

VEN $\mu$ S

# The Vegetation and Environment New Micro Satellite (VEN $\mu$ S): Unique characteristics and applications

Arnon Karnieli, Manuel Salvoldi, Gérard Dedieu, Olivier Hagolle, Jean-Louis Raynaud, Dick Arthur, Julien Michel



# Vegetation and Environment New Micro Satellite



**VENμS**

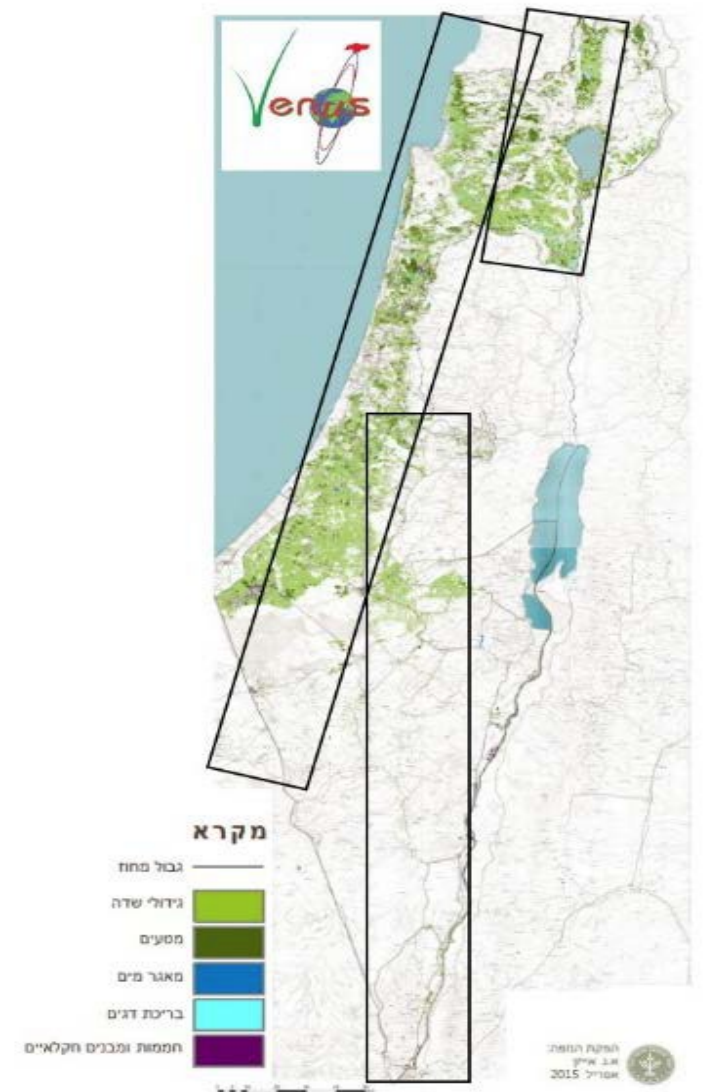
# VEN $\mu$ S General Characteristics

- **Orbit**: near polar, sun-synchronous (constant view angle)
- **Altitude**: 720 km
- **Inclination**: 98.27°
- **Revisit time**: two days
- **Swath**: 27.56 km
- **Spatial resolution**: 5.3 m
- **Number of spectral bands**: 12 (VIS-NIR)
- **Tilting capability**: +/-30° across and along track
- **Radiometric resolution**: 10 bits
- **Equator crossing time**: 10:30 AM, descending mode
- **Launch**: 1 August 2017

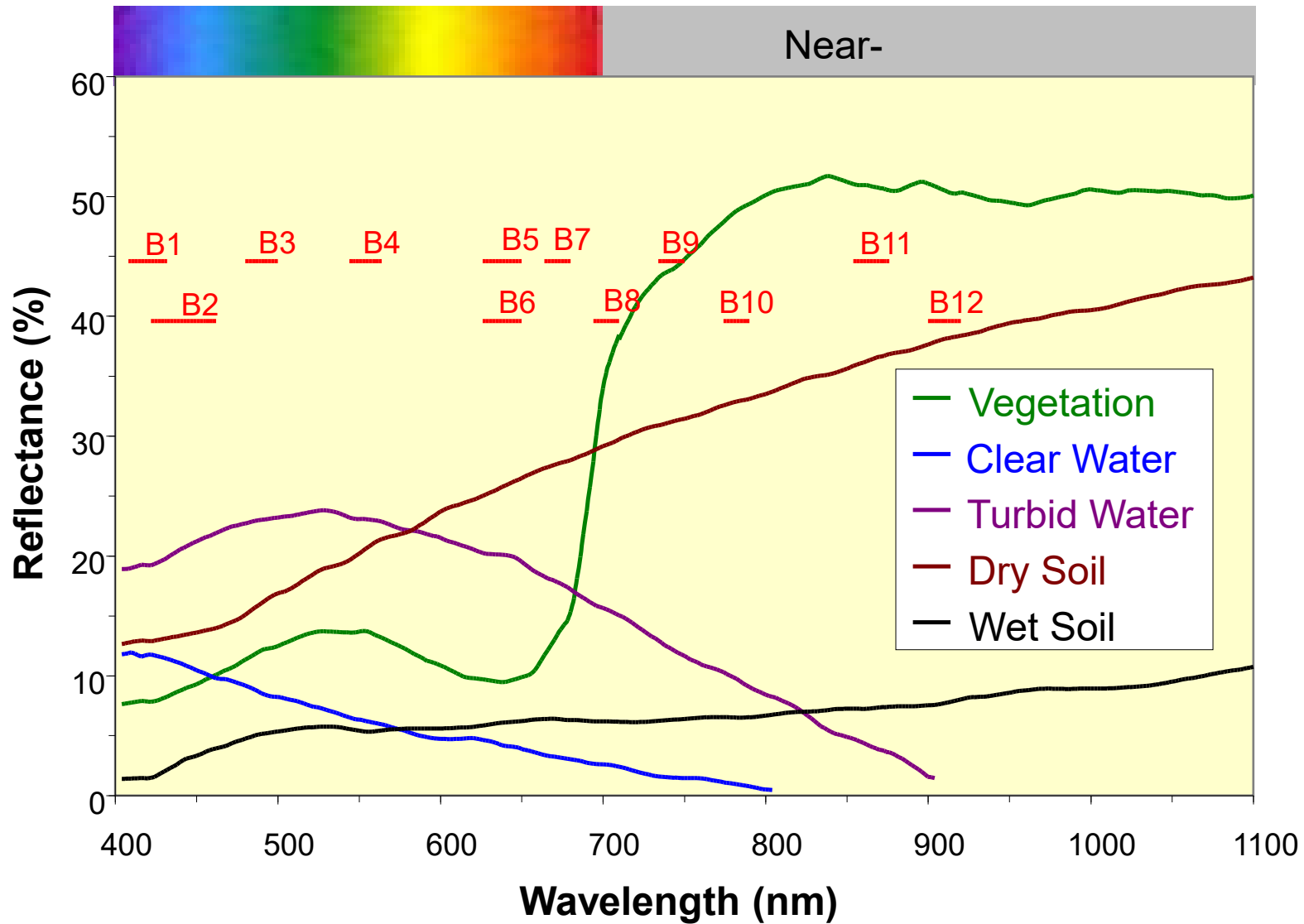


1 August 2017

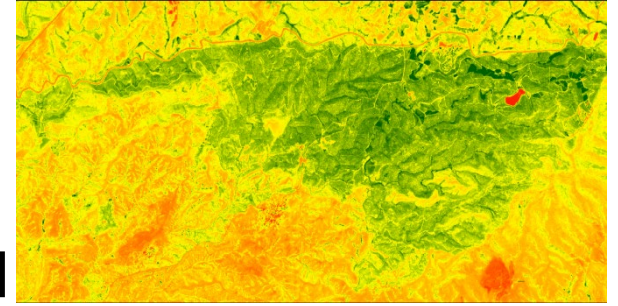
# Scientific Sites During VM1 (2017-2020)



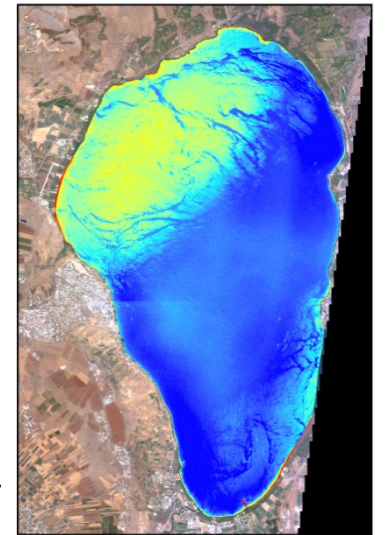
# VEN $\mu$ S Band Setting and Applications



