

DESIS MISSION AND DATA ACQUISITION STATUS

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Knowledge for Tomorrow

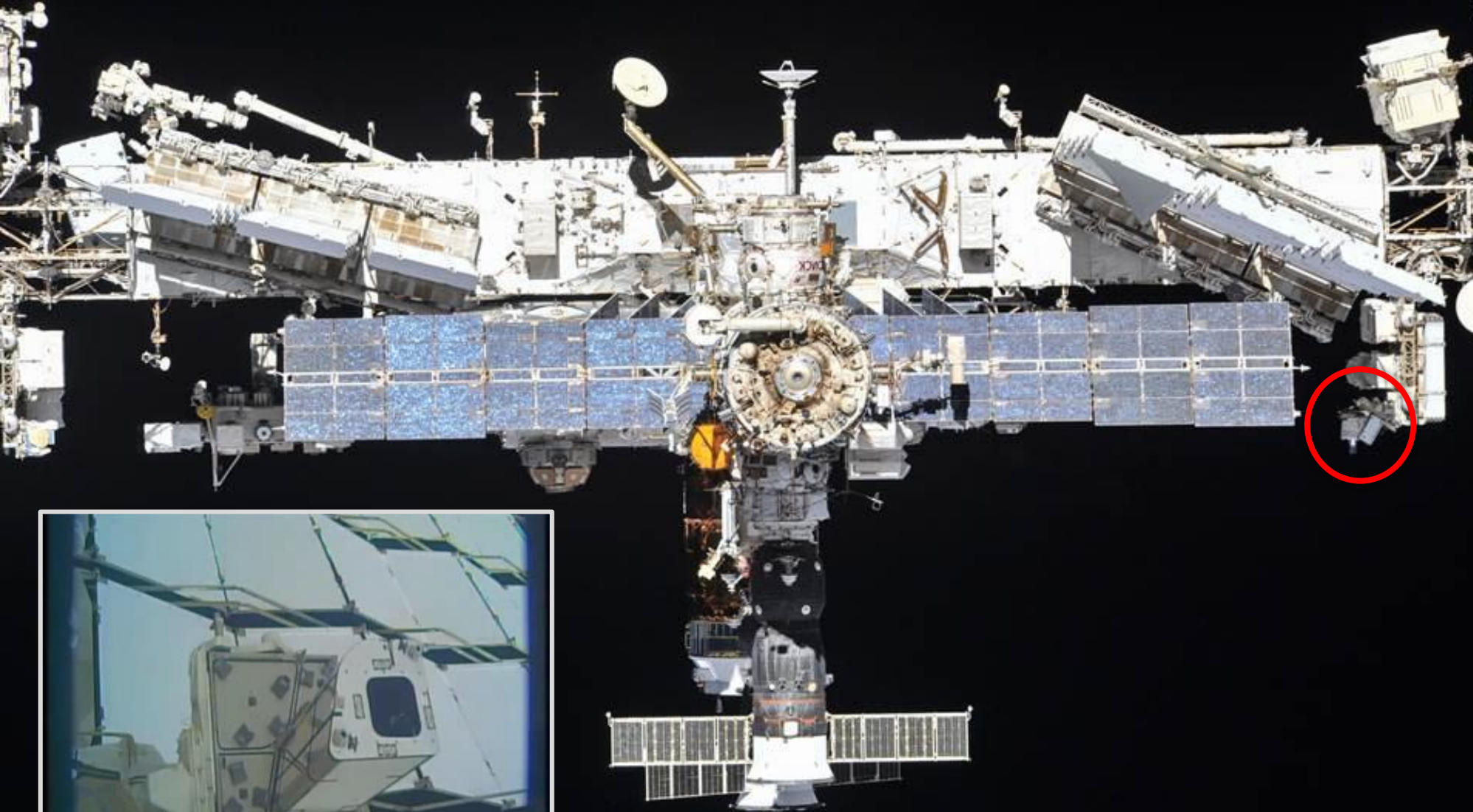




Teledyne



Mission introduction DESI, MUSES and ISS



Teledyne Brown Engineering (USA) and DLR have partnered to build and operate the DLR Earth Sensing Imaging Spectrometer (**DESI**) from the Teledyne-owned Multi-User System for Earth Sensing (**MUSES**) Platform on the ISS

DESI, the hyperspectral sensor has been developed and built by DLR.

DLR also established the Ground Segment and licensed the SW processors to Teledyne running in an Amazon Cloud

Mission introduction

DESIS / MUSES Timeline



2014 / 2015

MUSES / DESIS
Start Mission



7. June 2017

MUSES installation
on ISS



27.-28.08 2018

Installation of
DESIS in MUSES.
Start
Commissioning
Phase



23 Oktober 2019

@ IAC Washington
Start operationell
Phase (official
announcement)



29.09.–01.10.2021

1st DESIS User
Workshop (online)



02.11.2023

2nd DESIS User
Workshop at
WHISPERS

Design, Implementation, Test

Commissioning

Operations

| Mission Instrument | ISS/MUSES DESIS | Mission Instrument | ISS/MUSES DESIS |
|--|---|---|--|
| Off-nadir tilting (across-track, along-track) | -45° (backboard) to +5° (starboard), -40° to +40° (by MUSES and DESIS) | Target lifetime | 2018-2023 |
| Spectral range | 400 nm to 1000 nm | Satellite (mass, dimension, usage) | 455 t, 109.0×97.9×27.5 m ³ (multi-purpose) |
| Spectral (res., acc.) | 2.55 nm, (*) | Orbit (type, local time at equator, inclination, height, repeat cycle) | not Sun-synchronous, various, 51.6°, 320 km to 430 km, no repeat cycle |
| Radiometry (res., acc.) | 13 bits, (*) | Coverage | 55° N to 52° S |
| Spatial (res., swath) | 30 m, 30 km (@ 400 km) | Revisit frequency | 3 to 5 days (average) |



