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Water Health Indicator System (WHIS)

Using cloud native technology to continuously monitor global freshwater resources

About Development Seed

Acting on Earth Data

We build geospatial products as technical partner to some of the most impactful organizations around the world.

Our products allow them to:

- Manage and distribute **planetary data**
- Do **Open Science** and analysis at scale
- Use **AI to accelerate** insight from geo data
- Allow decision makers to **derive and share insight** from EO data

The team

- 55 engineers, designers, scientists across the globe
- Offices in Washington DC, Lisbon and Ayacucho
- European operations are coordinated out of Portugal

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Project overview and context

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ABOUT WHIS

Water Health Indicator System

esa
European Space Agency

ESA funded project to produce water quality API, focused on Portugal

Tasks

- Market analysis for water health indicator data
- Create a prototype of an remote sensing based water quality system
- Develop a business model for this kind of system
- API expected to be operational in Q1 2024

WHIS

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PARTNERS

LABELEC: Test User

- ➔ Private research laboratory, part of biggest utility in Portugal: EDP
- ➔ First test user, primary source for user study
- ➔ Will provide validation data

MARE: Scientific Partner

- ➔ MARE - Marine and Environmental Sciences Centre, part of University of Lisbon and the FC.ID association
- ➔ Combines technical and scientific expertise to address all types of aquatic ecosystems, river basins, coastal systems and ocean
- ➔ Works in context of regional and global changes and cumulative anthropogenic impacts.

WHIS Team

Development Seed

Olaf Veerman
General Manager Portugal
Portugal

Daniel Wiesmann
Product Manager
Portugal

Vincent Sarago
Geospatial Developer
France

Daniel da Silva
Frontend Developer
Portugal

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UI/UX Designer
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MARE Center

Vanda Brotas
Professor
Portugal

Ana Brito
Professor
Portugal

Labelec

João Pádua
Estudos de Ambiente
Portugal

Gabriel Silva
Estudos de Ambiente
Portugal

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STAKEHOLDERS

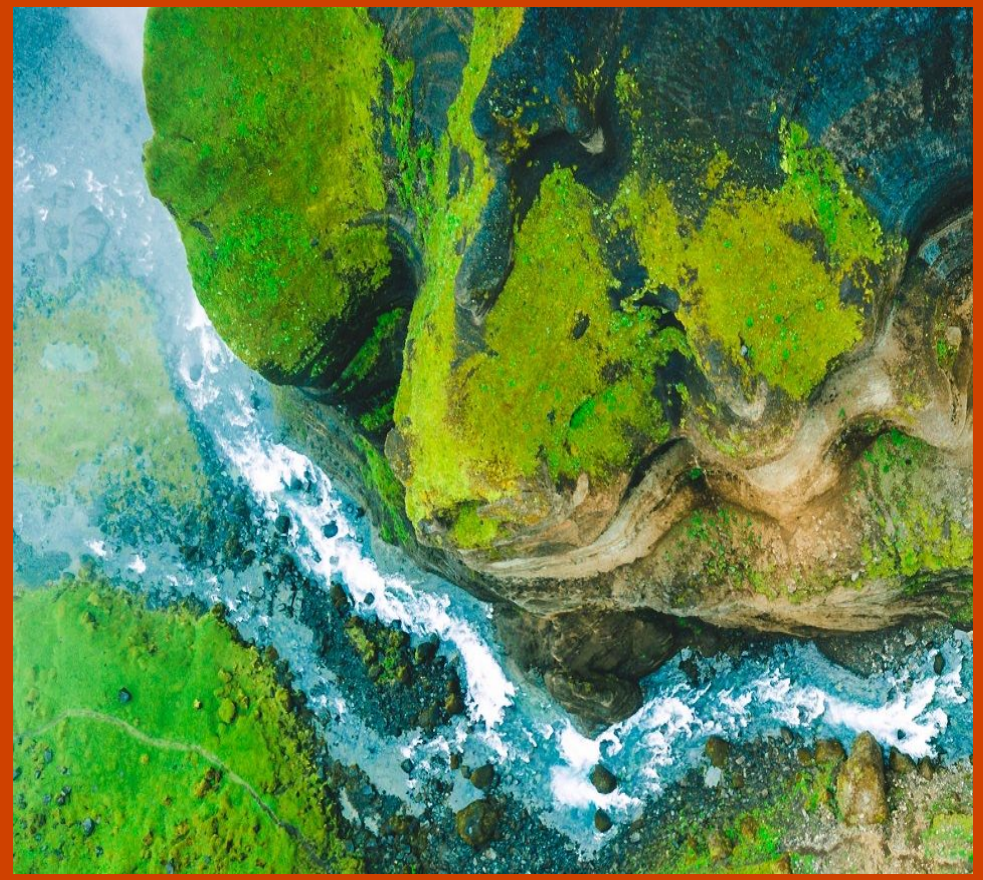
CEO Water Mandate

- The Water Resilience Coalition is an industry-driven, CEO-led initiative to address the global water crisis.
- We aim to elevate action on mounting water stress and its connection to climate change to the top of the global corporate agenda.

