



AIRCENTRE

ATLANTIC INTERNATIONAL RESEARCH CENTRE

Flash Talks

Évora, 24-25 November 2022

João Pinelo

Head of Data Science, Cloud Infrastructure and Development



Atlantic International Research Centre

Outline

- **A brief introduction to the AIR Centre**
- **Introduction to the AIR Centre's Data infrastructure**
- **Open data offer**



AIR Centre Timeline

Idea (2016)

The 1st Atlantic Interactions International Workshop (New York City, United States of America, June 2016) - International ministerial meetings followed.

Legally formed in April 2018

First CEO nominated in late 2018

Reality (late 2019)

Team building started in 2019

Operation



AIR CENTRE CHARTER

Thematic Missions and Vision



Clean and productive
bays and estuaries



Resilience to coastal
natural hazards



Sustainable food
production



Improved management of
marine and coastal
resources



Improved
environmental and
maritime monitoring



To Serve the scientific community



Job creation and knowledge-driven economic development



To monitor and contribute to reaching the UN Sustainable Development Goals



AIR CENTRE FOCUS

- **Serve** the scientific community
- Job creation and **knowledge-driven** economic development
- To **monitor** and contribute to reach the UN Sustainable Development Goals

Focus: To create proof-of-concept services (not fundamental research)



DATA PIPELINES

Automation
Online
High-availability

Space
4.0



AIR CENTRE CHARTER

Thematic Missions and Vision



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AIR DATA CENTRE

Support infrastructure to the Missions and Vision

- Serve the scientific community
- Job creation and knowledge-driven economic development
- To monitor and contribute to reach the UN Sustainable Development Goals



AIR CENTRE DEVELOPMENT

Since 2019: Creating the Infrastructure

1. International Networks:

AIR Centre

European Spatial Agency

United Nations Environment Program

2. Project Proposals:

Over 20 Funded Projects

3. Communications Networks (Regional+)

4. Data collection:

DRS

Atlantic Constellation

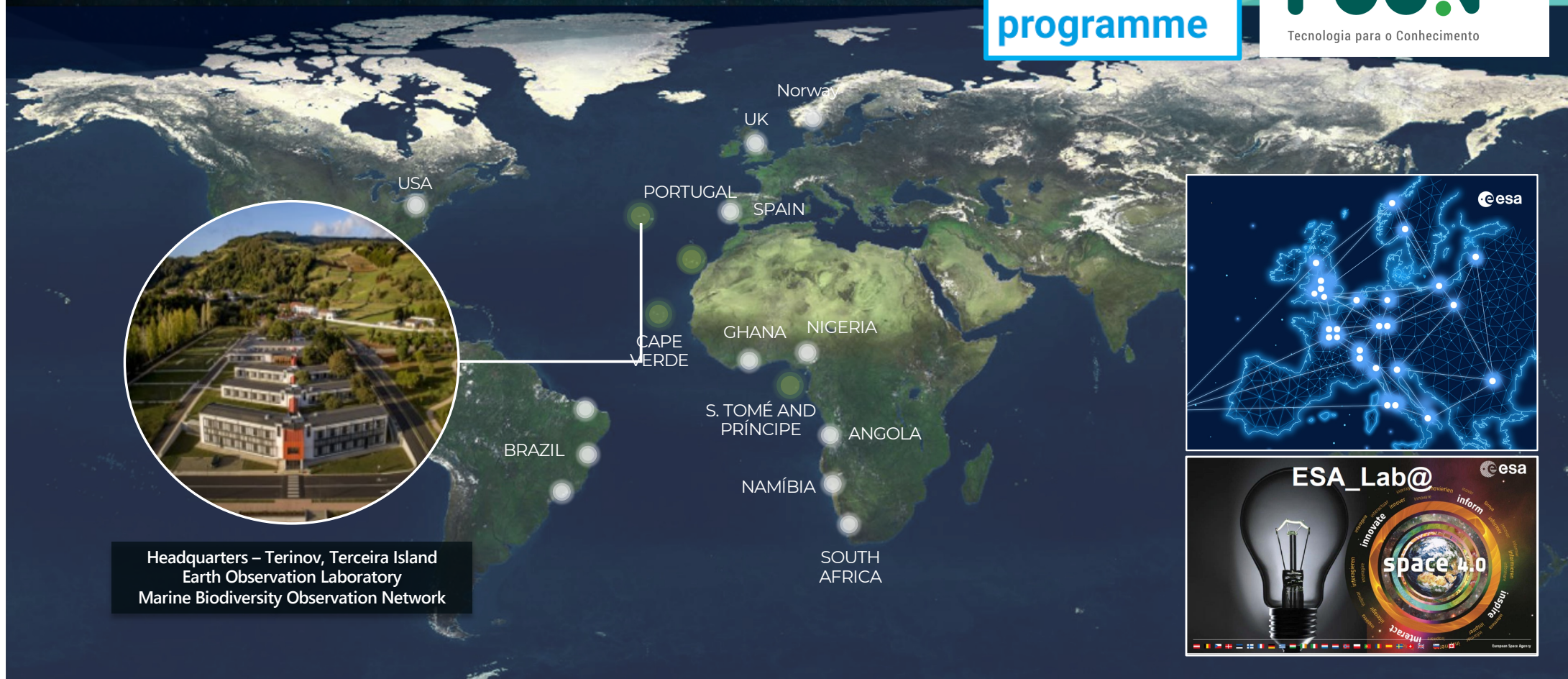
5. Data Centre (Hardware Infrastructure, Data Storage, and Processing)