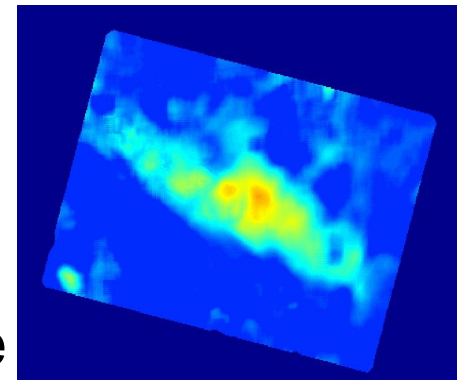
Land



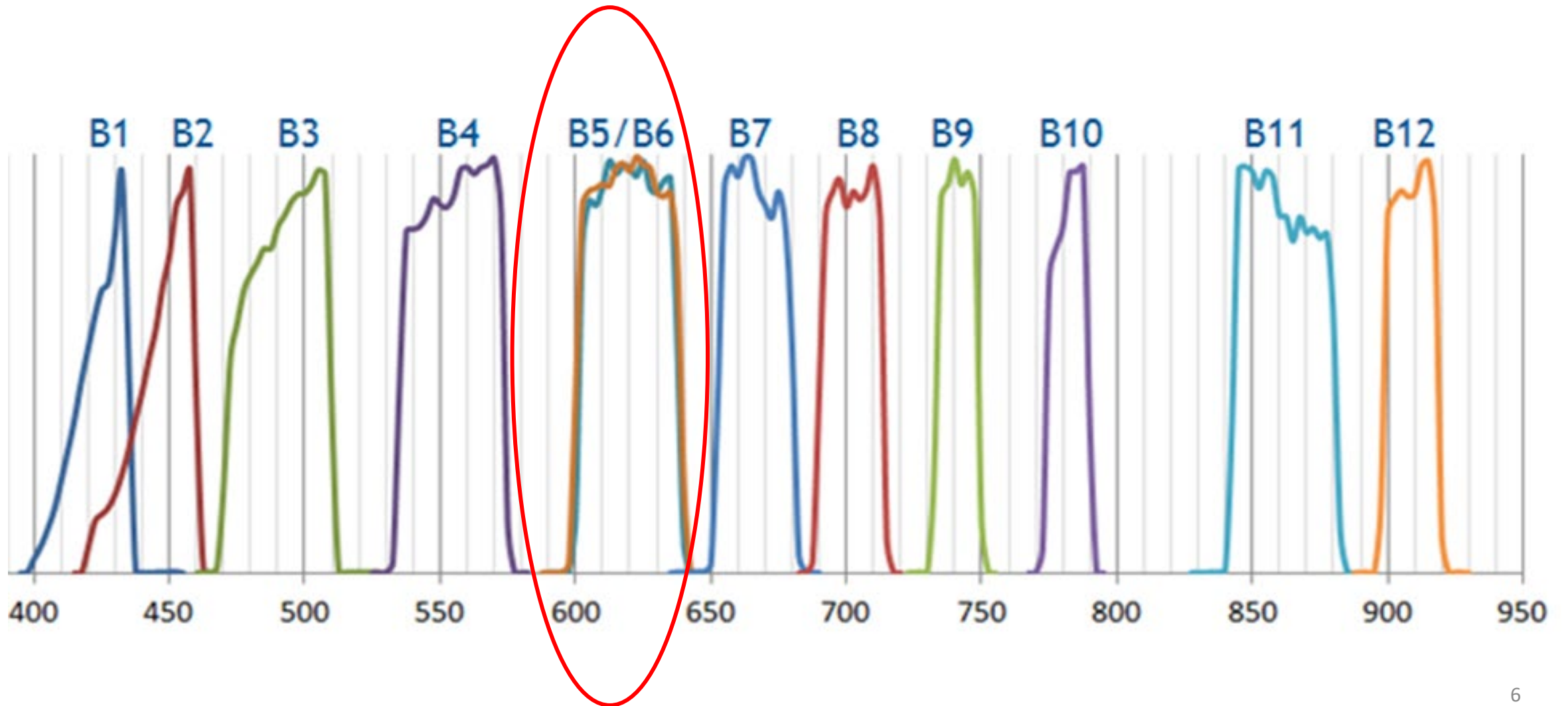
Water



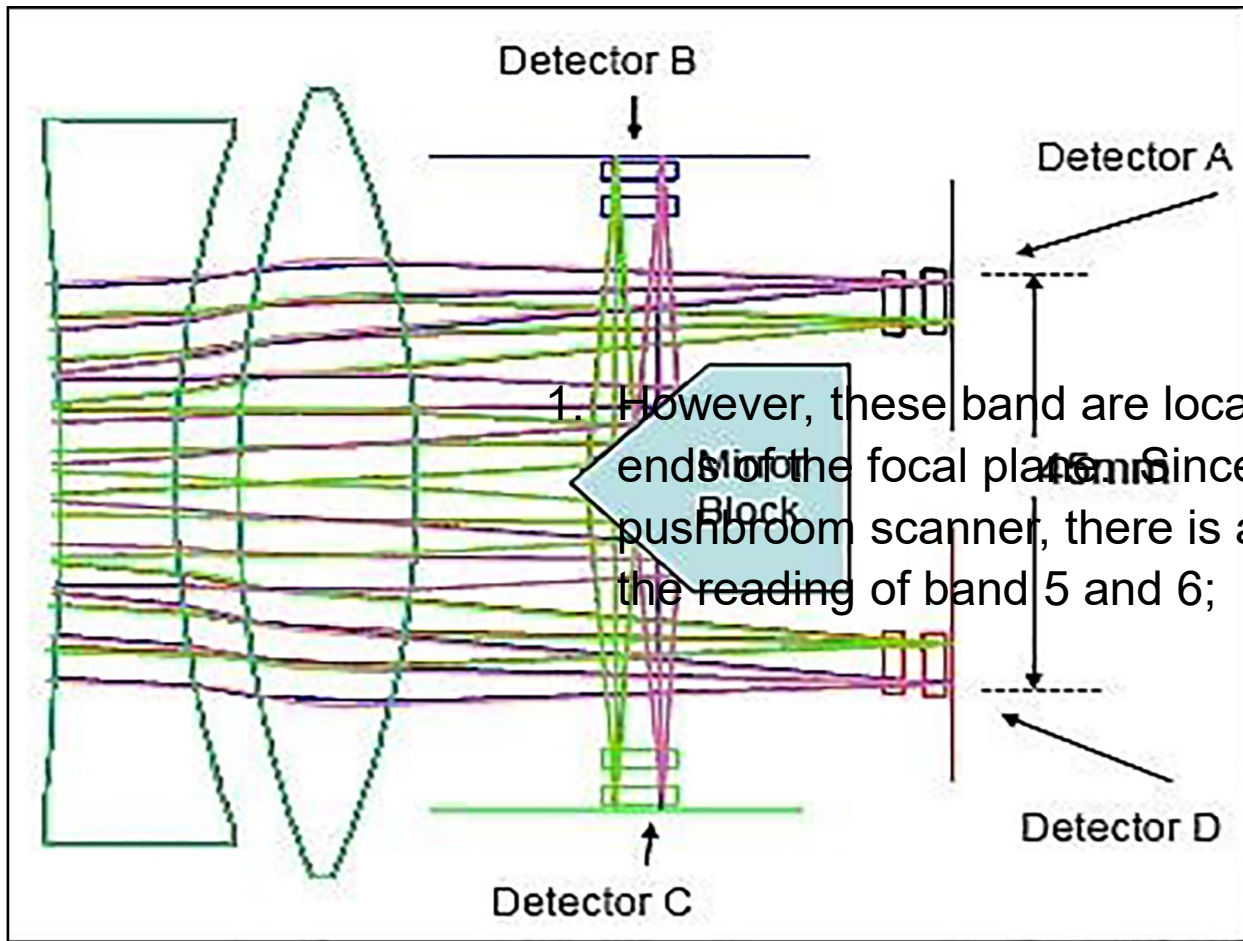
Atmosphere



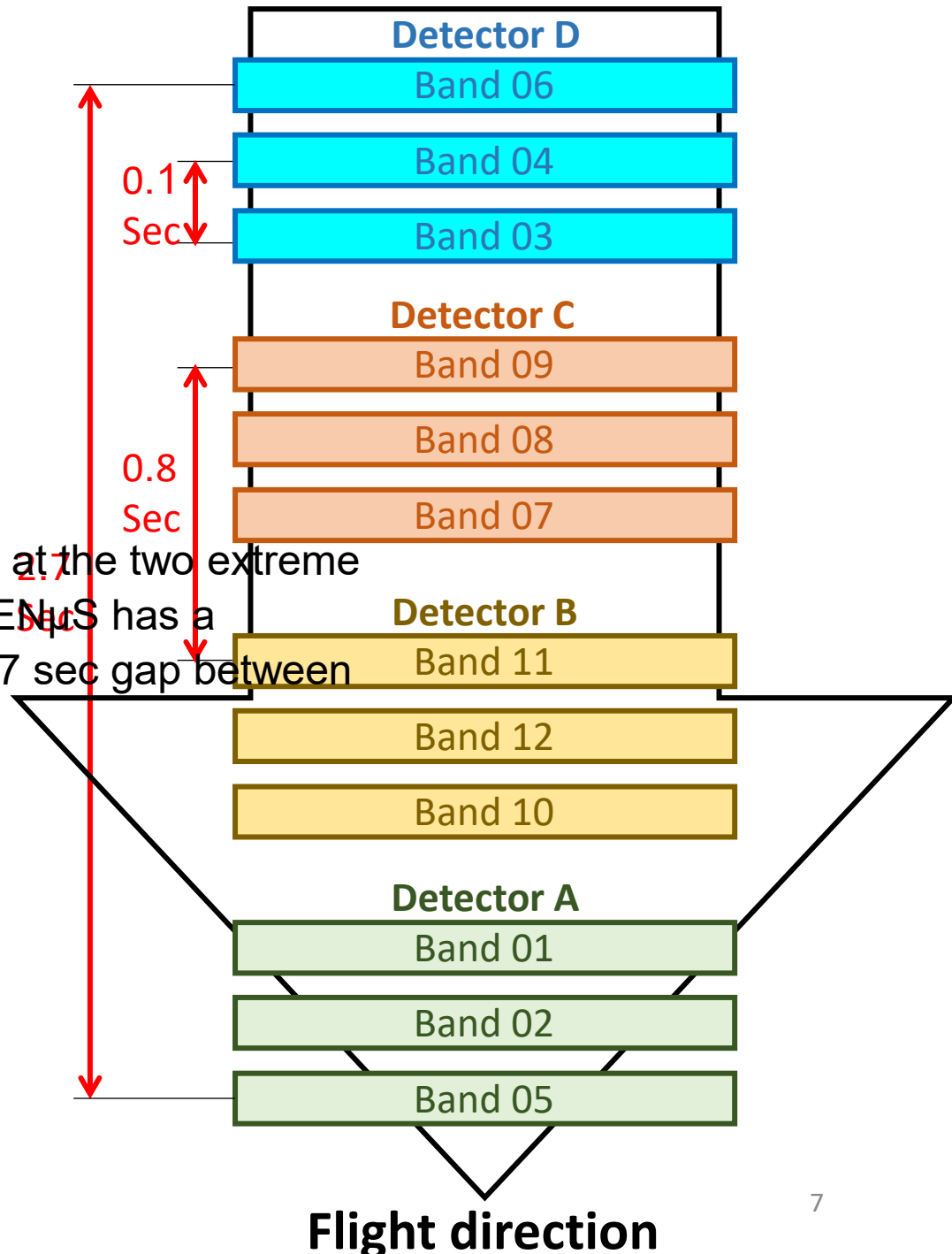
# VEN $\mu$ S Band Setting



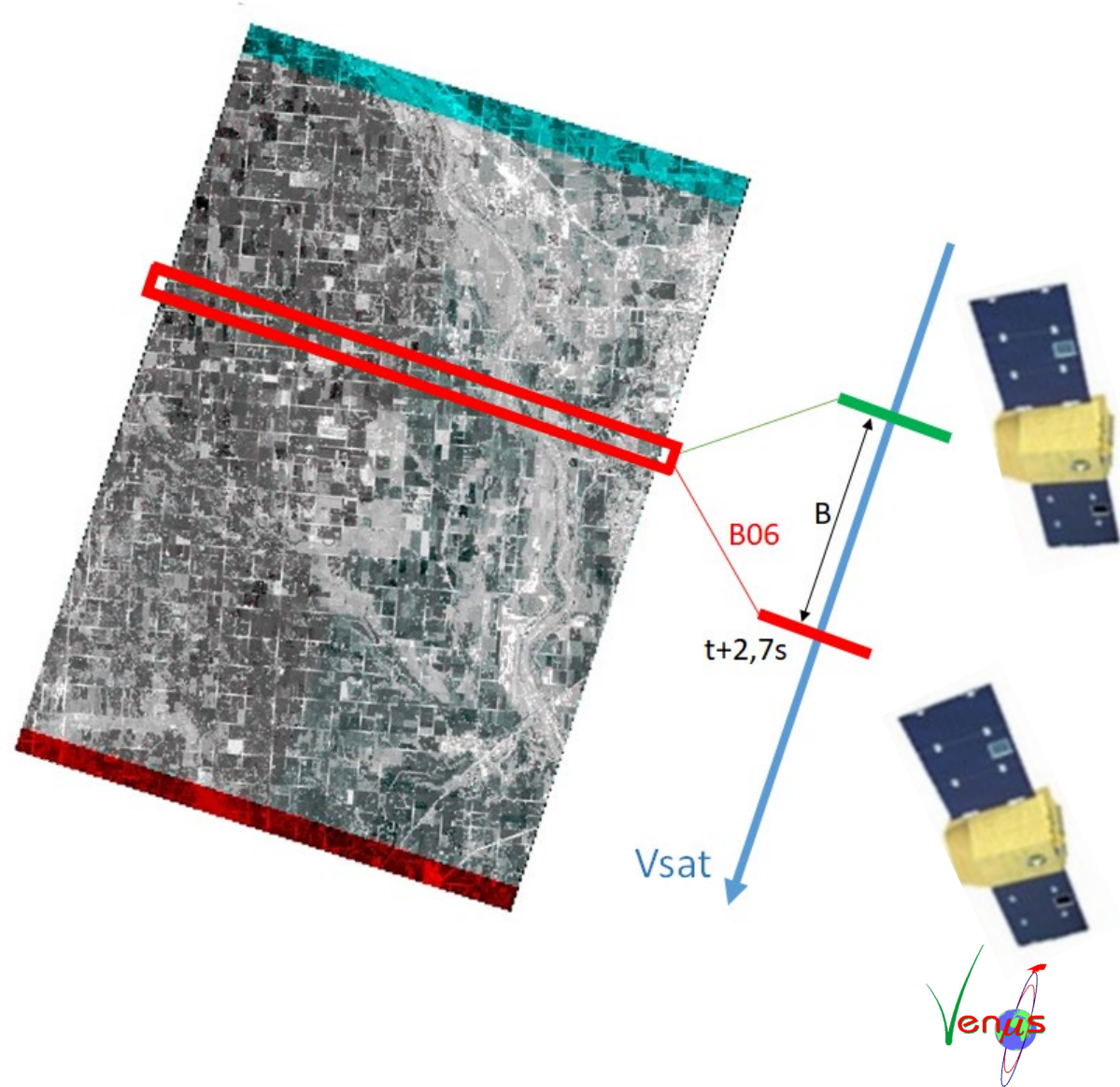
# Focal Plane



1. However, these band are located at the two extreme ends of the focal plane. Since VEXUS has a pushbroom scanner, there is a 2.7 sec gap between the reading of band 5 and 6;