Pacific Institute

- The Pacific Institute is a global water think tank
- Are working on a platform that will integrate multiple data streams from several ESA projects, including WHIS

UN GLOBAL COMPACT
WATER RESILIENCE COALITION
CEO WATER MANDATE
PACIFIC INSTITUTE
REIMAGINING WATER FOR A CHANGING WORLD



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Technology stack

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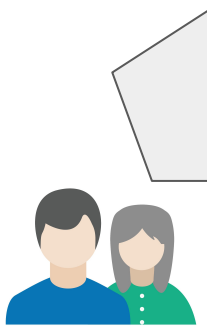
INTRODUCTION

Overview

Build and API for water quality monitoring as a product-services play

Remote Sensing Data

AOI - Water body



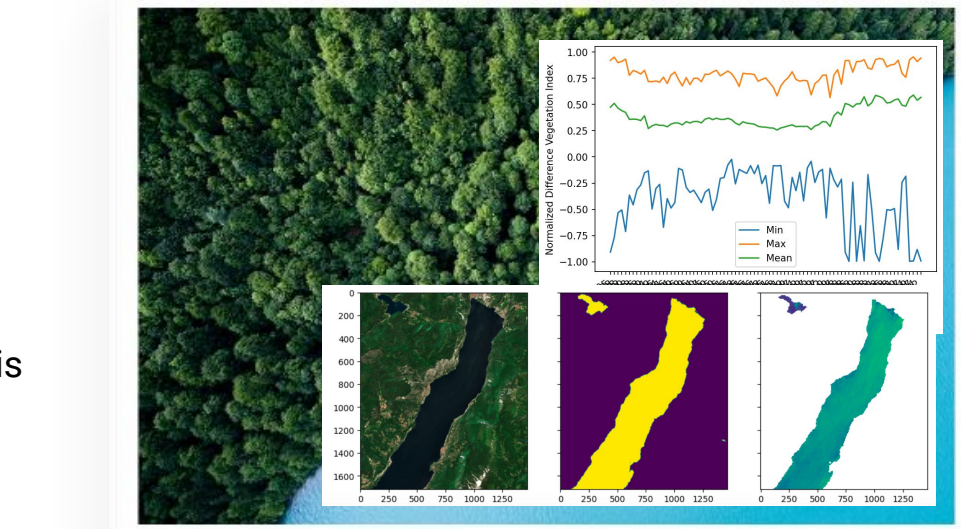
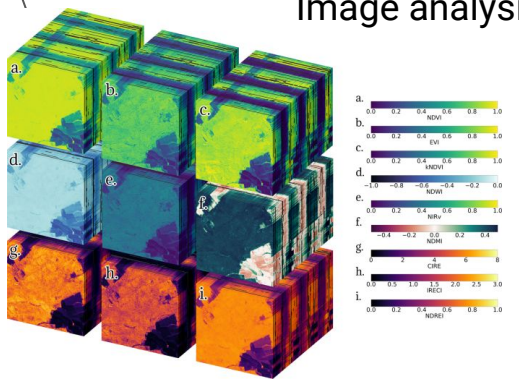
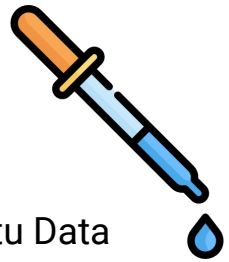