AIR CENTRE Networks



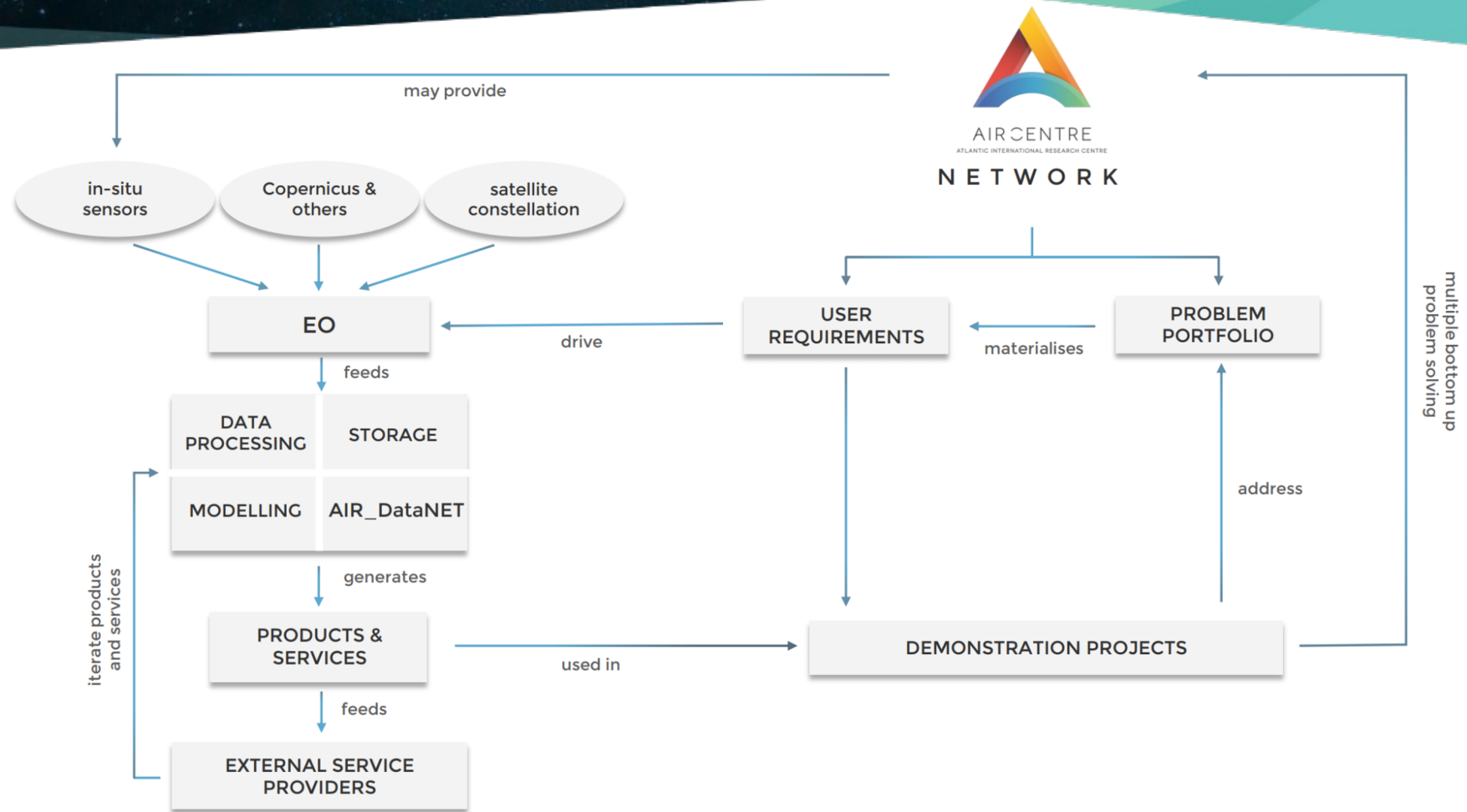
Headquarters – Terinov, Terceira Island
Earth Observation Laboratory
Marine Biodiversity Observation Network