# Spectroscopic View

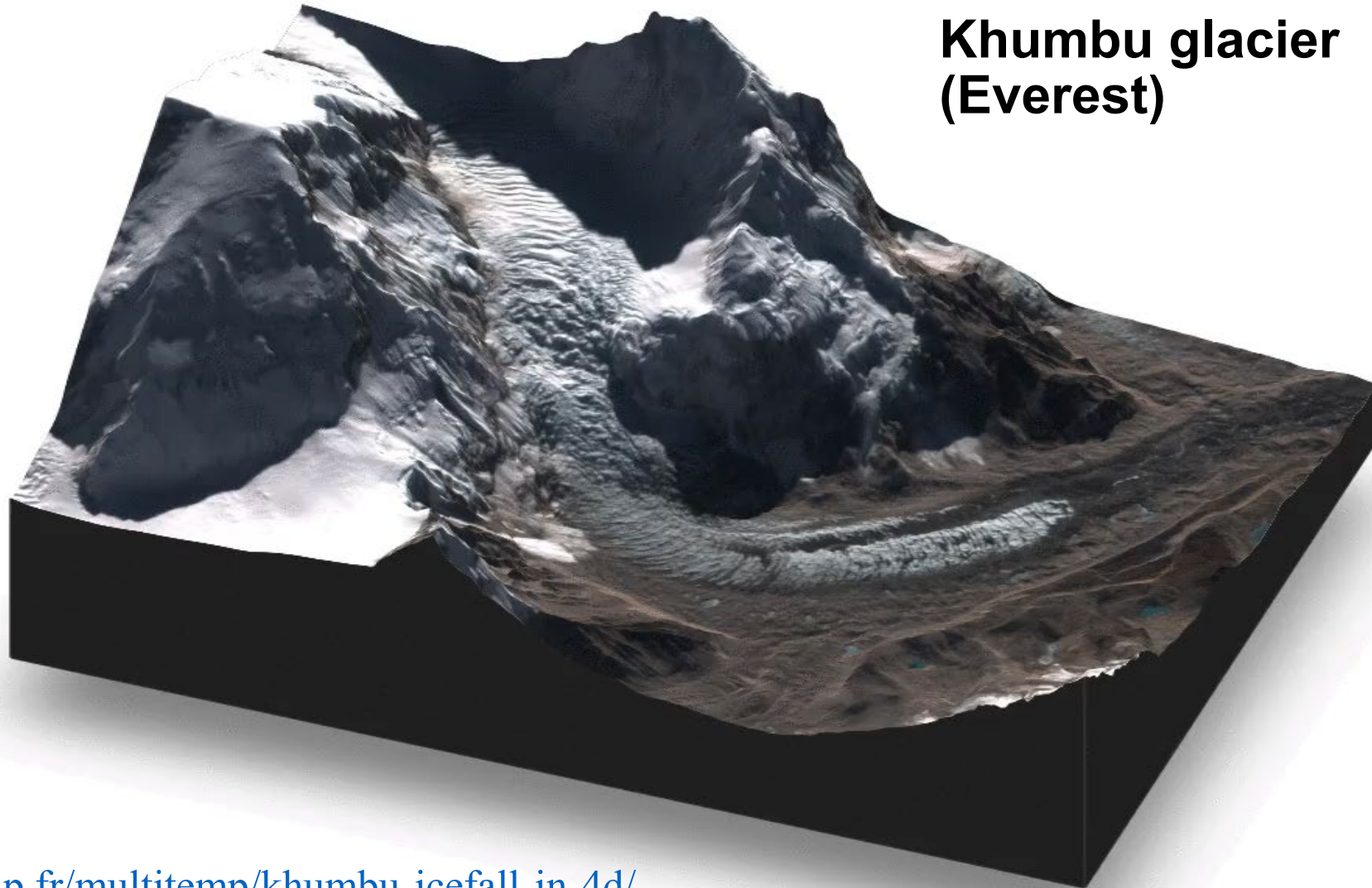




# 3D Digital Elevation Model (DEM)

20171127

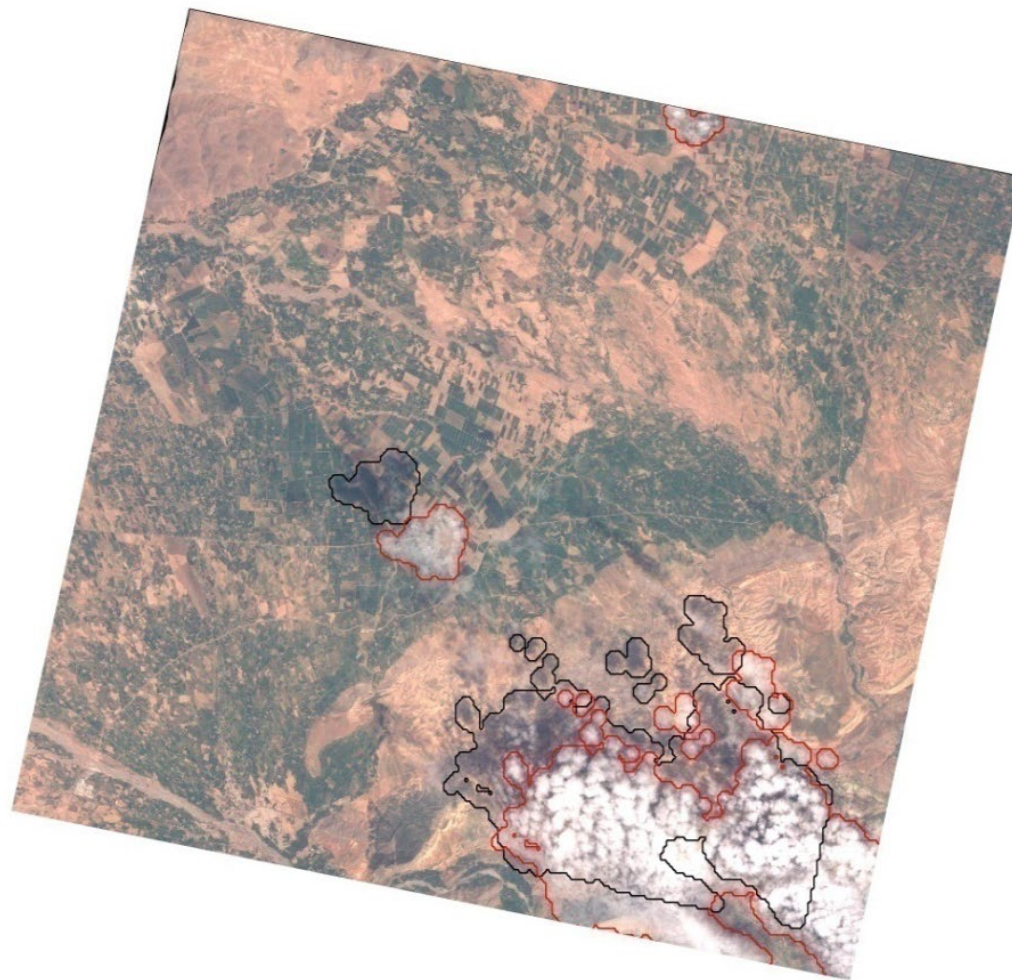
**Khumbu glacier  
(Everest)**



<https://labo.obs-mip.fr/multitemp/khumbu-icefall-in-4d/>

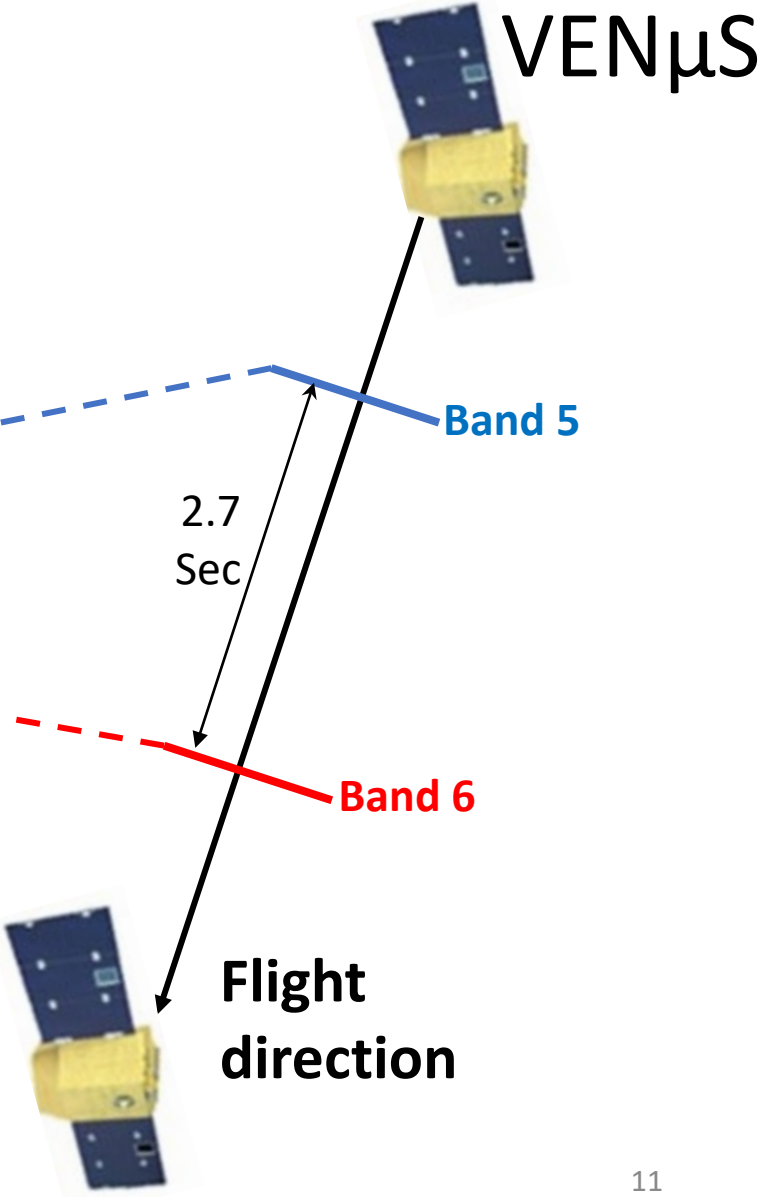