Image analysis



In Situ Data



Cloud Optimized data

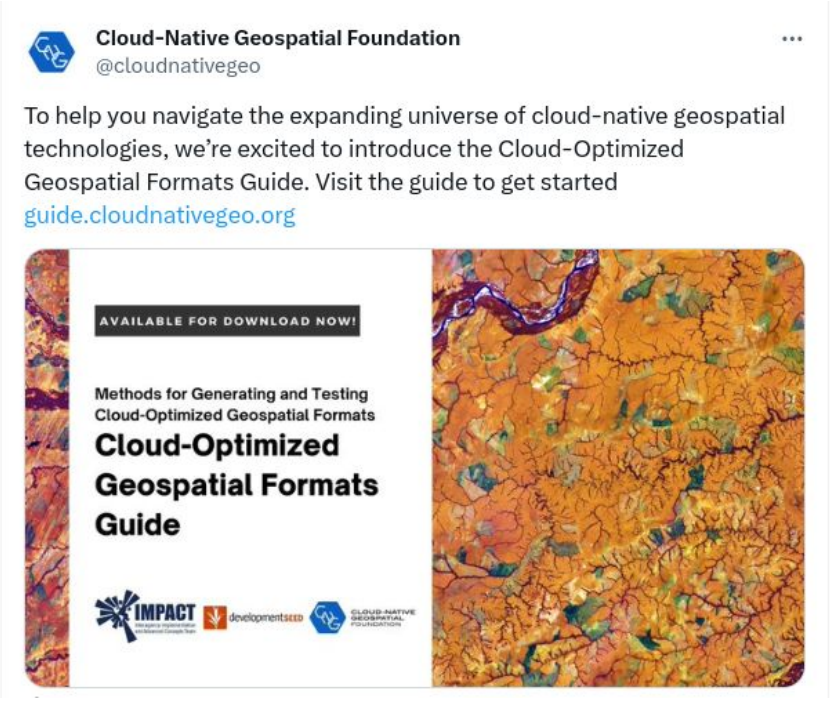
Cloud Native

Cloud Optimized formats are **read-oriented**. Data is organized in small chunks and can be accessed through HTTP range requests. This makes it great for:

- **Partial reads**
- **Parallel reads**

Only get what you need and easy to scale.

guide.cloudnativegeo.org

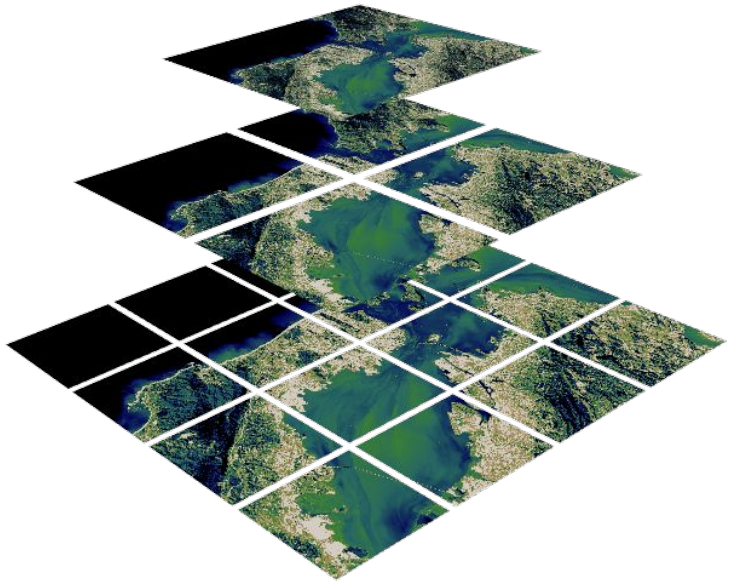


Cloud Optimized data

Cloud Optimized GeoTIFF (COG)

- Internal organization containing Overviews & Tiling
- Backward compatible with regular GeoTIFF