Mission introduction

DESIS – Data products



Archive

L1A Raw Data
(prepared for selection & ordering & processing)

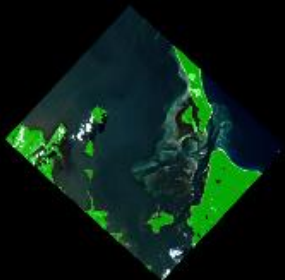
Analysis Ready Data

L1B Top-Of-Atmosphere (TOA) Radiance

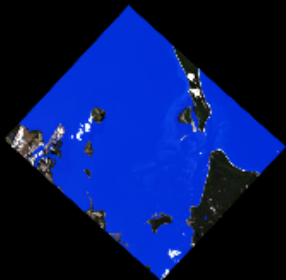
L1C Geocoded & Orthorectified

L2A Bottom-of-Atmosphere (BOA) Reflectance

Land Mask



Water Mask



Cloud Mask



Cloud Shadow
over land



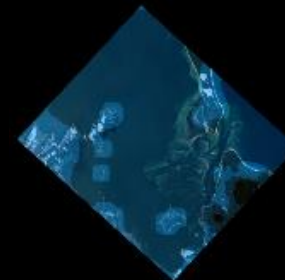
Haze over land



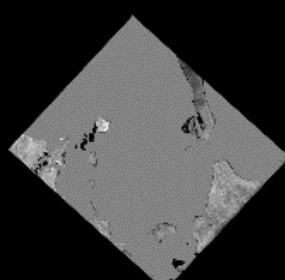
Haze over
water



AOT Map

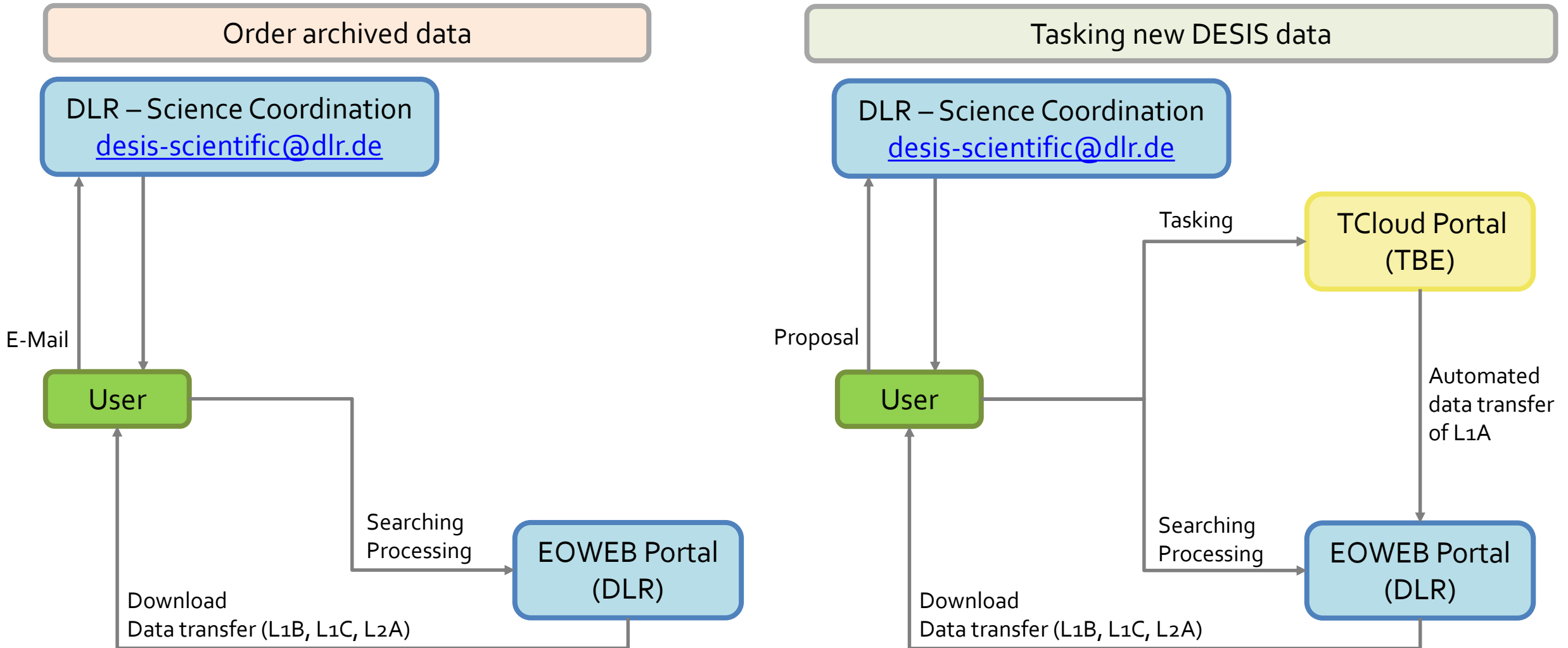


WV Map



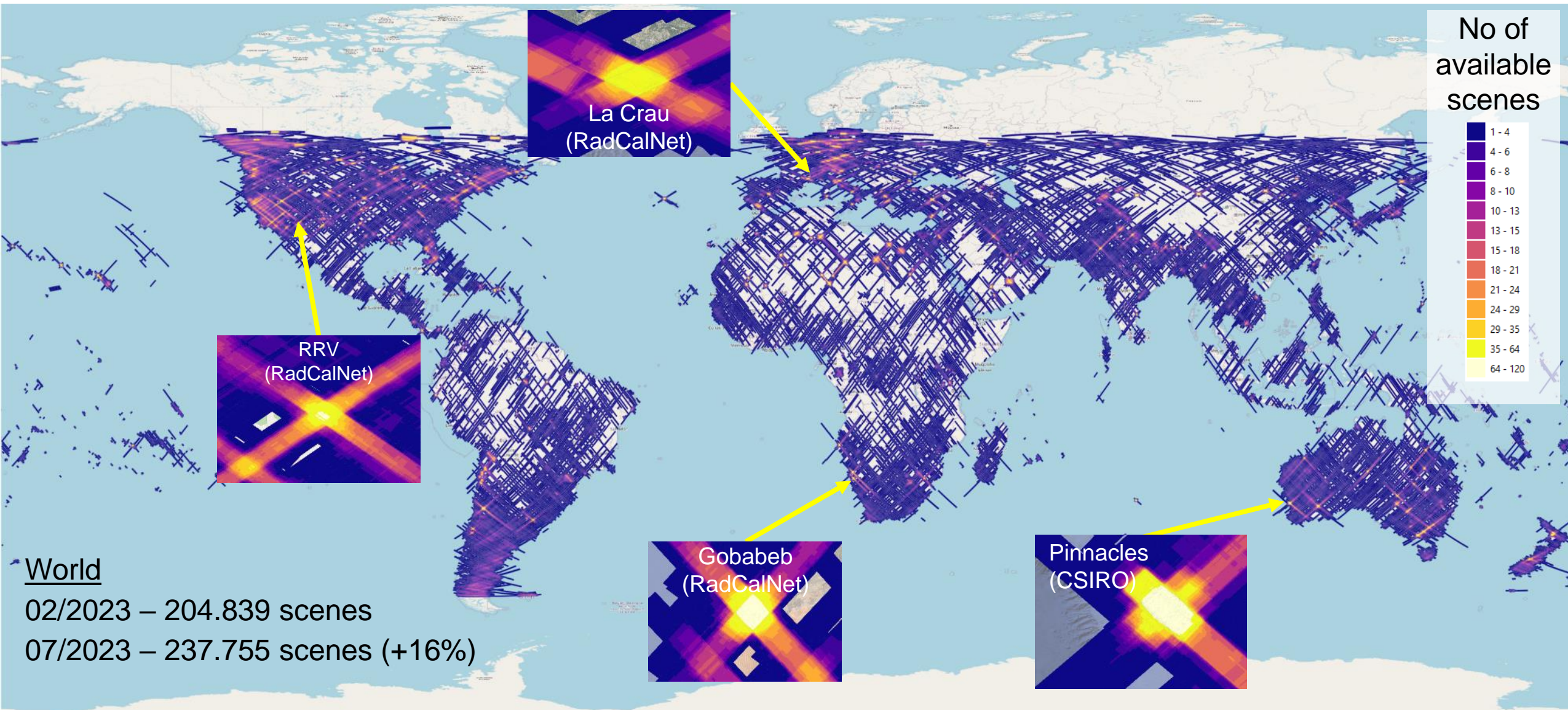
Mission introduction

DESIS data access



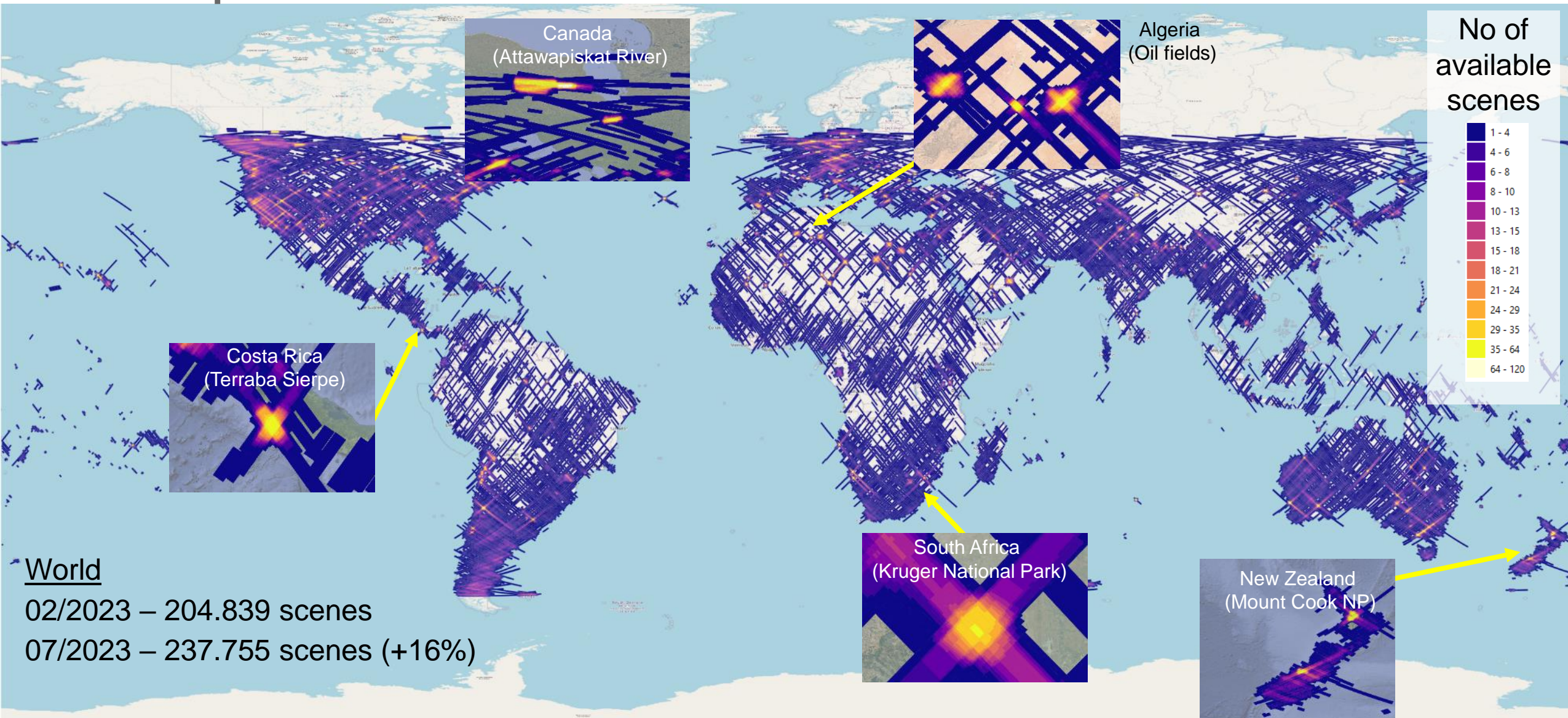
Hyperspectral DESIS data archive