# Cloud Detection and Mask

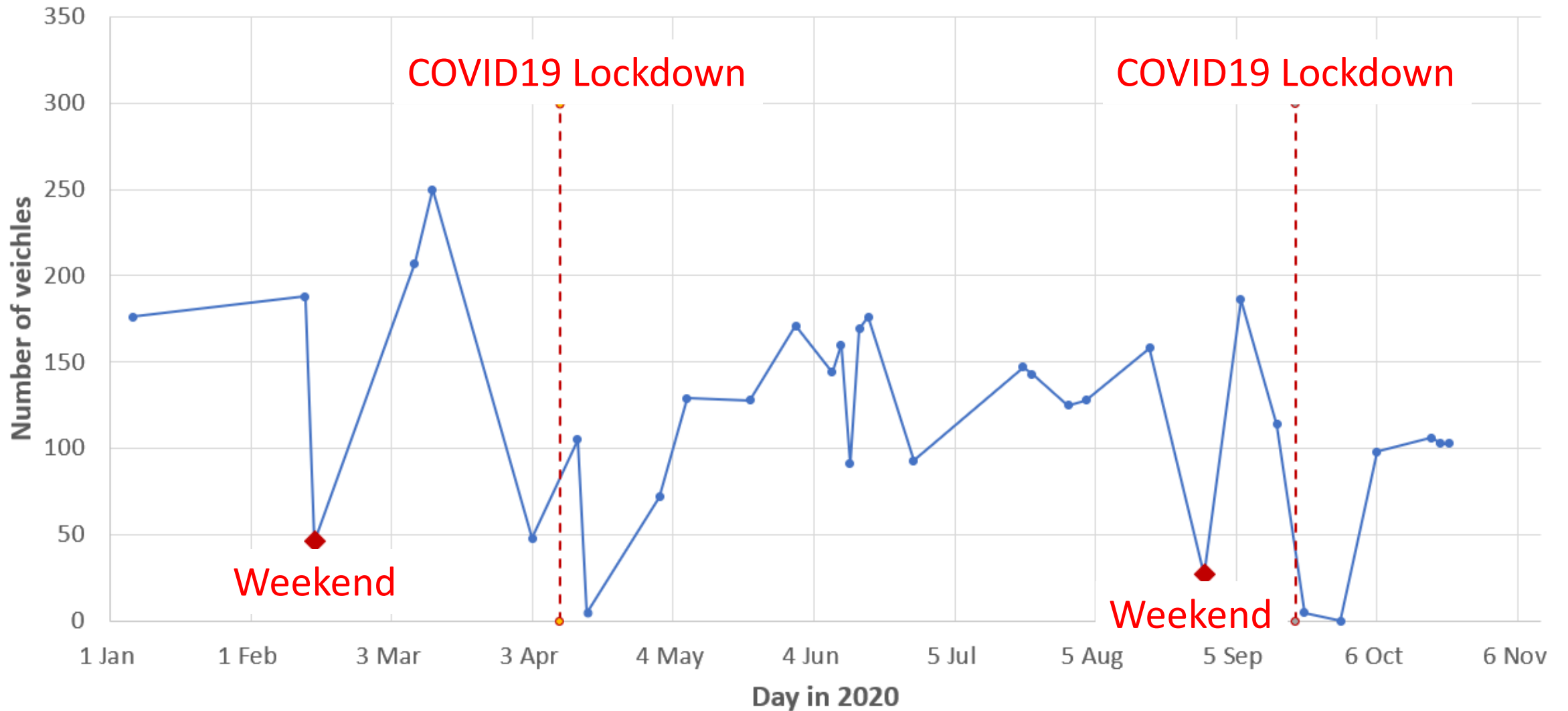


- Spectroscopic image enables computation of clouds and shadows' location;
- Frequent requisition enables replacement of the contaminated pixels with clean ones.

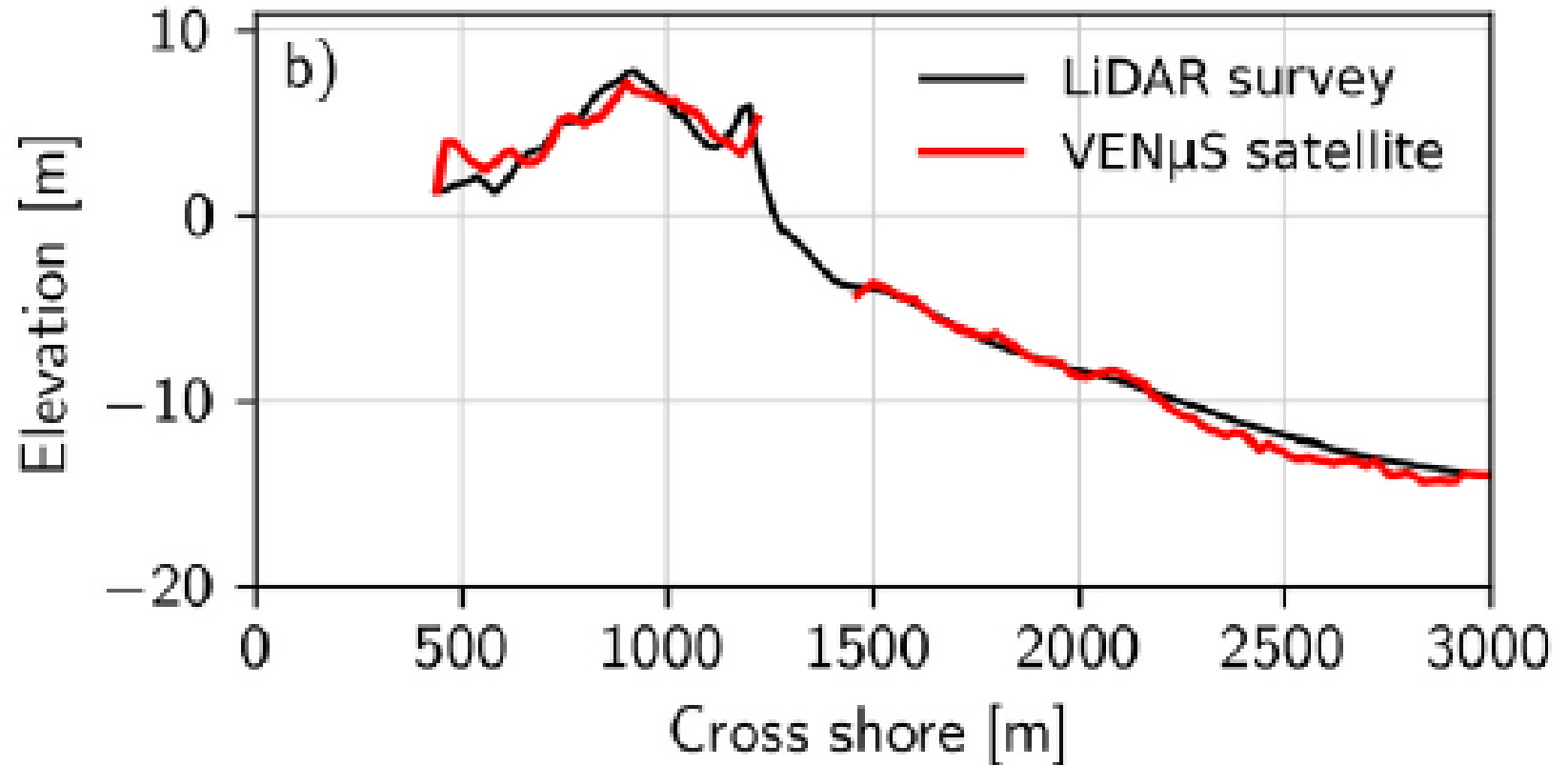
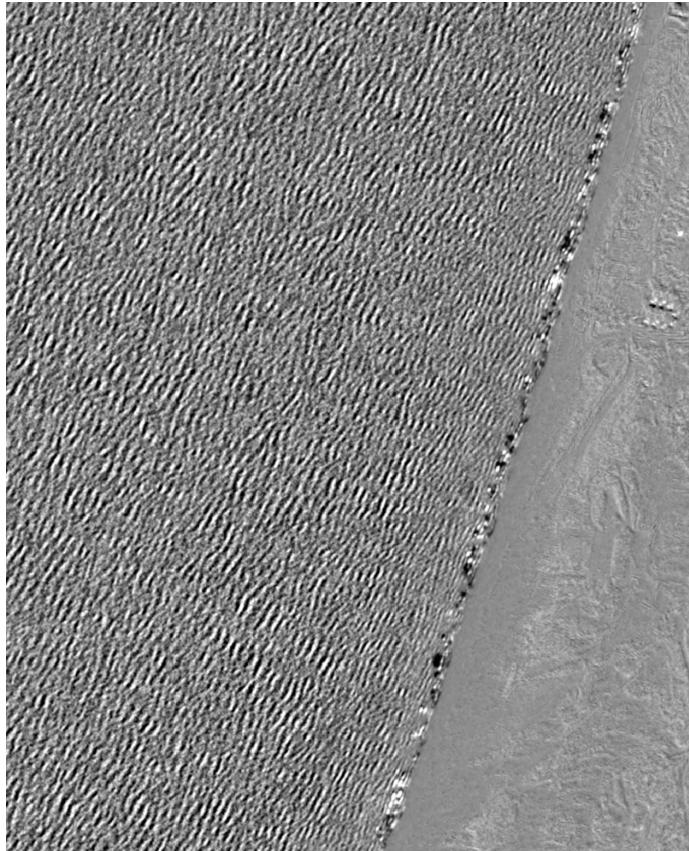
# Moving Car Detection