cogeo.org



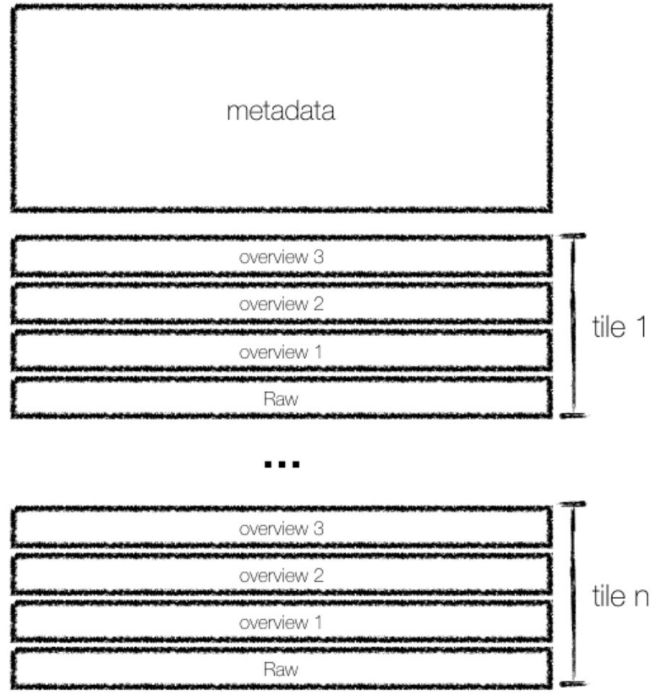


Image source: kitware.com/deciphering-cloud-optimized-geotiffs

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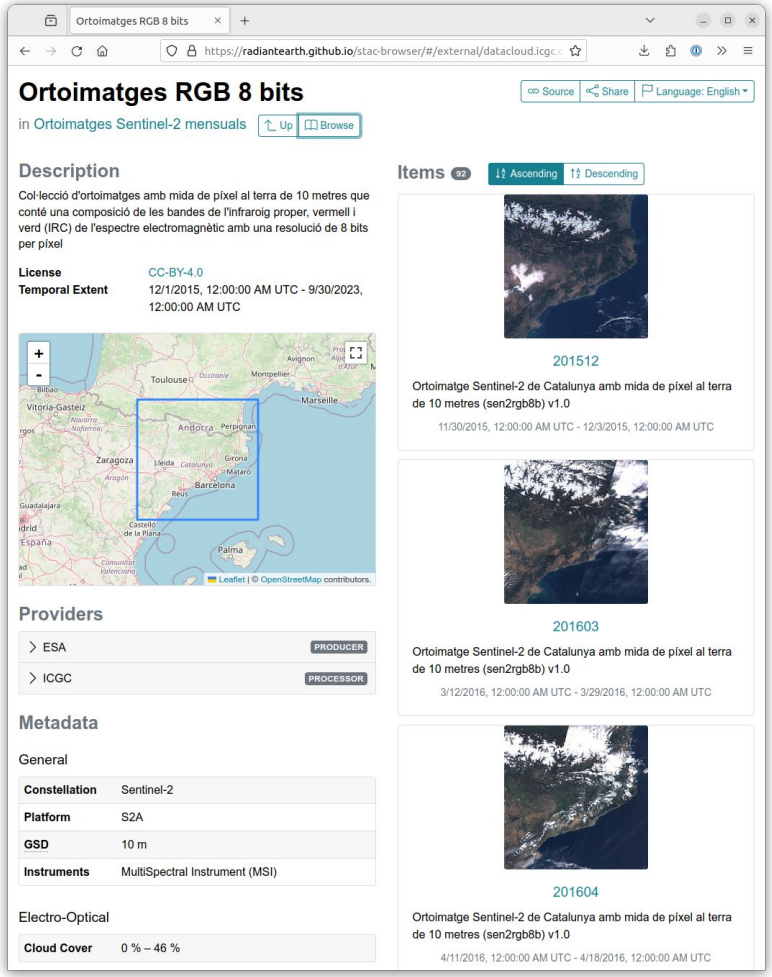
Cloud Optimized data

Spatio Temporal Asset Catalog (STAC)

Spatio Temporal Asset Catalog - a common language for describing and discovering geospatial data