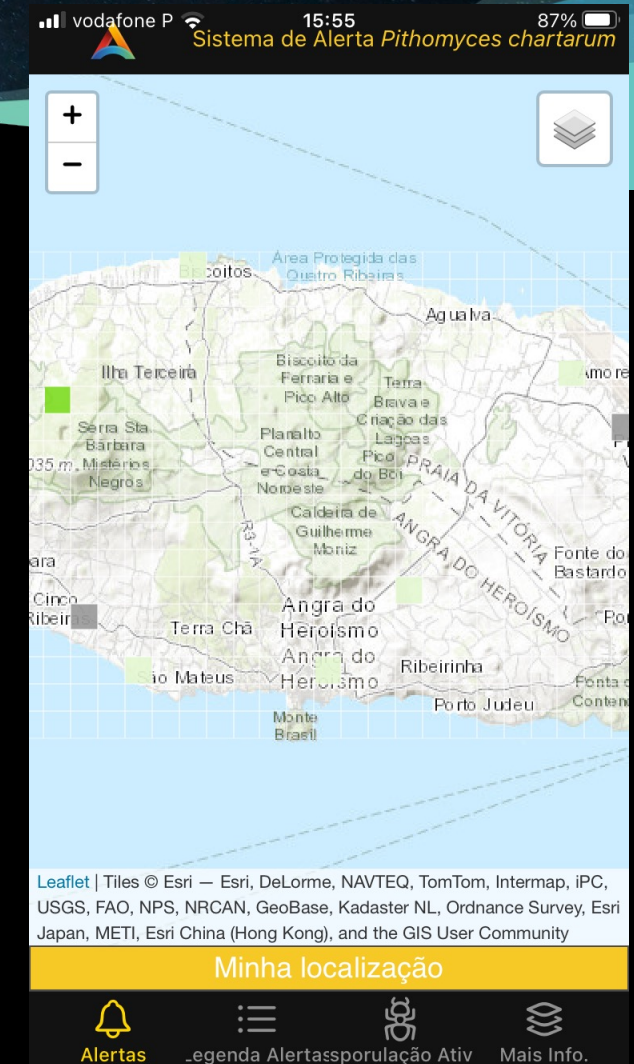


AIR DATA CENTRE

Standard use case



PRACTICAL EXAMPLES (2/2)



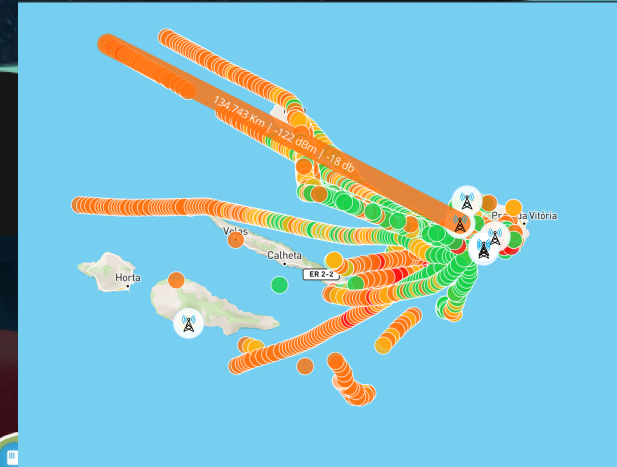
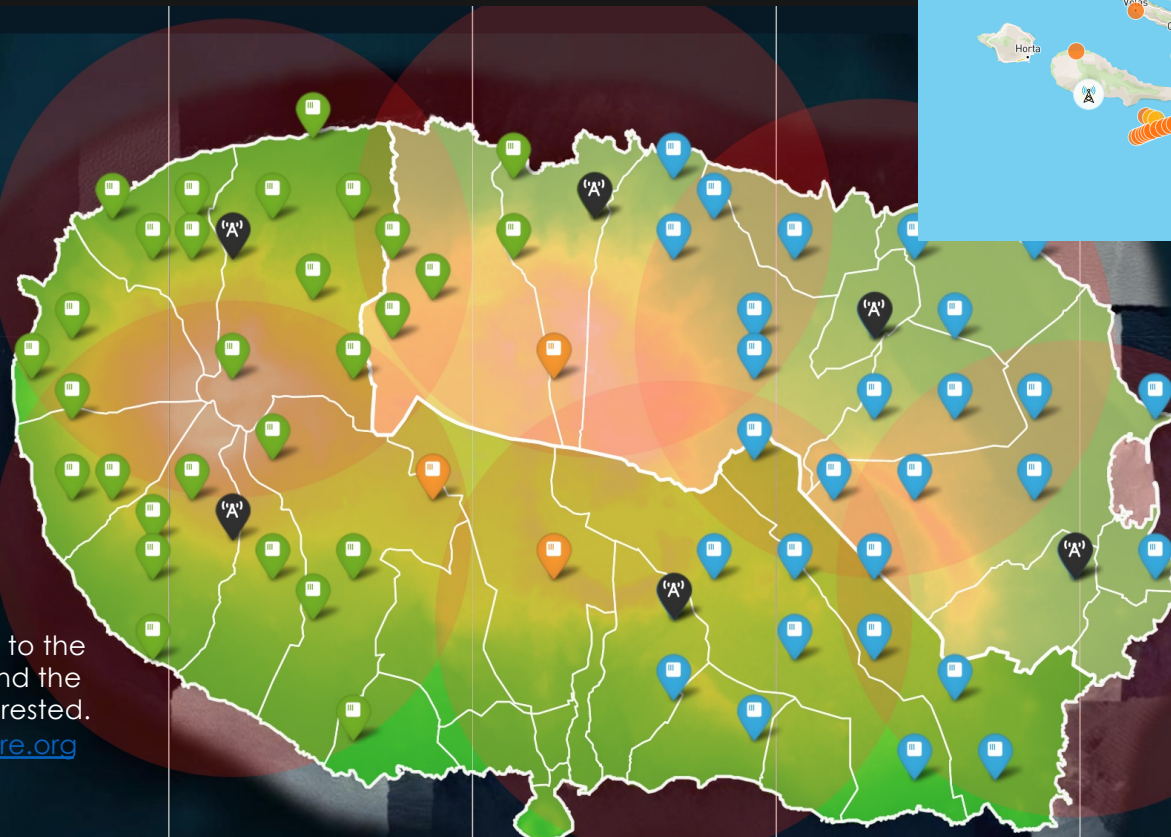


