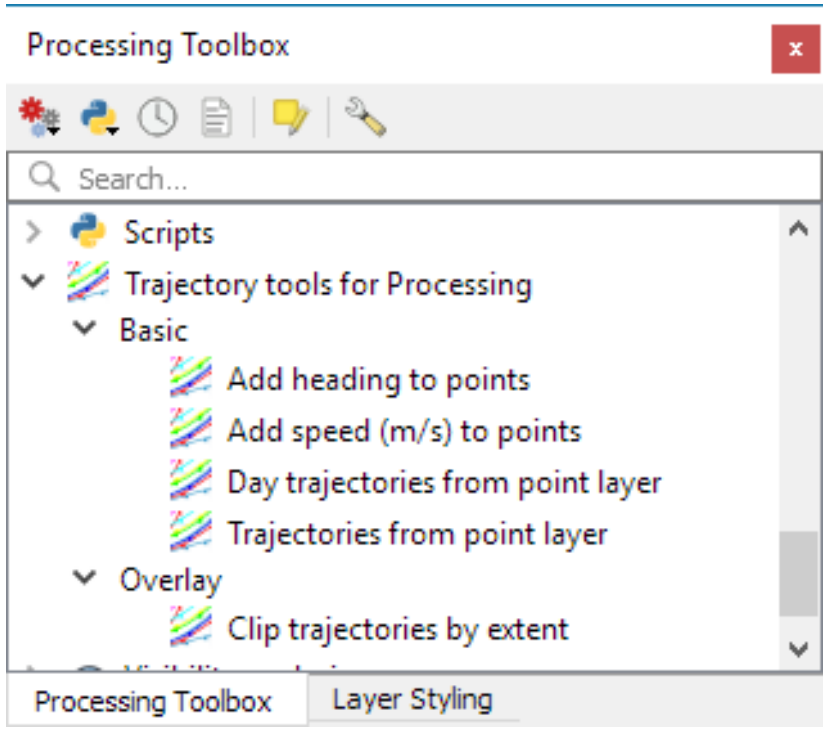
In [1]:
```
input_files = [
    './data/aisdk_20170701.csv',
    './data/aisdk_20180101.csv'
]
```

```
linked_plots = link_selections(map_plot + hist_plot)
linked_plots.cols(1)
```



https://fosdem.org/2021/schedule/event/geopandasholoviews/

QGIS ♡ DATA SCIENCE



https://anitagraser.com/2019/02/02/movement-data-in-gis-20-trajectools-v1-released/

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TOMORROW TODAY

anitagraser.com/movement-data-in-gis

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@underdarkGIS