stacspec.org



WHIS Under the Hood

eoAPI

eoapi.dev

WHIS Under the Hood

eoAPI

WHIS Under the Hood

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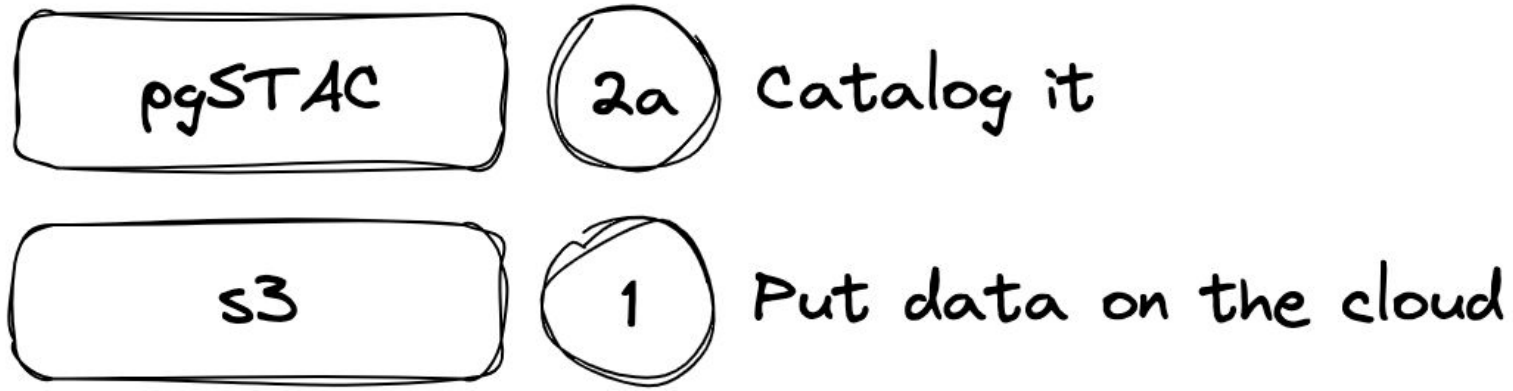
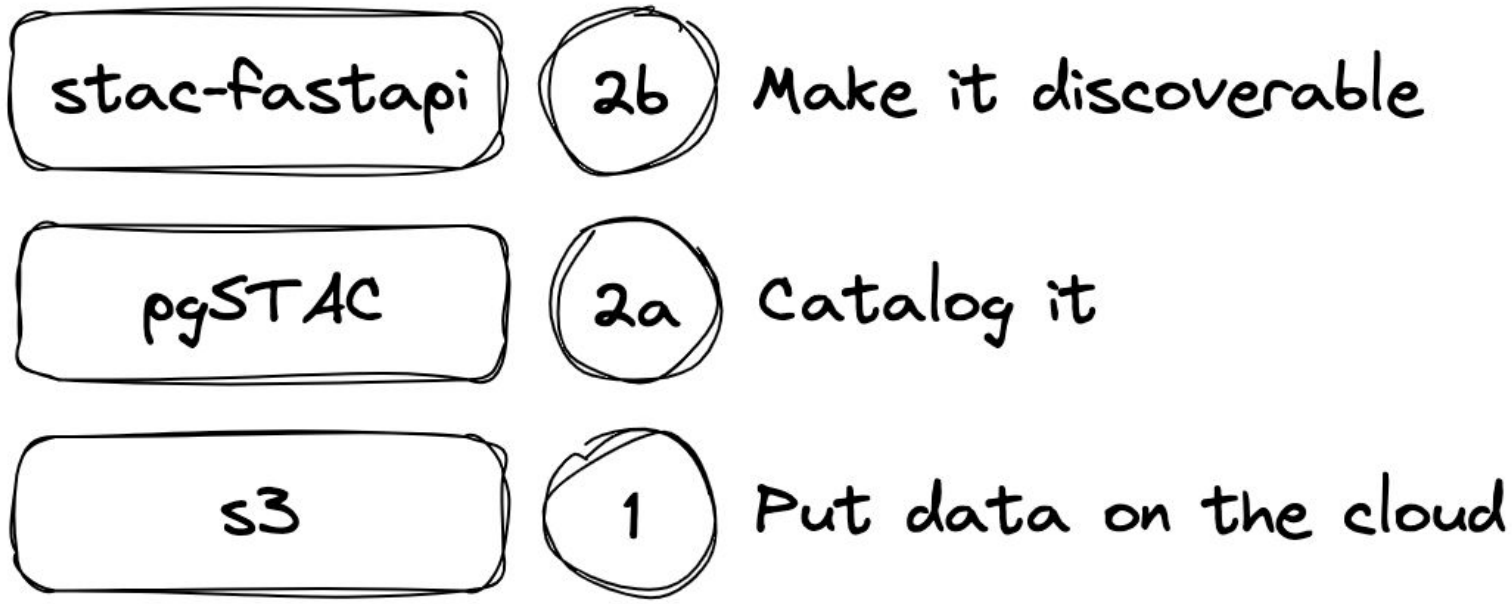