Vicarious calibration and validation sites



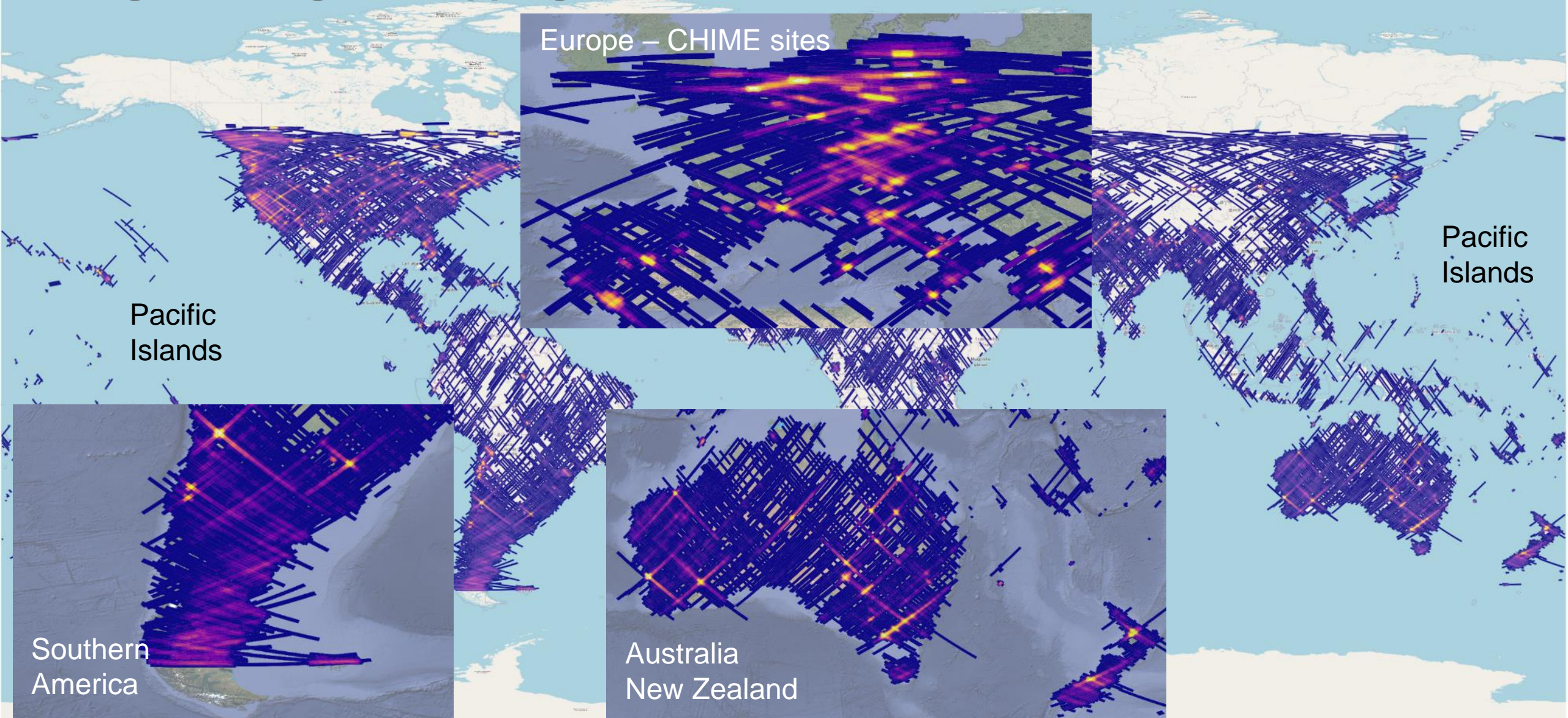
Hyperspectral DESIS data archive

User requests



Hyperspectral DESIS data archive

Large coverages - mapping

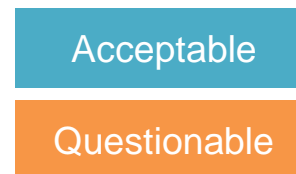


Hyperspectral DESIS data archive

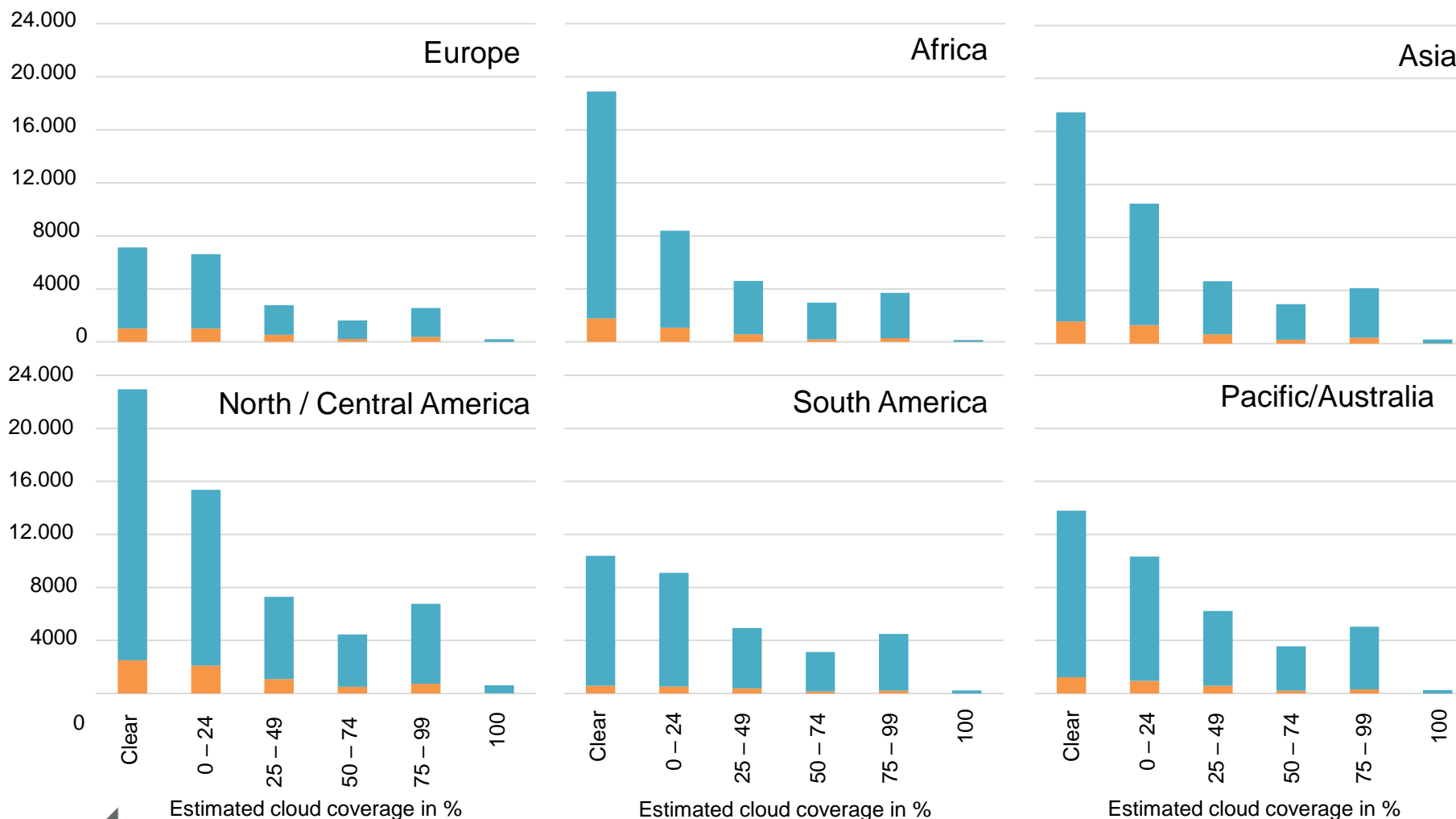
Cloud coverage and data quality rating

DESIS data archive

