REACTIV and Sentinel-1:
Visual Gallery of Use Cases and Extensions

Illustrative Examples for Event-Based Detection, Seasonal Adaptation, and Polarimetric Optimization

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Reference:
Colin, E. & Nicolas, J.M. (2020). *Change detection based on the coefficient of variation in SAR time-series of urban areas.*
Remote Sensing, 12(13), 2089.

Repository:
All scripts and supplementary examples available at
🔗 https://github.com/elisecolin/REACTIV

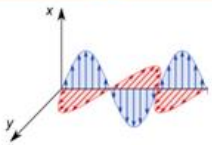
REACTIV Classic

WHAT FOR?

Detecting a new event In an active area

Filter out unwanted seasonal effects

Use polarimetry to separate and identify more changes



BENEFIT

Focuses on a single date

Eliminates unwanted previous detections.

Facilitates the detection of specific events in natural environments

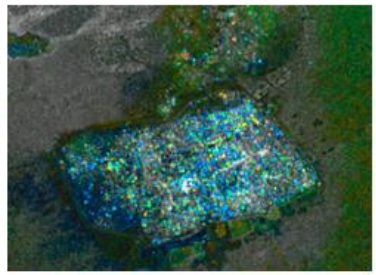
Allows for the separation of up to two types of changes

Enhances the detection of weak events.

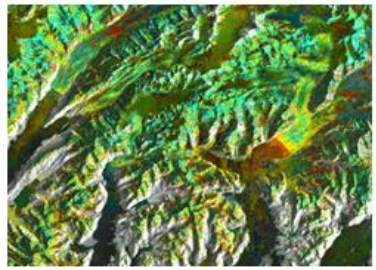
VERSIONS

Frozen Background

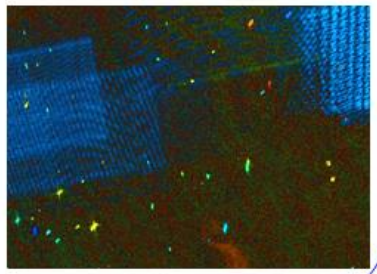
NewEvent (Ratio CV method)



Seasons

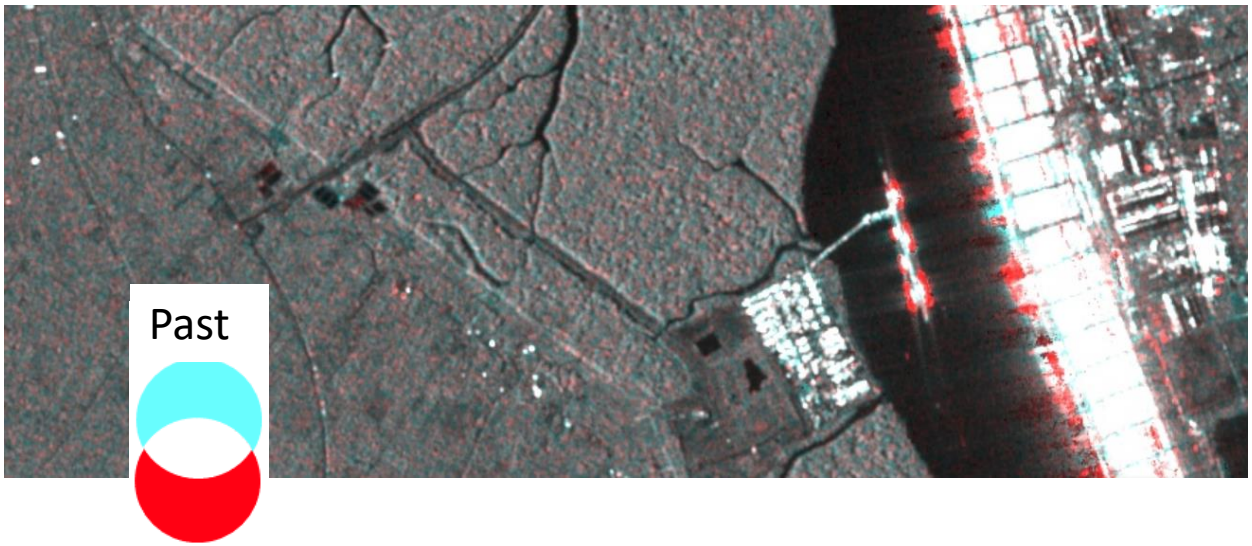


POLARIMETRY



Event-Based Detection – Port Area near Singapore (Sentinel-1, IW Mode)

Location: 1.358° N, 103.541° E
Observation window end date: July 1, 2025



Top: Frozen Background Composite

This visualization highlights ships appearing.