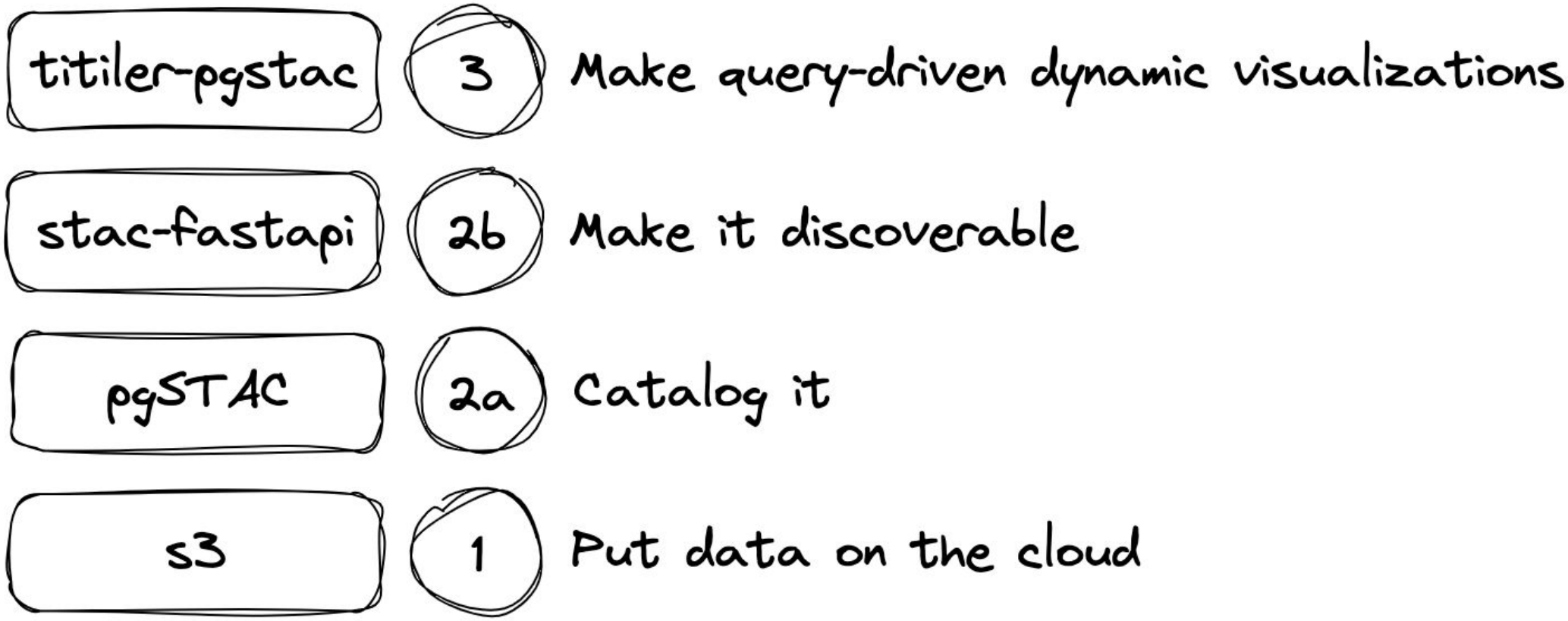
WHIS Under the Hood

eoAPI



WHIS Under the Hood

eoAPI



WHIS Under the Hood

eoAPI

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First results