- 237.755 scenes (July 2023)
- TBE is estimating cloud coverage and undertaking a data quality rating for each scene



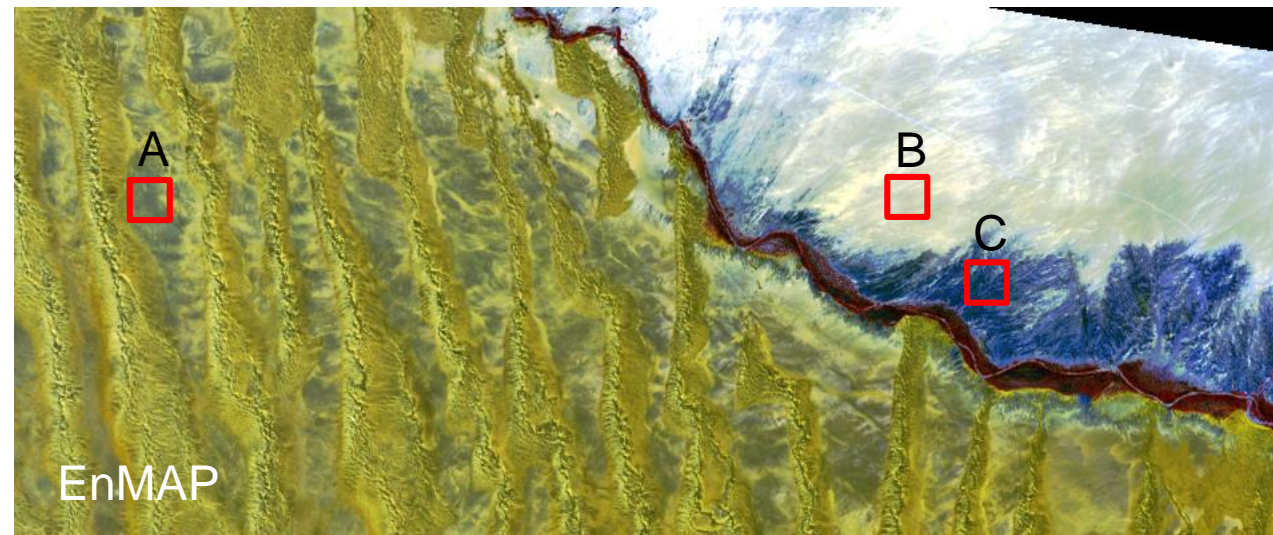
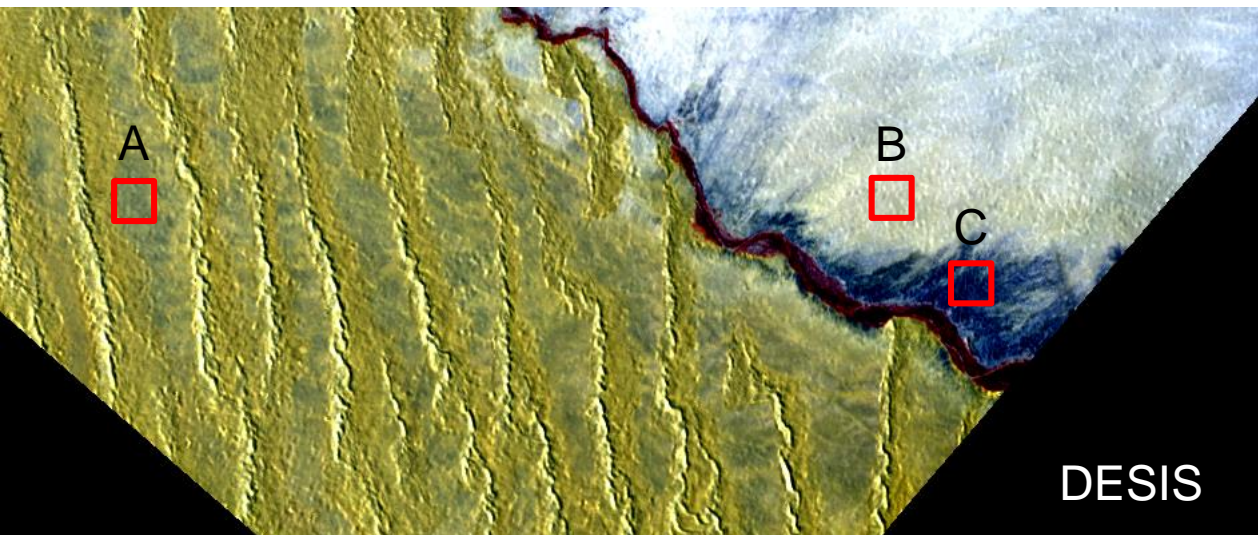
- 90,7 % acceptable data
- > 67 % less than 25% cloud coverage
- Allowed cloud coverage can be defined by users
- Commercial cloud cover forecast used as one taking parameter