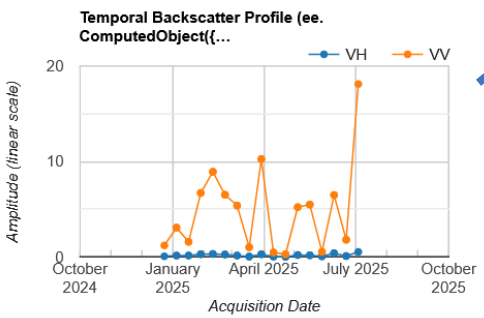
standard composition

The Frozen Background more effectively isolates *new* reflectors while suppressing previous occurring events

New Event detection

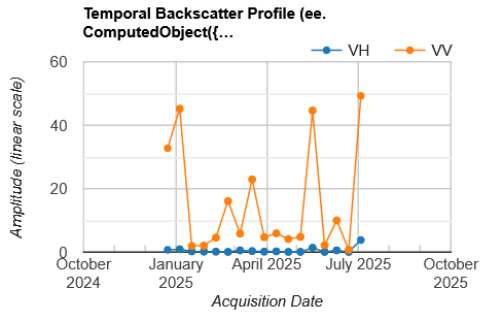
Left plot: No new event is detected because this location shows **frequent alternations** between presence and absence of vessels—resulting in high temporal variability rather than a unique new change.

Longitude: 103.54057, Latitude: 1.35806



Right plot: A **distinct new event** is detected only in VH, because signal increases only in the most recent acquisition.

Longitude: 103.54671, Latitude: 1.35834



New Event Detection – Industrial Area, Qatar (Sentinel-1, IW Mode)