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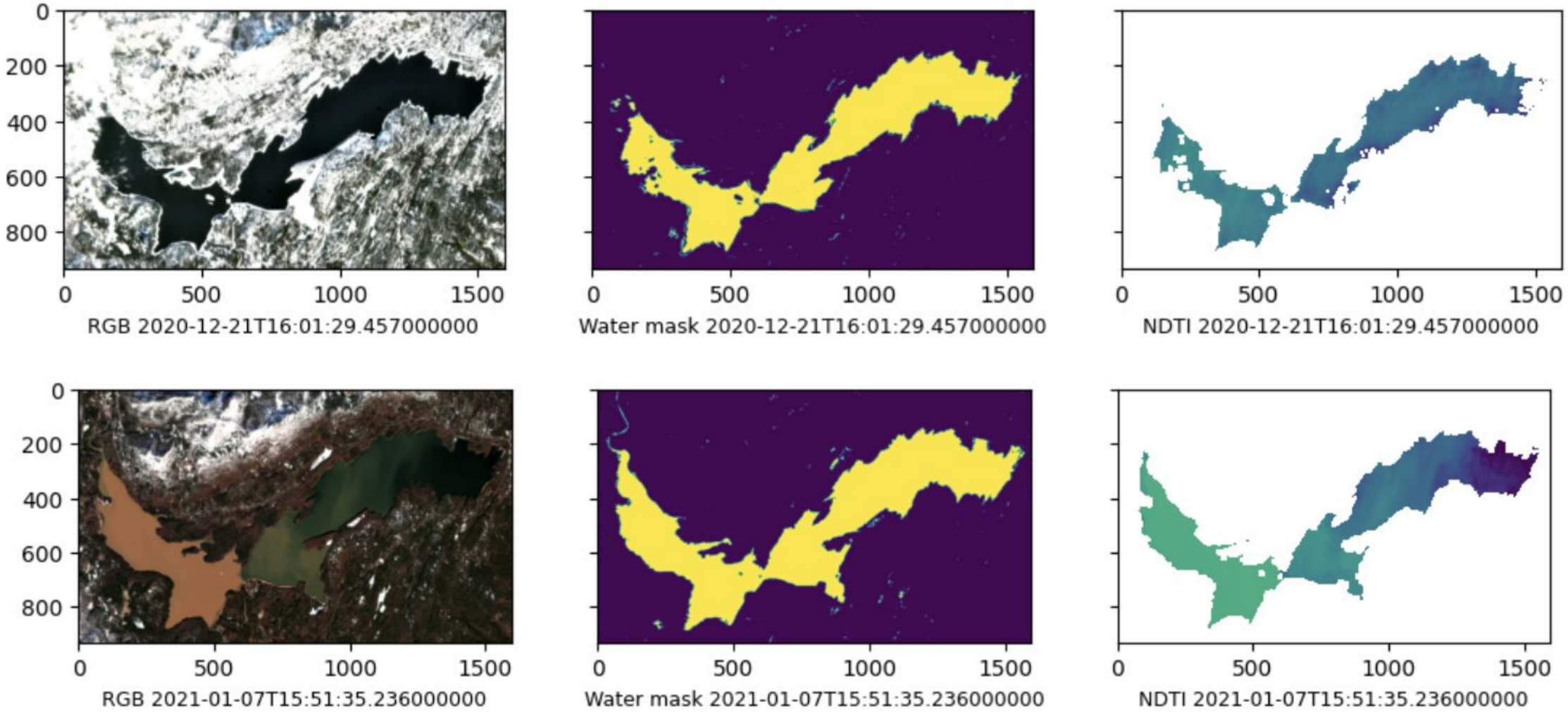
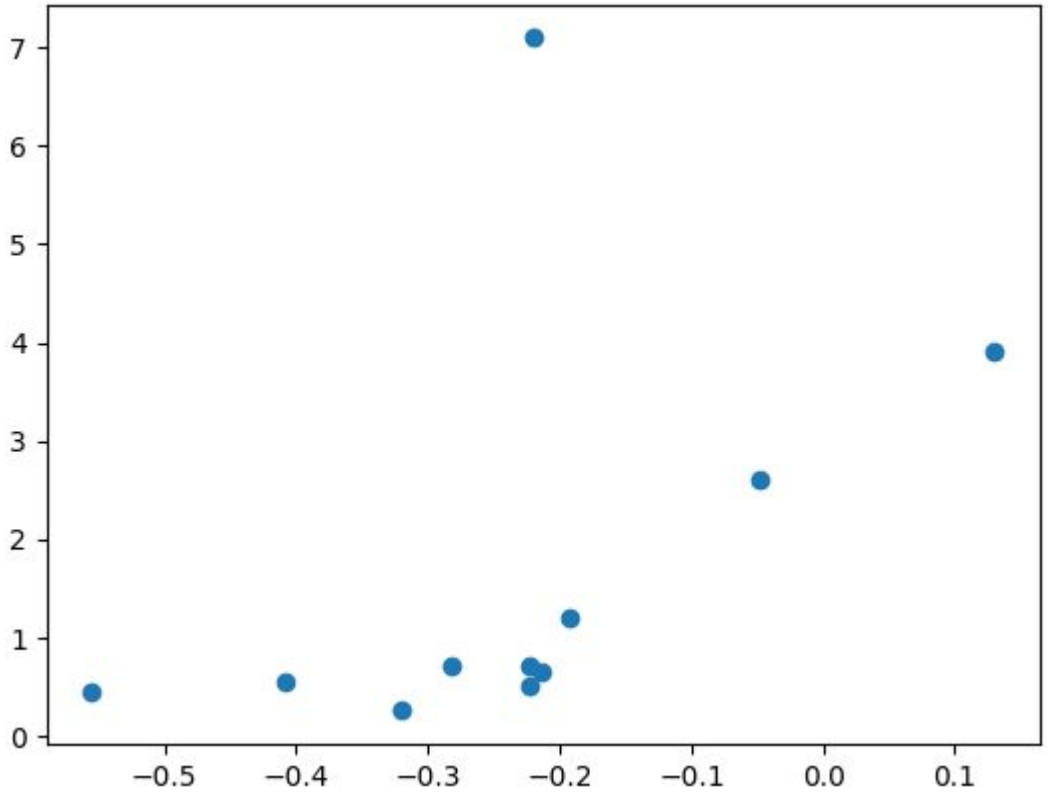
Case study