Data comparison

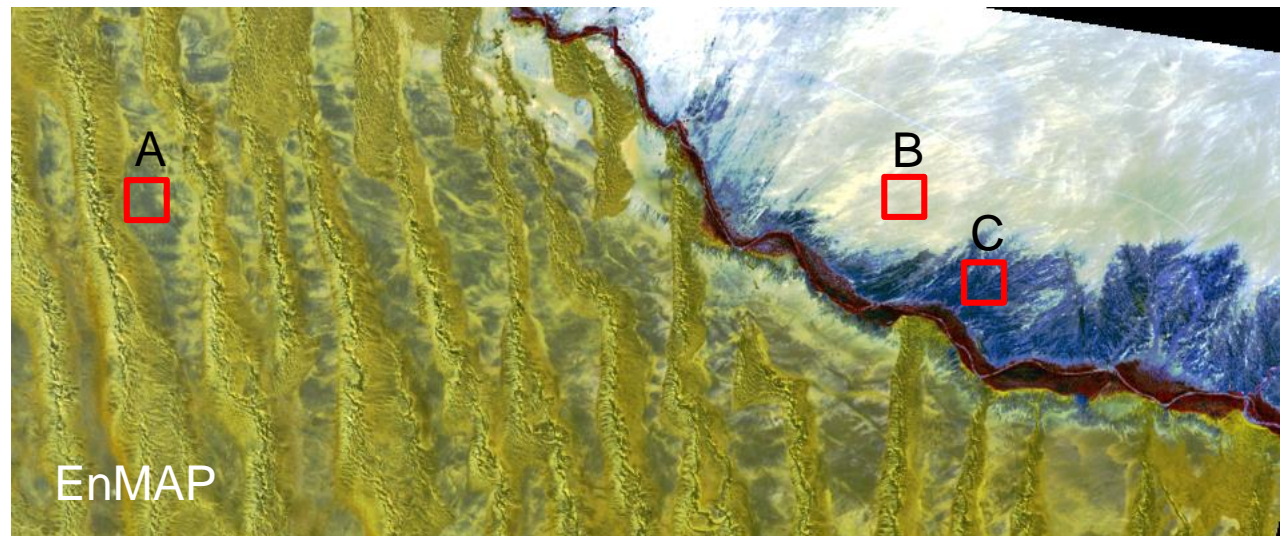
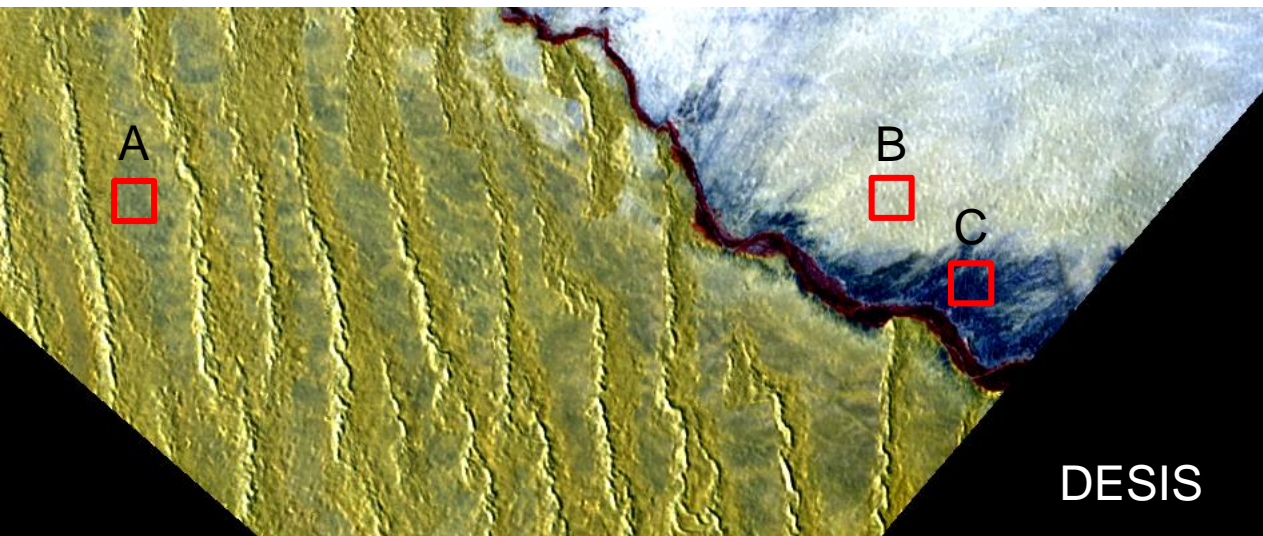
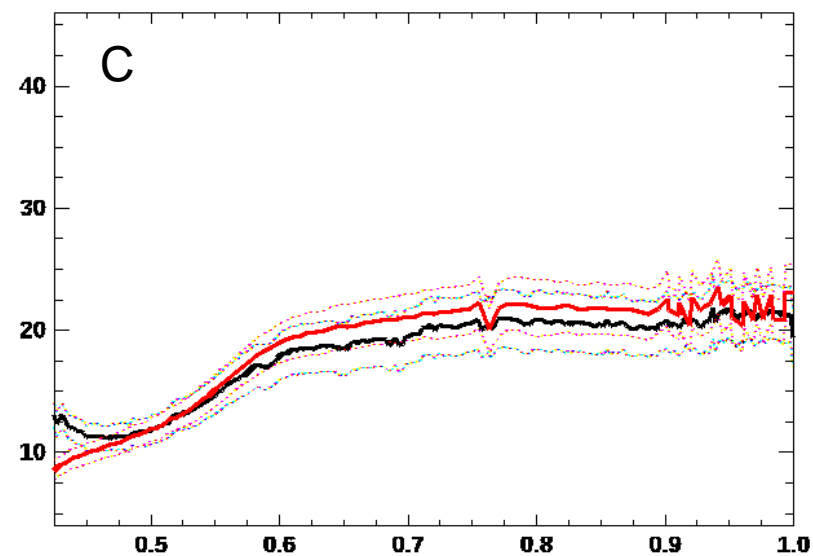
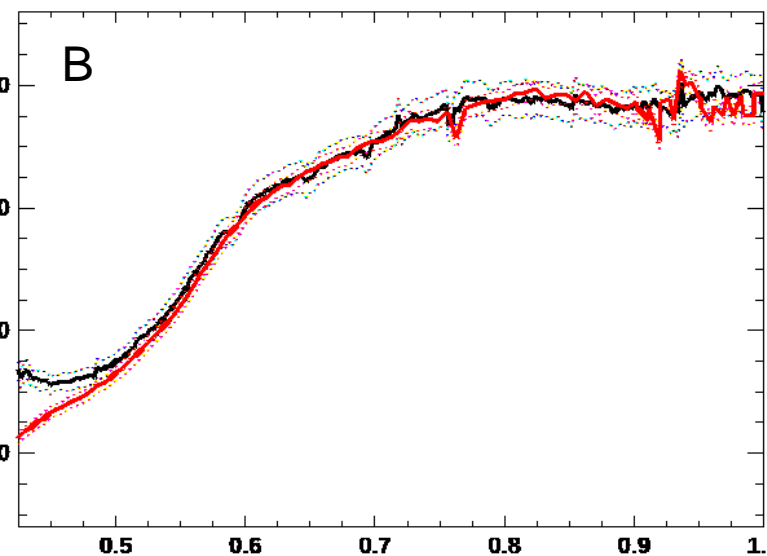
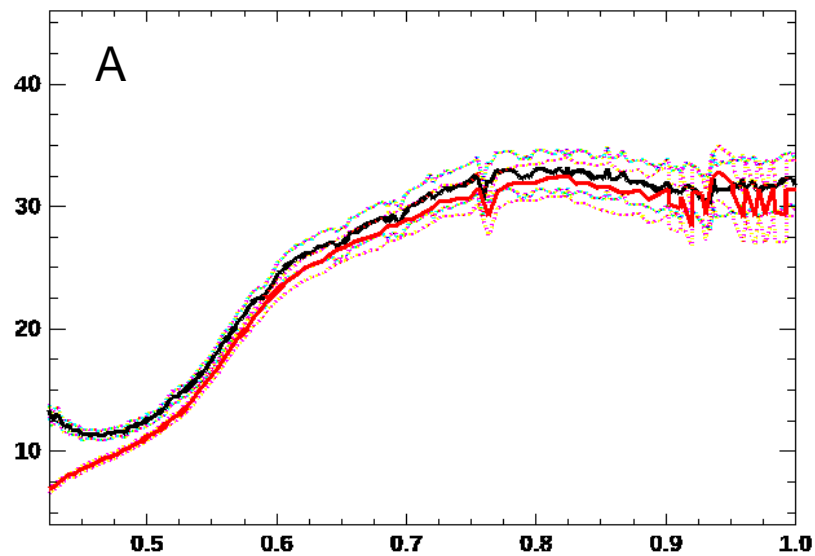
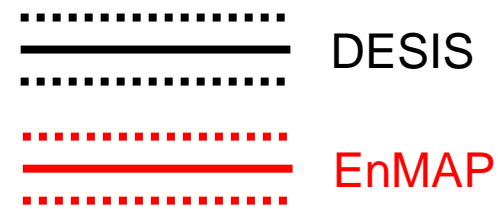
DESIS and EnMAP – same L2A processing pipeline (PACO)

- Gobabeb, Namibia; DESIS + EnMAP cal/val site,
- DESIS: SAA 72°, SZA 47°, 02/10/2022, 07:52 (UTC)
- EnMAP: SAA 40.9 xx°, SZA 25.6°, 02/10/2022, 09:43 (UTC)
- Same L2A processing pipeline: PACO
- BRDF correction: DESIS none, EnMAP – yes
- RGB both sensors: R: 801/801 501/501, G:675/672, B: 501/501