# Moving Car Detection – Temporal Analysis

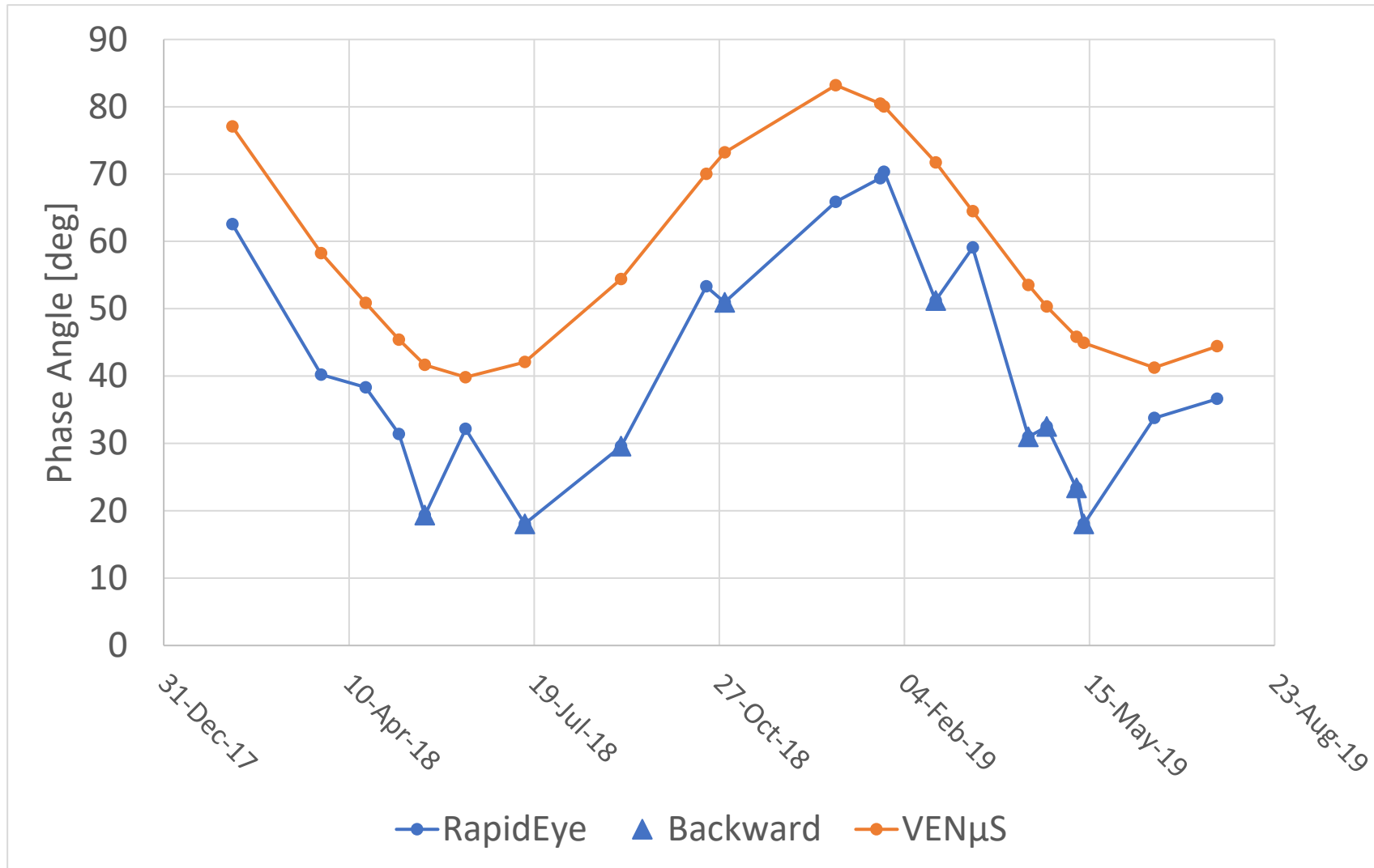


# Bathymetry

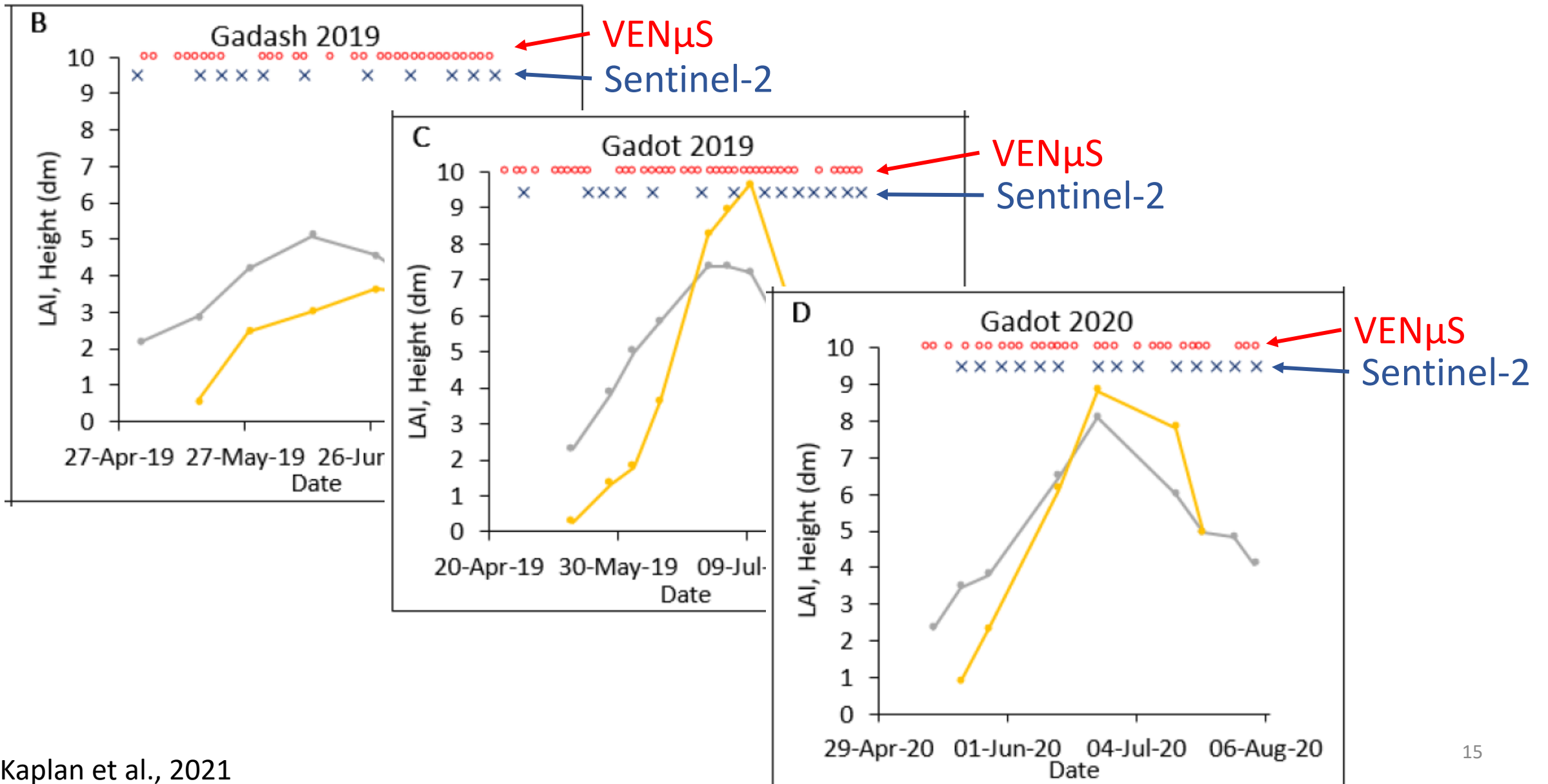


- VEN $\mu$ S bathymetry is computed from wave propagation analysis.
- Results are consistent with airborne LiDAR data

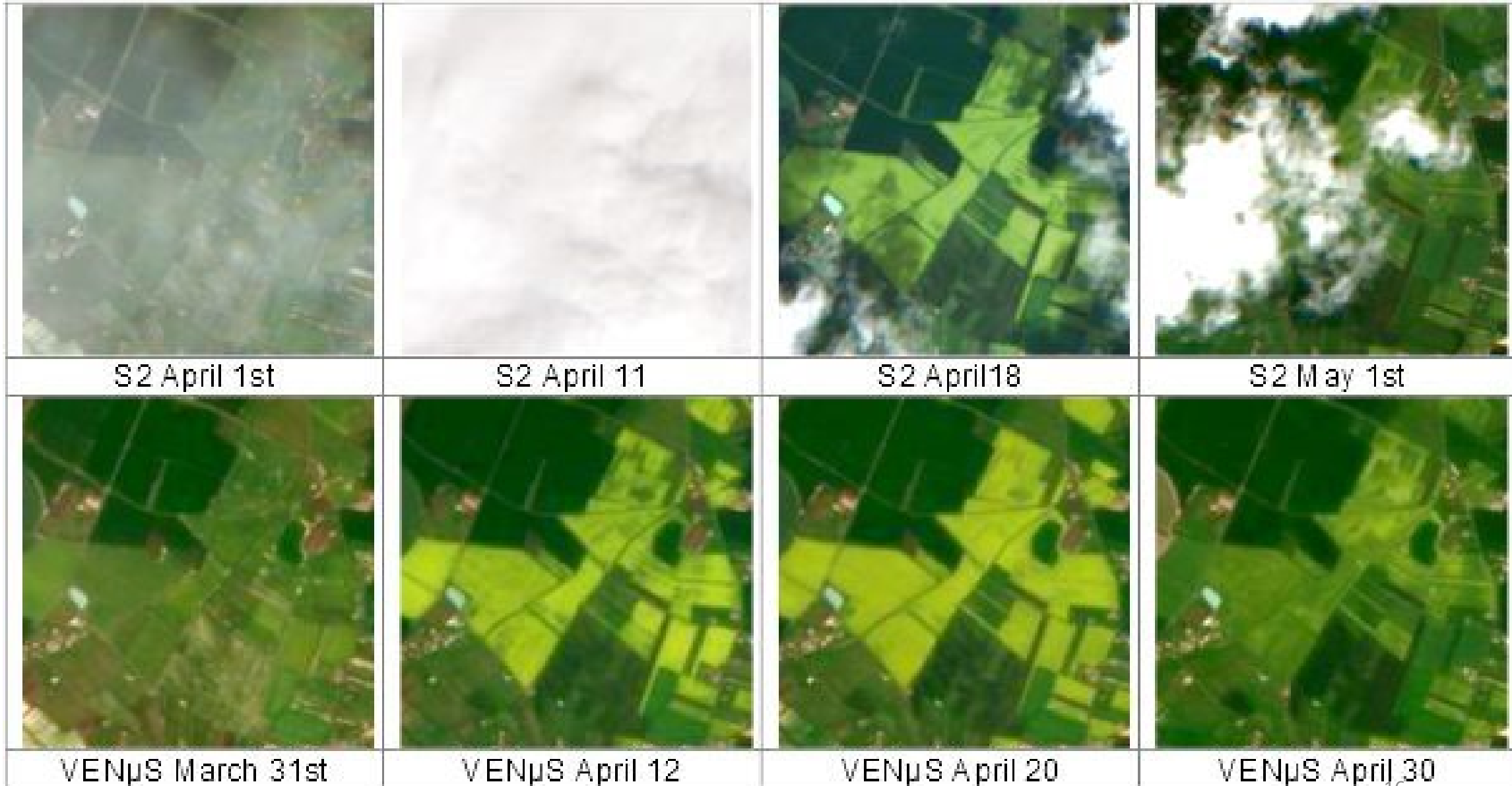
# Constant View Angle VEN $\mu$ S vs. RapidEye



