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## Sweden's Implementation of the VIIRS 375m Active Fire Algorithm

**Evaluation results from 2022** 

## Outline

- Satellite detection and its challenges
- Characteristics of the Swedish fire season
- Operational setup
- Evaluation methods
- Results from 2022



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## The method in short

#### Why is it useful?

- Early detection of fires
- Accurate location
- Day & night
- Semiconstant cross-track resolution
- Full spatial coverage of Sweden incl. rural areas (swath width roughly 3,000 km)
- Input data for case studies

#### **Drawbacks and challenges**

- Polar orbit limited temporal coverage (better in the north)
- Clouds causing missed events
- False alarms



# Characteristics of the Swedish fire season **Grass fire**

#### Snow depth (cm)



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### Characteristics of the Swedish fire season Fire Weather Index, FWI



The fire risk is highly weather dependent, on time scales ranging from the order of hours (rainfall, air mass advection) to the order of weeks (dry periods)



## **Operational setup**

Direct readout reception of VIIRS data Suomi-NPP & NOAA-20 → SMHI (Norrkoping, Sweden)

VIIRS Active Fire Algorithm (local implementation)

#### Post processing/filtering

No detections in

- populated areas
- industrial areas/buildings + 500m

#### Notifications to users (incl. SOS Alarm)





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SMH (@) noaa20 - 2018-07-17 02:55 UTC





## Notification to users

Around 15 minutes delay from time of observation (working towards 10 minutes)

Introduced this year: Alerts sent to SOS Alarm after spatial & temporal filtering

All detections are found along a timeline in the user portal

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# Evaluation methods Sentinel-2 for verification

#### Active fires and recently burned areas

- 842 nm (band 8)
- False Color Urban
- SWIR







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# Evaluation methods Cloud cover

#### Are fires detected in cloudy conditions?

- Cloud free conditions for more than 40% of the alerts
- Partly cloudy otherwise
- Alerts with full cloud cover is rare





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## **Evaluation results 2022**



- Detection in 386 points
- These detections could be associated with 189 events.

Confirmed vegetation fire & associated with fire fighting operations: **39 events**, out of which **26%** were detected by the algorithm **before** first call to SOS Alarm.

**4,672** The number of vegetation fire operations per year (average period 1998-2020)





## False alarms

The algorithm may produce a detection when interpreting signals from objects other than fires, and thus yield false alarms.

Among the detected events in 2022, around 10% are likely to have been caused by reflection or heat emission from:

- Greenhouses
- Agricultural buildings
- Solar panels



### Studying and interpreting the dataset **Time distribution of satellite alerts**



### Counting only wild vegetation fires (grass & forest)

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## Take-home message

A complete communication chain is now established in Sweden (from satellite to SOS Alarm)

Three key factors behind the success:

- 1. The geolocation accuracy with VIIRS (compared to AVHRR)
- 2. The I4 & M13 channels' sensitivity to relatively small fires
- 3. The low latency (currently around 15 minutes)







## Thank you for listening! Any questions?

Please, do not hesitate to contact us

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