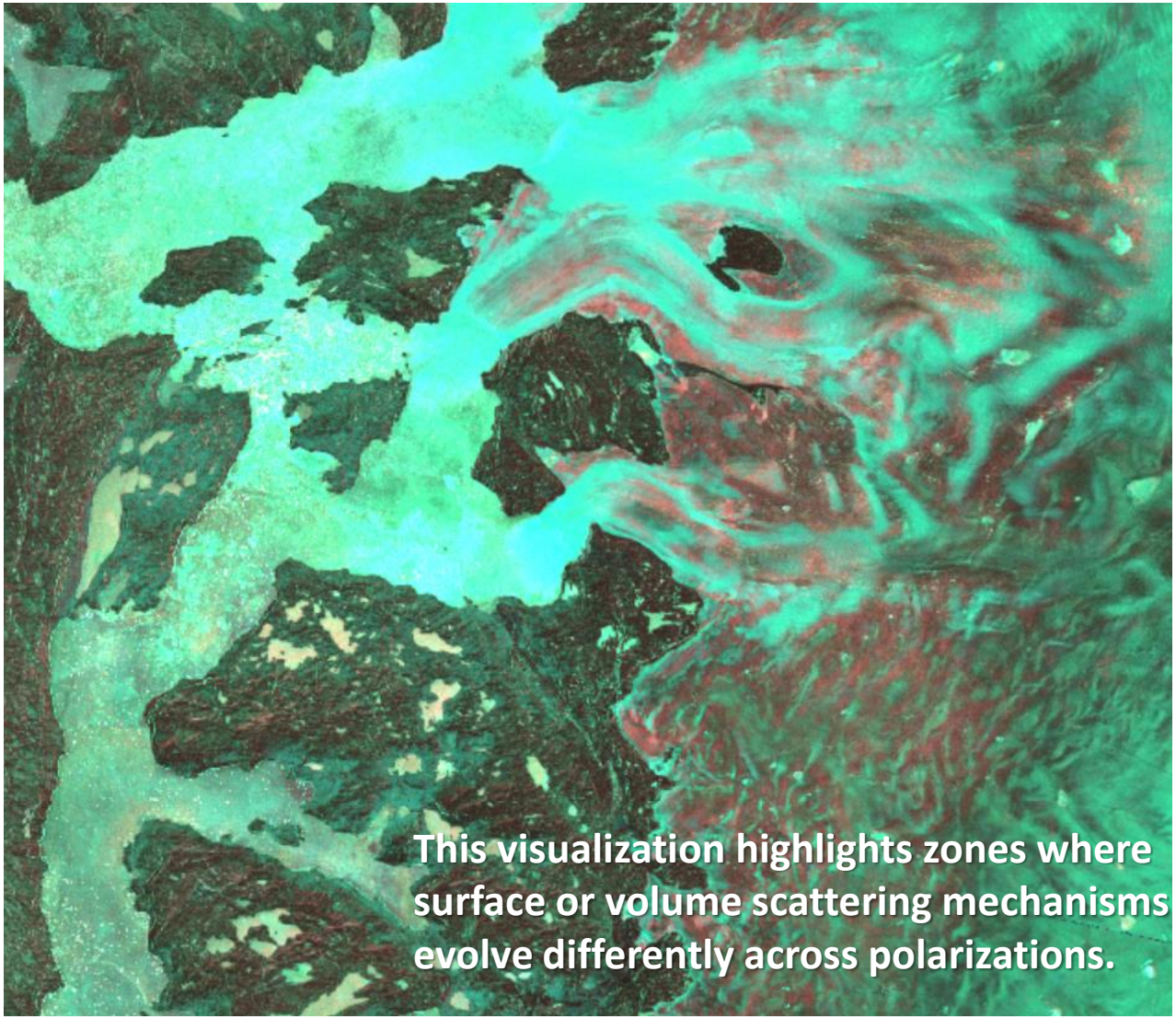
Location: 25.012° N, 55.064° E
Observation window end date: July 1, 2025

New Event in VV New Event in VH

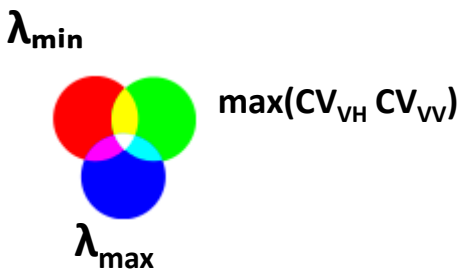
The “New Event” detection reveals a much **higher density of detections** compared to the Singapore port case.
This difference reflects the **strong temporal activity** within this industrial and construction zone, where new scatterers appear frequently in each new Sentinel-1 acquisition.

Polarimetric REACTIV – Greenland Ice Sheet (Sentinel-1, IW Mode)

Location: 69.897° N, –49.882° E
Observation window: January 1 2024 – July 31 2025



Red (λ_{min}) = regions where **temporal dynamics differ significantly between VV and VH channels**
Cyan/green = areas where both polarizations vary coherently over time