# Temporal Domain, VEN $\mu$ S vs. Sentinel-2



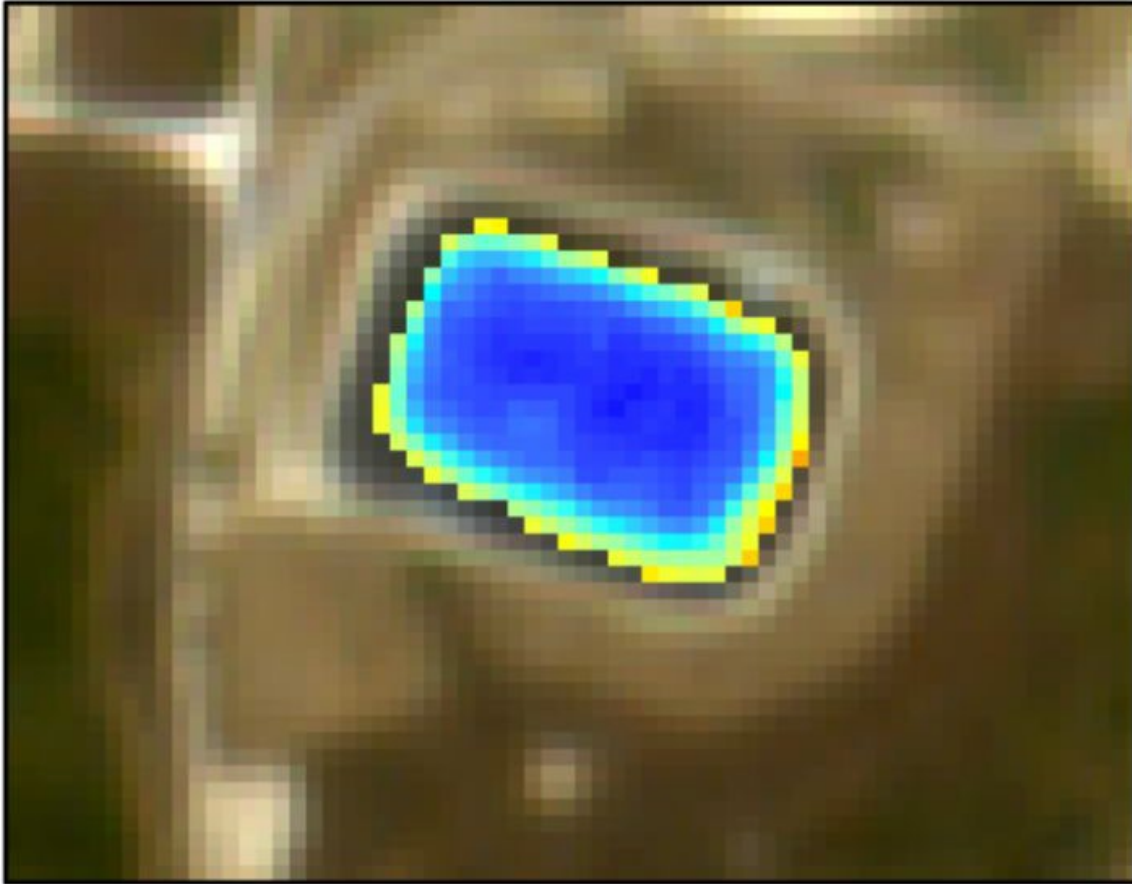
# Phenological Study



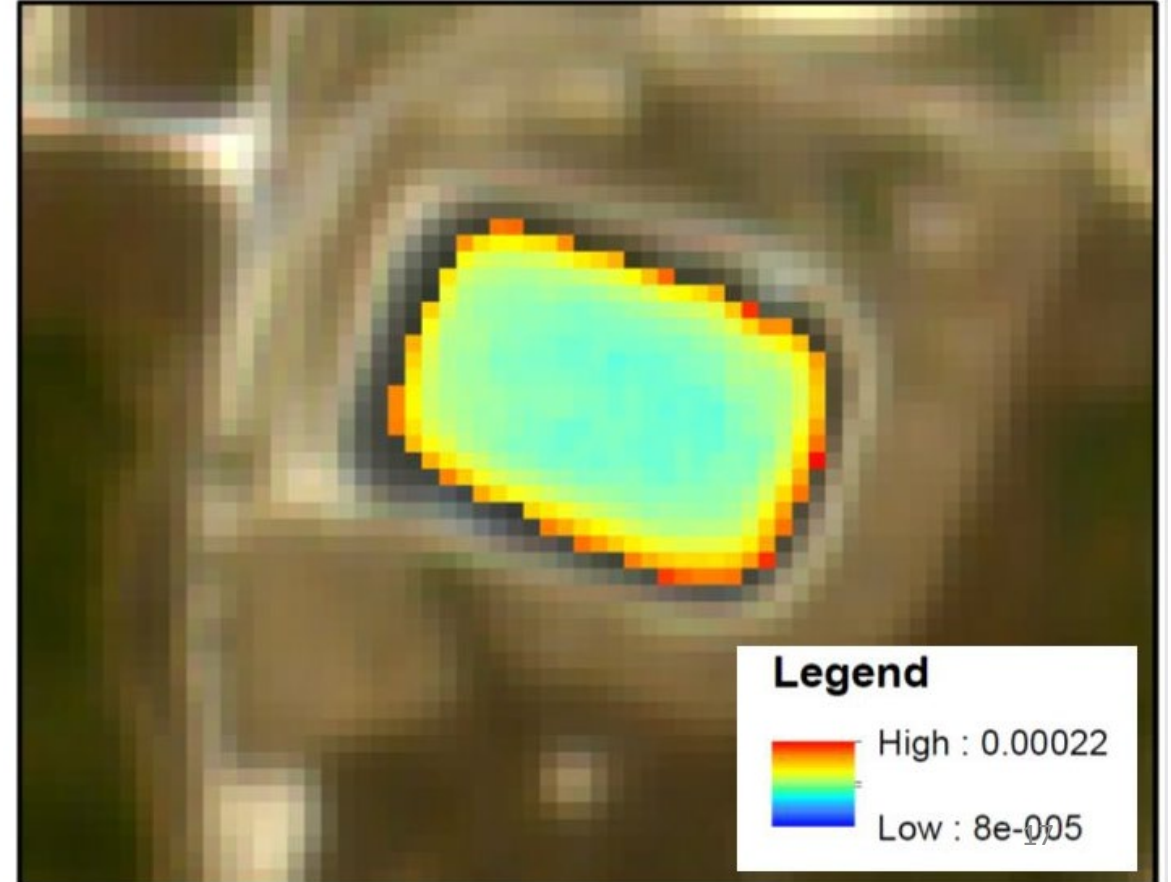


# Near-real-time detection of algae bloom

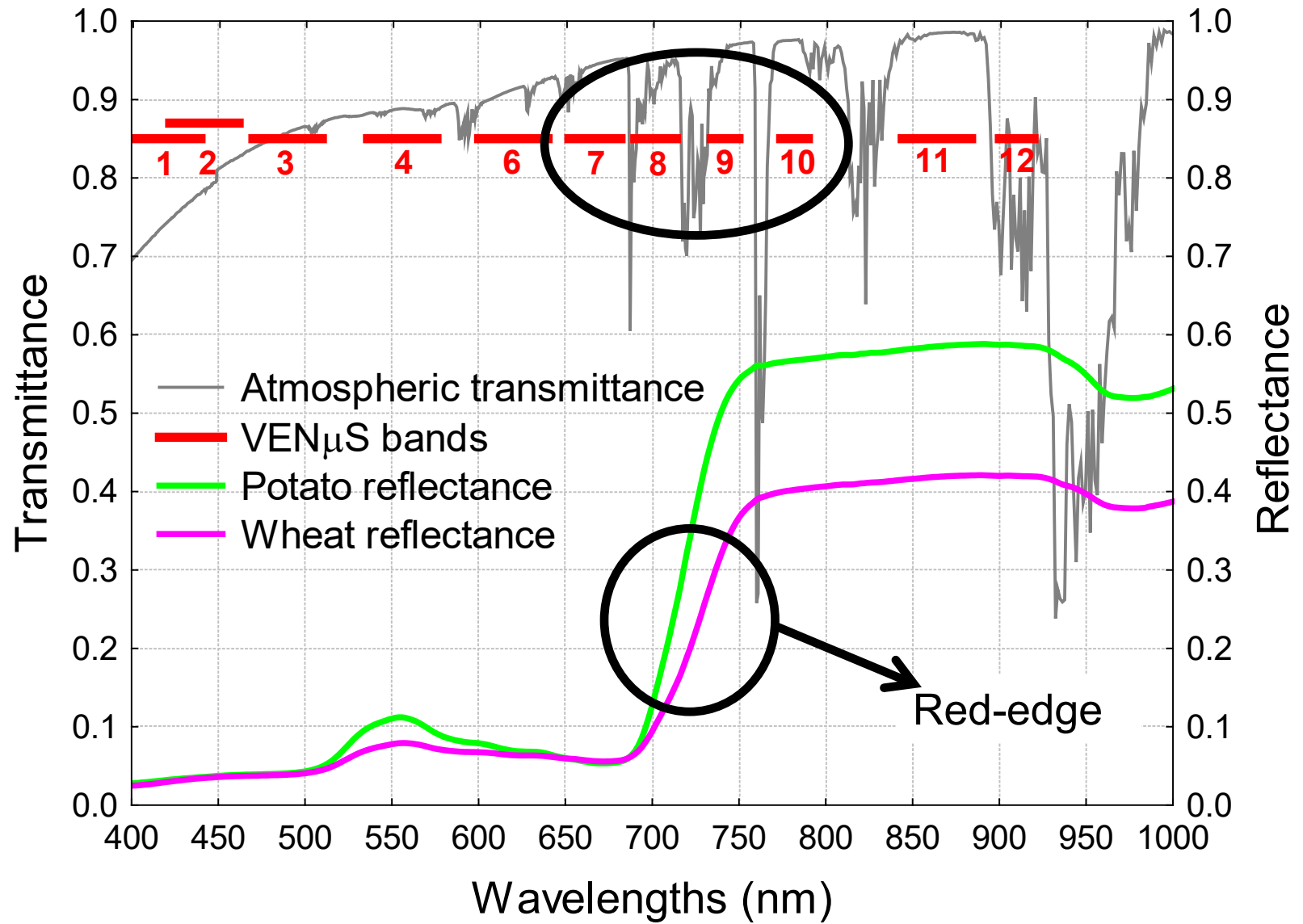
31/07/2018