Data comparison

DESIS and EnMAP – spectral comparison



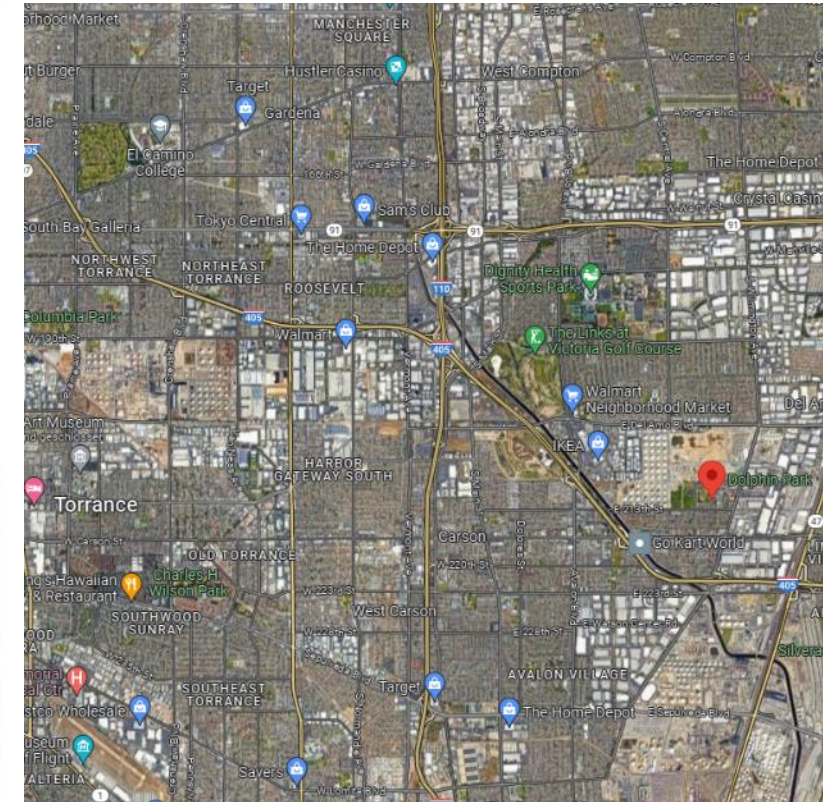
DESIS Multitemporal Acquisitions



30 Jun 2019



Los Angeles, North of Long Beach



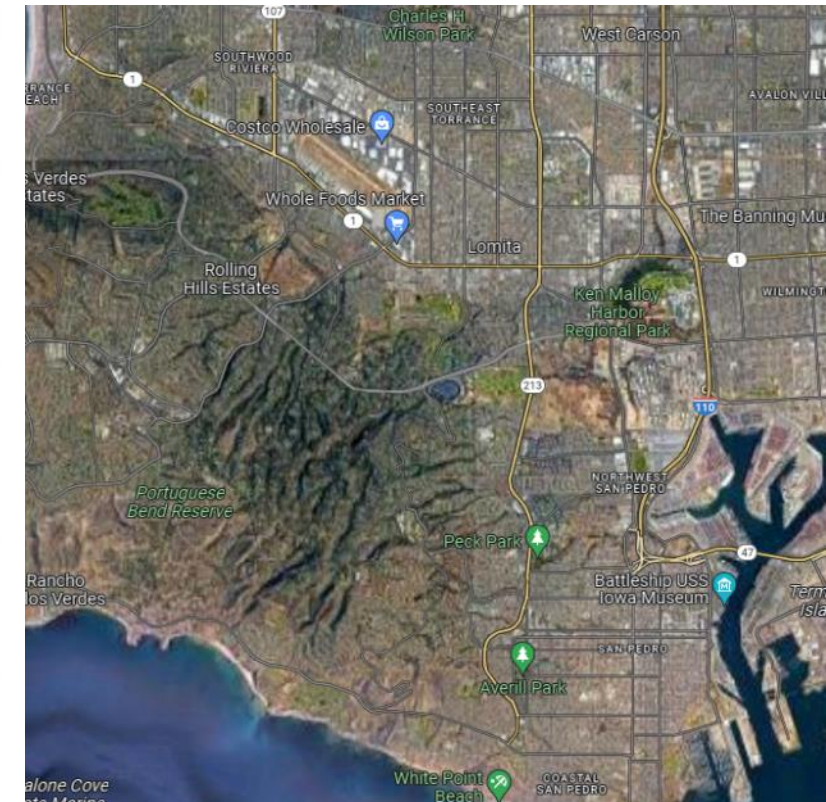
DESIS Multitemporal Acquisitions



30 Jun 2019



Los Angeles, around Hesse's Gap



2nd DESIS User Workshop

@WHISPERS - IEEE GRSS Workshop on Hyperspectral Image and Signal Processing
2nd of November 2023 in Athens, Greece

Image produced by Matthias Wocher, Ludwig-Maximilian-University (LMU), 2021

- Submit to the special session category: „DESIS 5th anniversary“
- Registration open since May 30, 2023
- **Late submissions possible until September 15, 2023**
- Author registration deadline September 30, 2023

We are celebrating
DESIS 5th year in
space!



DESIS News – New upcoming download



<https://geoservice.dlr.de/>

- Provides a wide range of satellite data products as maps [1] and via web services (WCS, WFS, WMS etc.)
- EnMAP quick looks have been made available recently [2] and L2A data download will follow soon
- Same planned for DESIS data (~Q1/2024):
 - DESIS data can be explored via a STAC Catalogue containing the metadata of the complete DESIS archive
 - L2A processed DESIS data (standard processing) will be made available
 - Bulk image download possible
 - Web services allow for user-specific integration of data in processors for DESIS but also other available data sets such as EnMAP

[1] <https://geoservice.dlr.de/web/maps/enmap:l0>

[2] https://geoservice.dlr.de/eoc/ogc/stac/v1/collections/ENMAP_HSI_LO_QL/items?sortby=-updated

Thank you very much for your attention!

FRP.P8.1:

**FAST MACHINE LEARNING SIMULATOR OF AT-SENSOR
RADIANCES FOR SOLAR-INDUCED FLUORESCENCE RETRIEVAL
WITH DESIS AND HYPLANT**

Fri, 21 Jul, 14:15 - 15:45 Pacific Time (UTC -7), Poster Area 8

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