Measure turbidity after [storm runoff event at Ashokan reservoir in New York (late December, 2020)] using Sentinel-2 (L2A).



Case study

Measure turbidity in freshwater bodies in Orange County, Florida using Sentinel-2.



- In situ data used for correlation obtained from Orange County Water Atlas Dashboard.
- Correlation based on measurements obtained on same day with nearest neighbor co-location of pixel to in situ sensor reference coordinate.

Pearson's correlation coefficient: 0.470. This agrees with two correlations reported in two other separate studies (1, 2).

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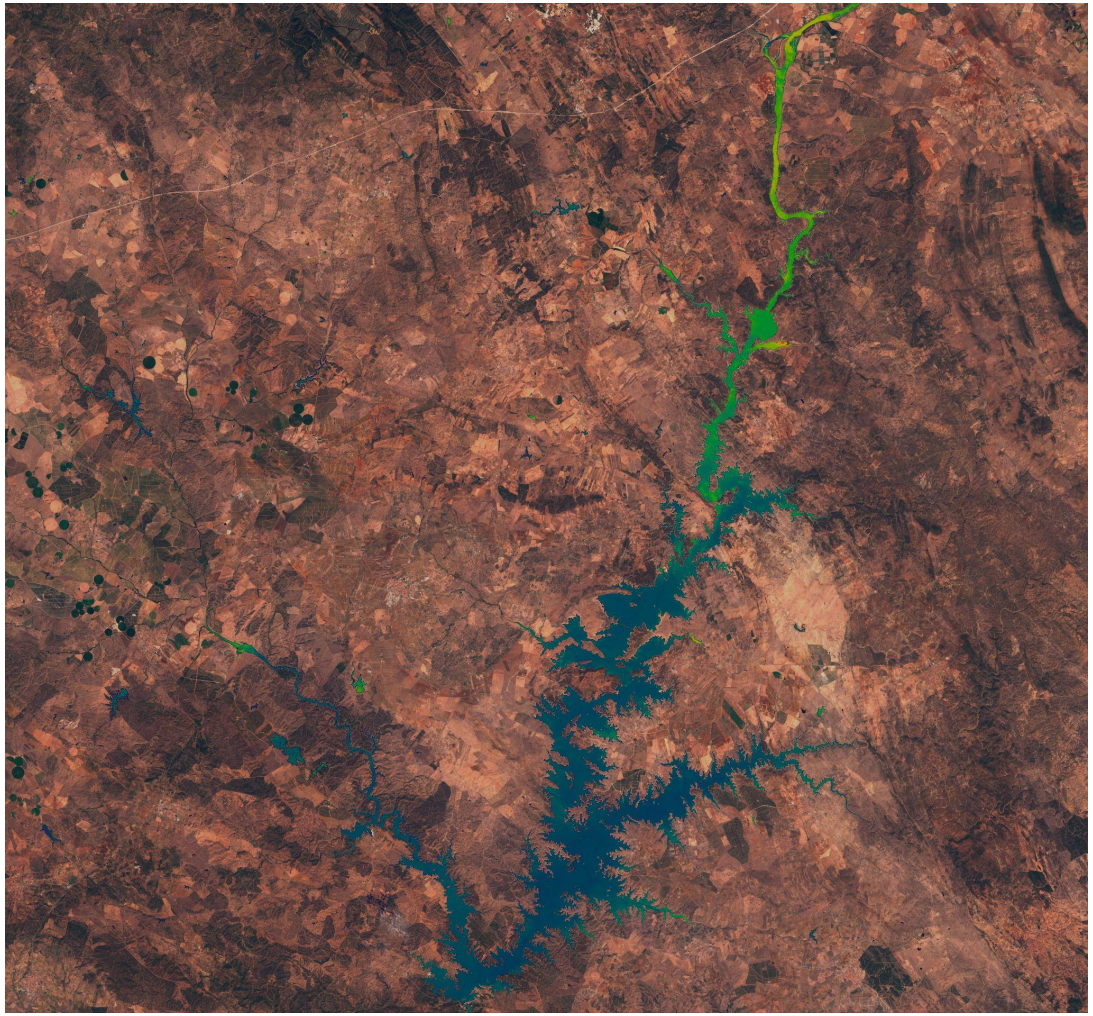
Case study

Detecting chlorophyll inflow to a large dam in Portugal using the C2RCC atmospheric correction.



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Next steps

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PORTUGAL

Initial focus on 10 lakes

- Process all Sentinel-2 imagery for the target lakes
- Use different atmospheric correction algorithms
  - Sen2Cor
  - C2RCC
  - Acolite
  - Polymer
  - iCor
- Use corrected imagery dynamically
  - Store corrected imagery as Cloud Optimized Geotiff (COG)
  - On the fly rendering & statistics

  → eoAPI

- First public results in Q1 2024

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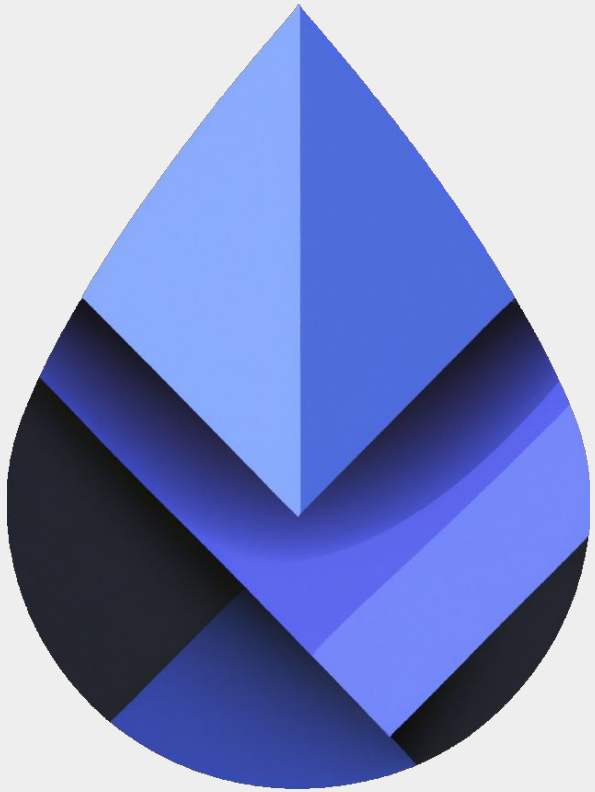
Thank you!



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github.com/yellowcap