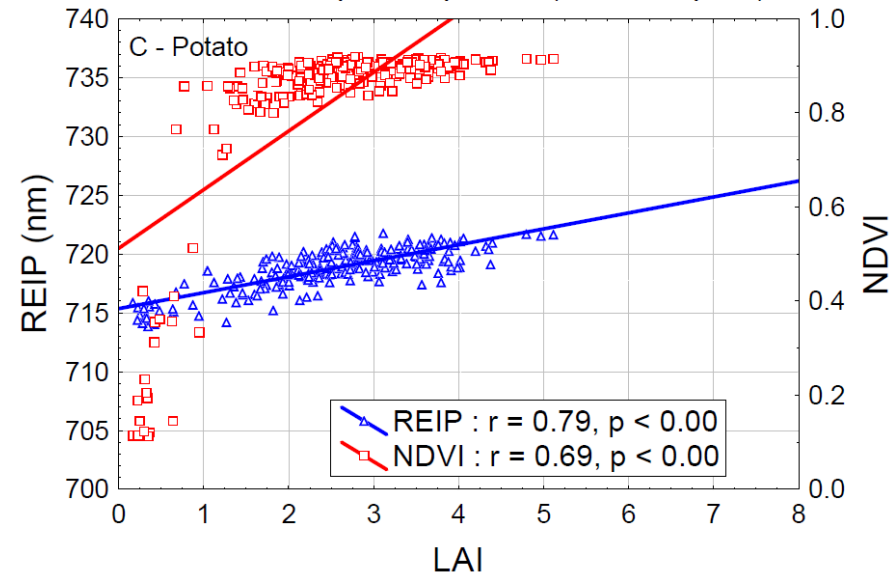
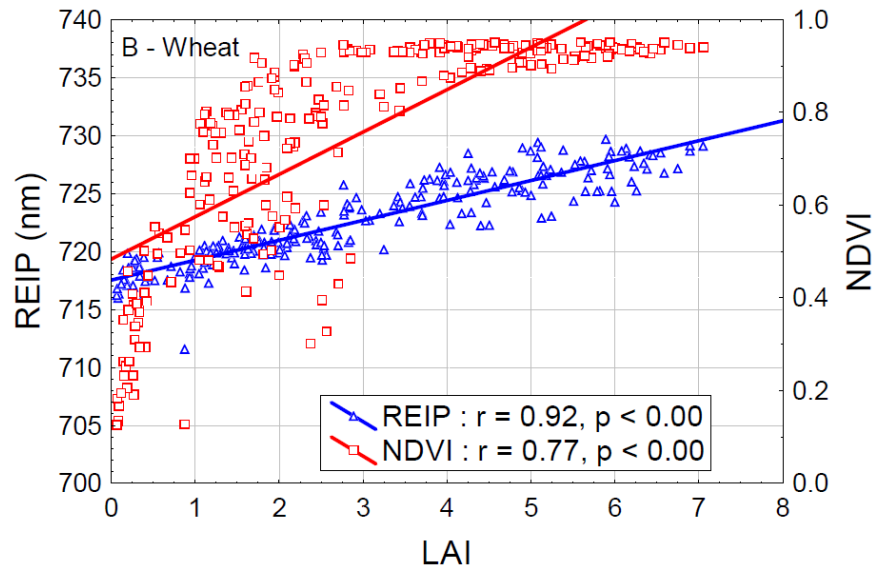
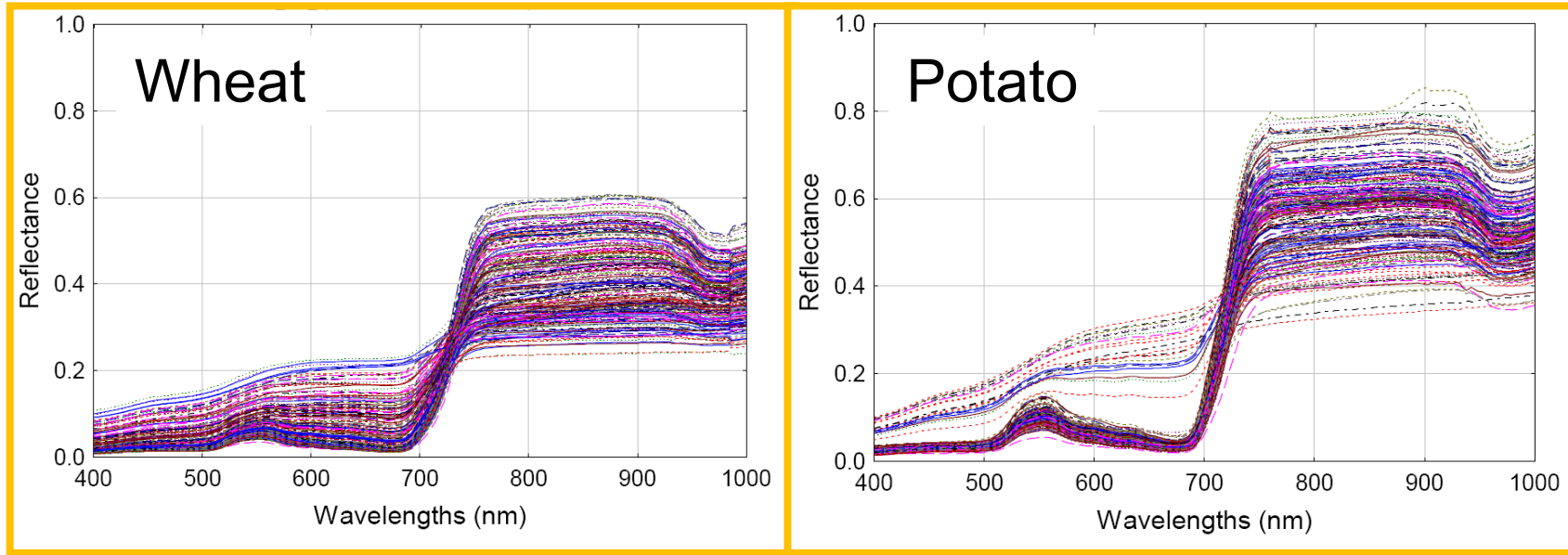
04/08/2018



# Red-Edge Bands Setting



# REIP for LAI Assessment

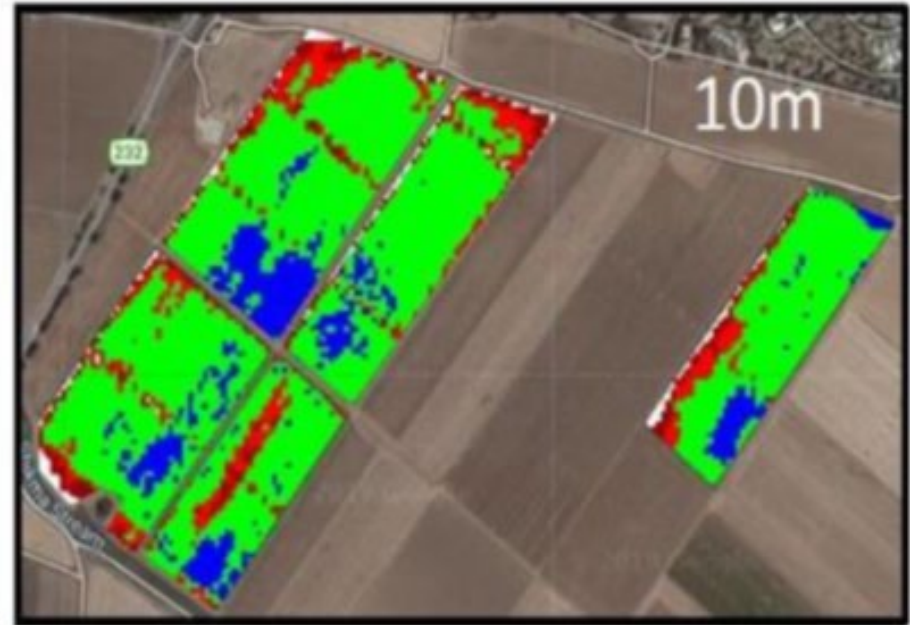
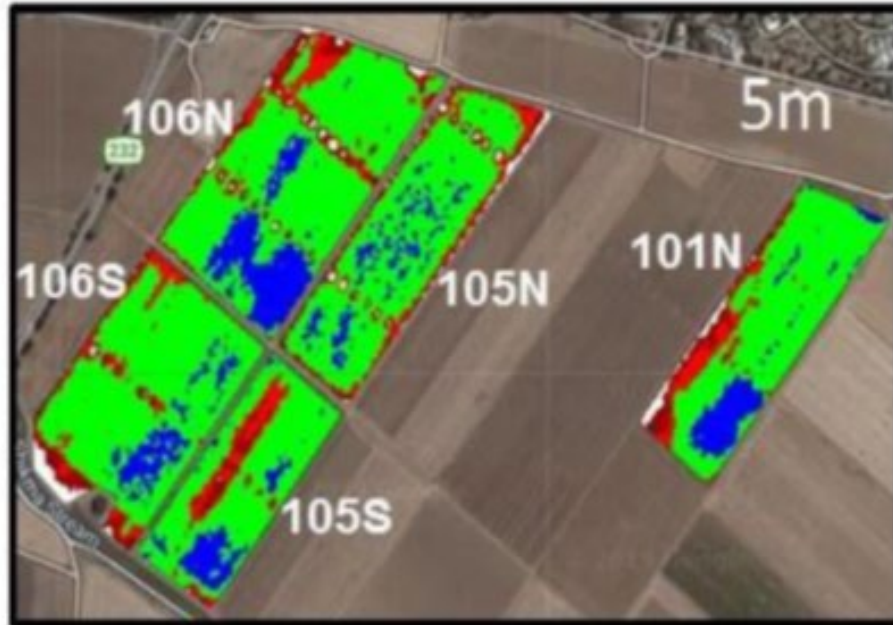