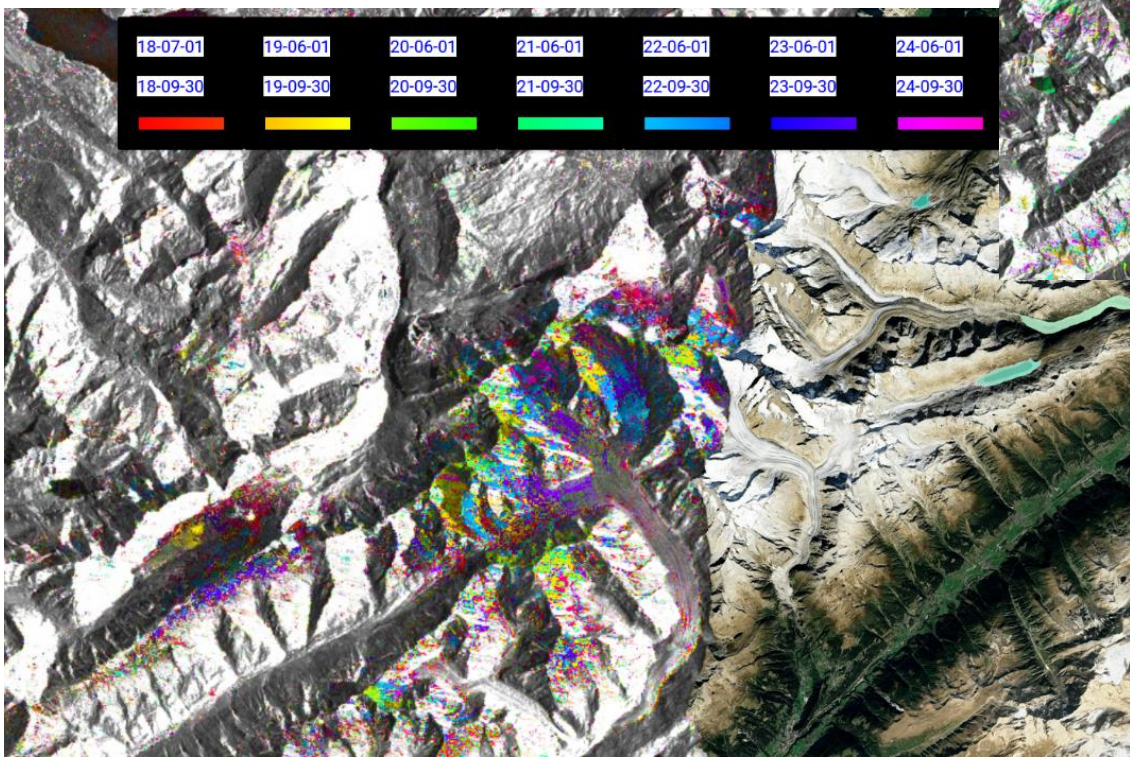


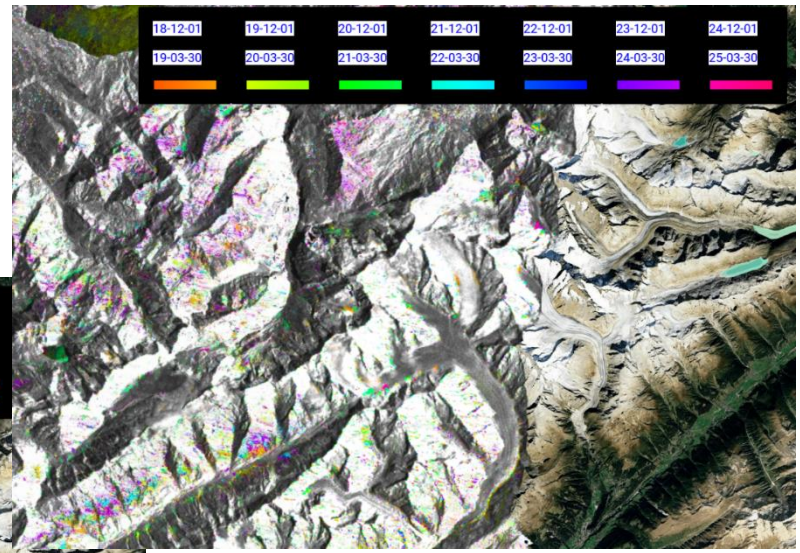
Seasonal REACTIV – Swiss Alps (Glacier Case)

Location: 46.505° N, 7.903° E

The **summer REACTIV** shows intense color variations across the glacier and its surroundings