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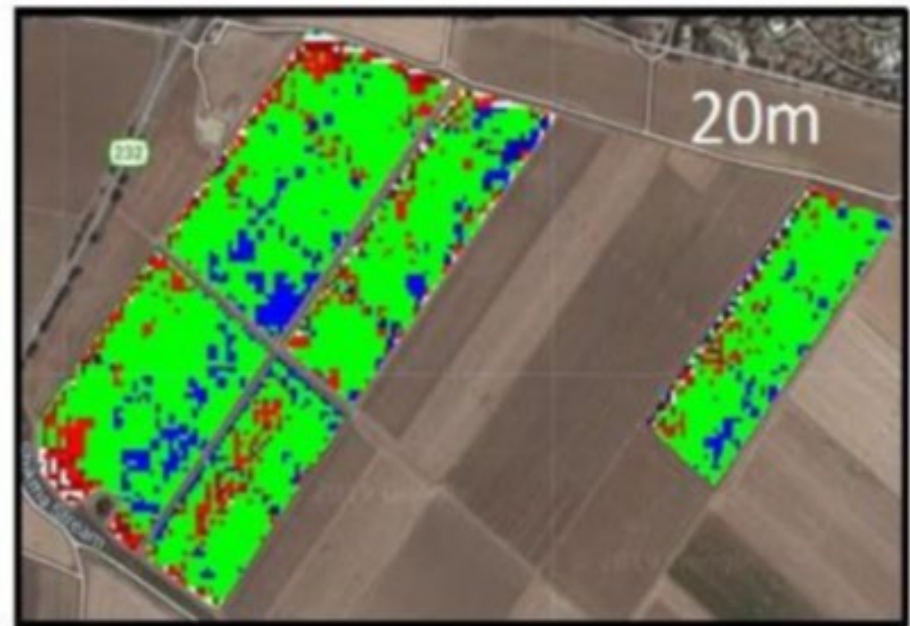
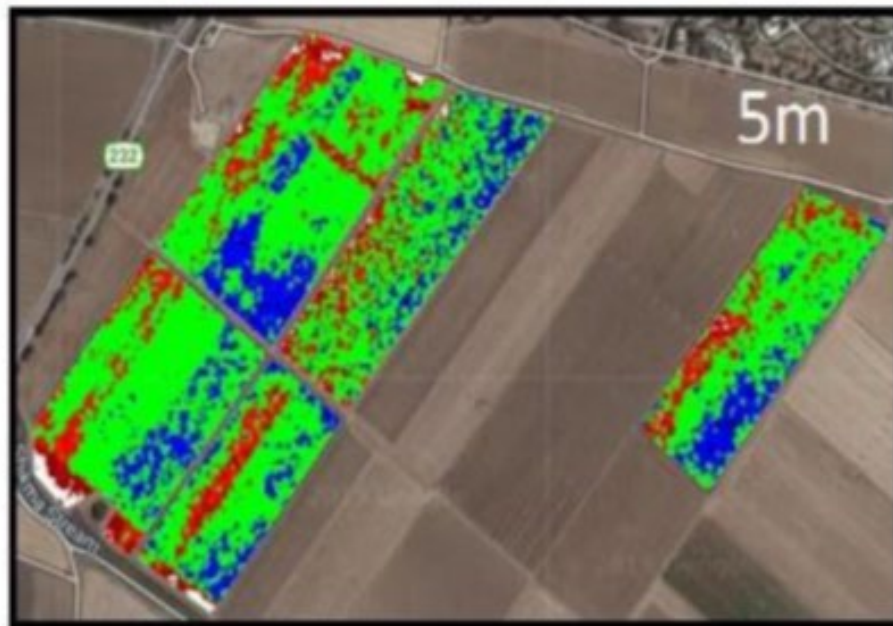
Sentinel-2

NDVI



- STD-2
- STD-1
- MEAN
- STD+1
- STD+2

REIP



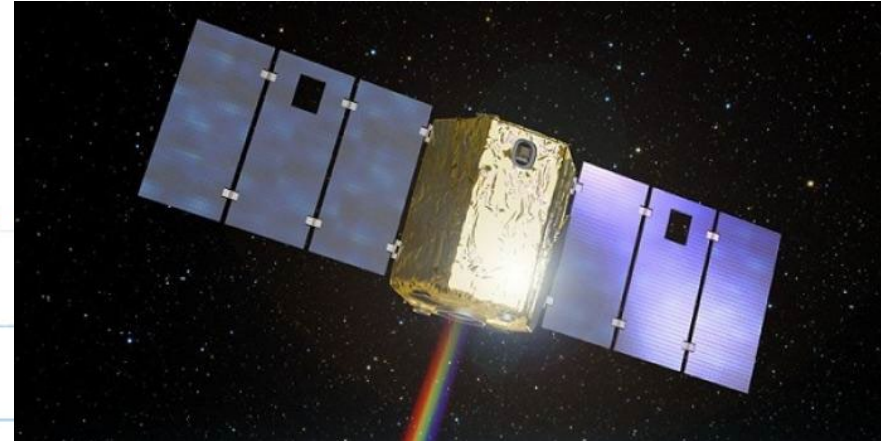
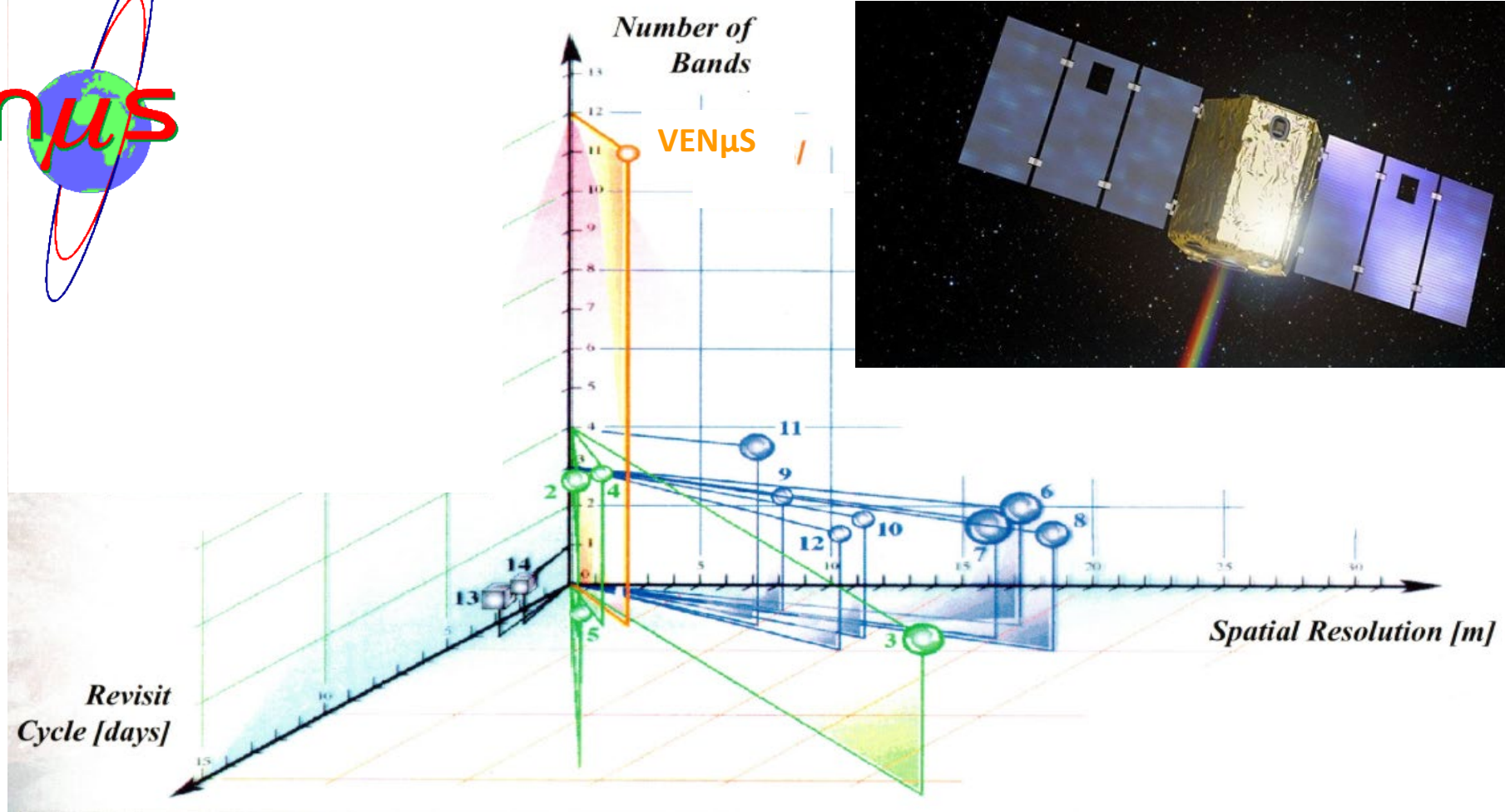
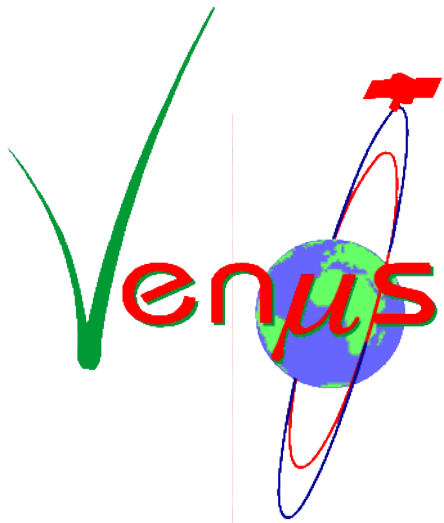
# New VEN $\mu$ S Mission (VM5)

- **Orbit**: near polar, sun-synchronous (constant view angle)
- **Altitude**: ~~720 km~~  $\rightarrow$  560 km
- **Inclination**: 98.27°
- **Revisit time**: ~~two days~~  $\rightarrow$  1 day
- **Swath**: ~~27.56 km~~  $\rightarrow$  21 km
- **Spatial resolution**: ~~5.3 m~~  $\rightarrow$  4 m
- **Number of spectral bands**: 12 (VIS-NIR)
- **Tilting capability**: +/-35° across and along track
- **Radiometric resolution**: 10 bits
- **Equator crossing time**: 10:30 AM, descending mode
- **Launch**: ~~1 August 2017~~  $\rightarrow$  March 2022 for 2 years

# Unique VEN $\mu$ S Features

1. High revisit time of one day;
2. High spatial resolution of 4 m;
3. 4 bands along the red edge;
4. Tilting capability of 35° along and across tracks;
5. 2 similar bands on the extreme locations of the focal plane;
6. Constant view angle.

# Take-home Message



Thank you!