Summer: June – September



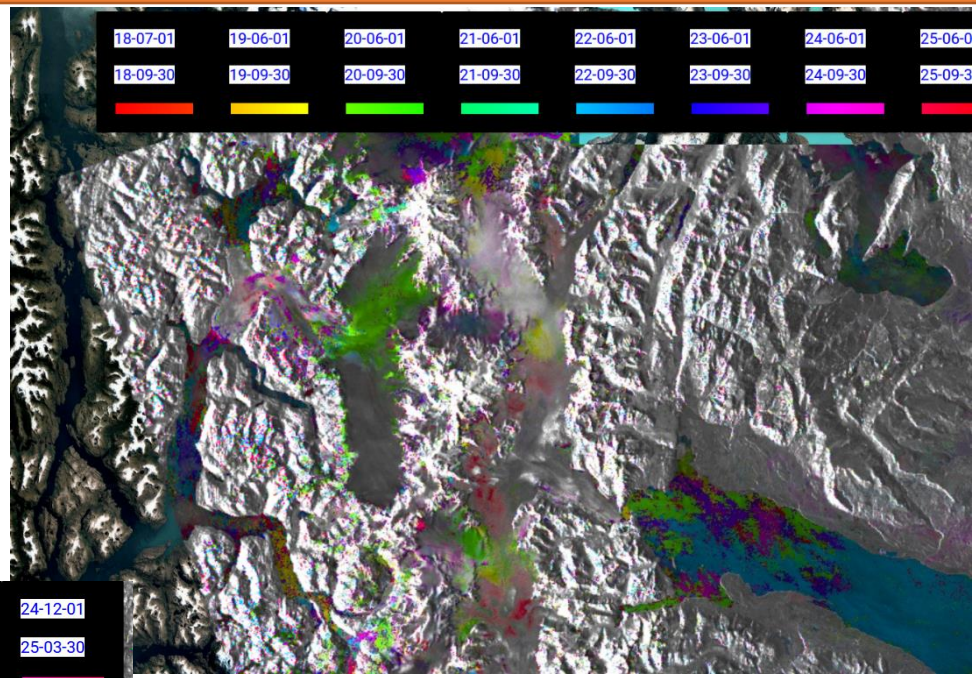


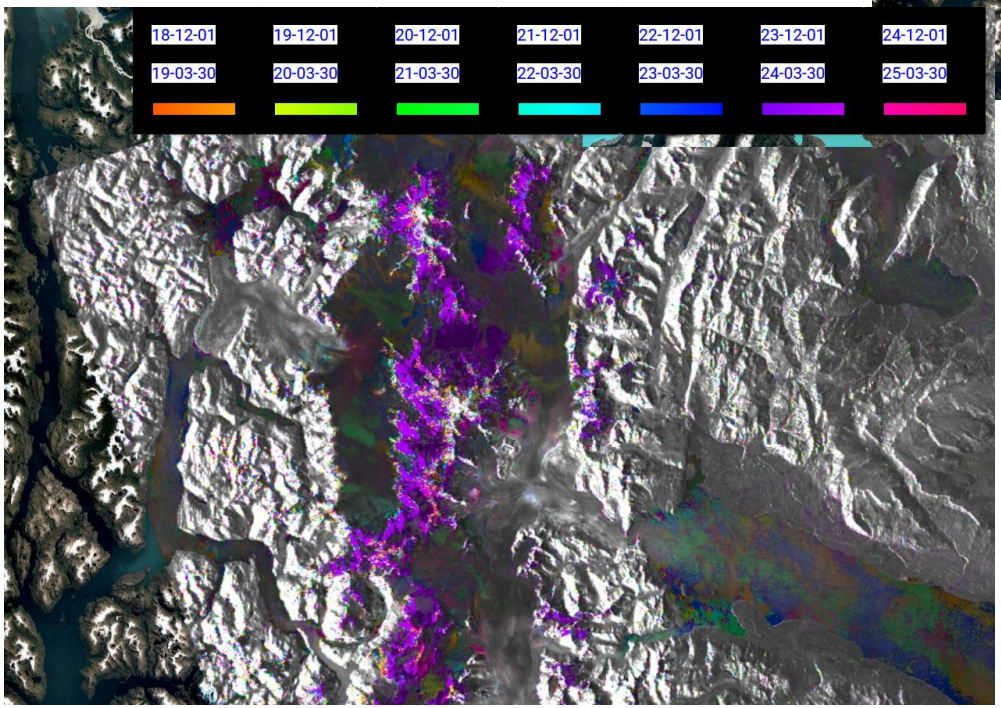
Winter: December – March

The winter REACTIV is markedly more stable

Seasonal REACTIV – Patagonia Glacier; Argentina
Location: Longitude : –73.3726, Latitude : –49.4308

Summer: June – September



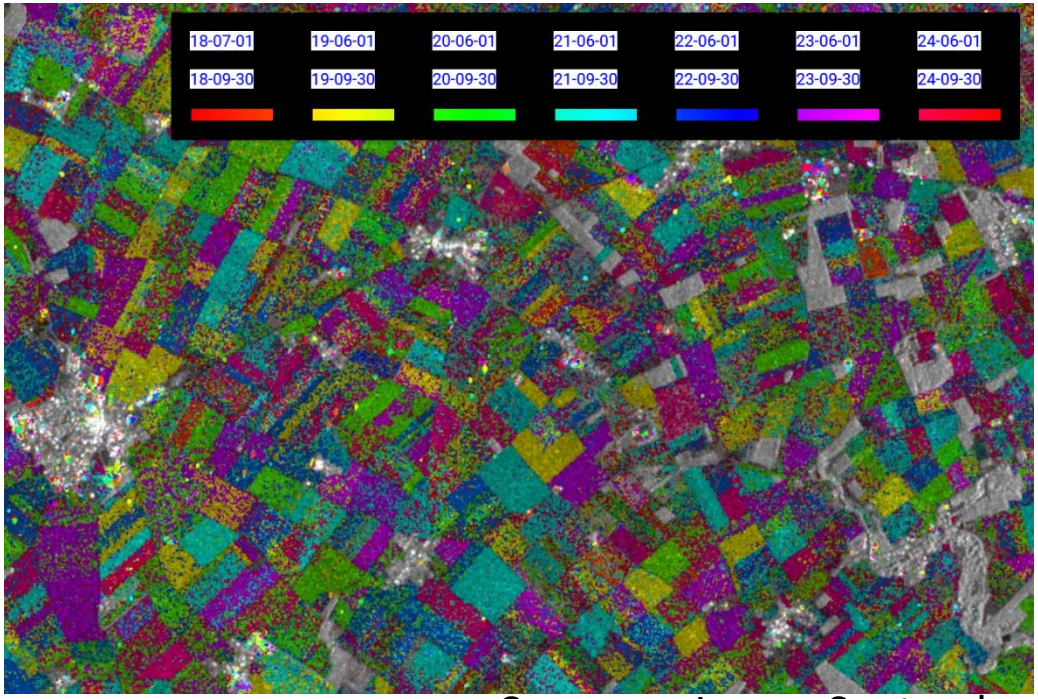


The **winter REACTIV** shows intense color variations across the glacier and its surroundings

Winter: December – March

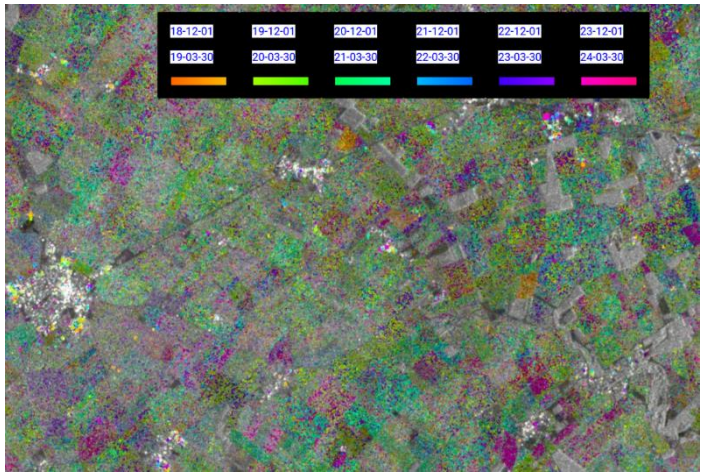
Seasonal REACTIV – Agricultural Dynamics (France)

Location: 47.908° N, 1.593° E



Summer: June – September

The **REACTIV visualization during the growing season** exhibits intense color variations across the agricultural parcels.
Each field appears in a distinct hue, reflecting **rapid changes in radar backscatter** associated with vegetation growth, irrigation, and crop rotation.
These strong temporal dynamics make it possible to clearly delineate plot boundaries and even infer differences in agricultural practices.



During the **dormant season**, most fields show **low temporal variability** and reduced backscatter, resulting in a uniform and muted composite.