AIR DATA CENTRE

Communications Network



Azores IoT Network

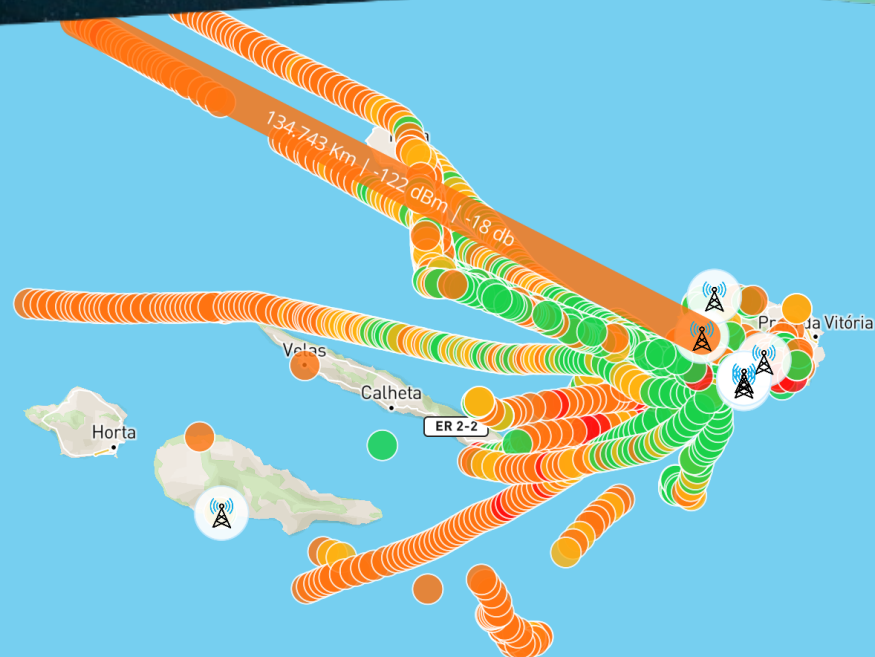


- ☐ Setores Alta Prioridade
- ☐ Esporos/grama
- ☒ Sensores Gr. Este
- ☒ Sensores Gr. Central
- ☒ Sensores Gr. Oeste
- ☒ Antenas
- ☒ Alcance Antenas
- ☐ Setores Nomes

The Azores IoT Network is expanding to the whole Azores, covering both land and the ocean and is available to those interested. Please contact joao.pinelo@aircentre.org for access.



AIR DATA CENTRE Communications Network



Azores IoT Network – current coverage

LoRaWAN TERCEIRA
MEDIÇÕES DE QUALIDADE DE SINAL



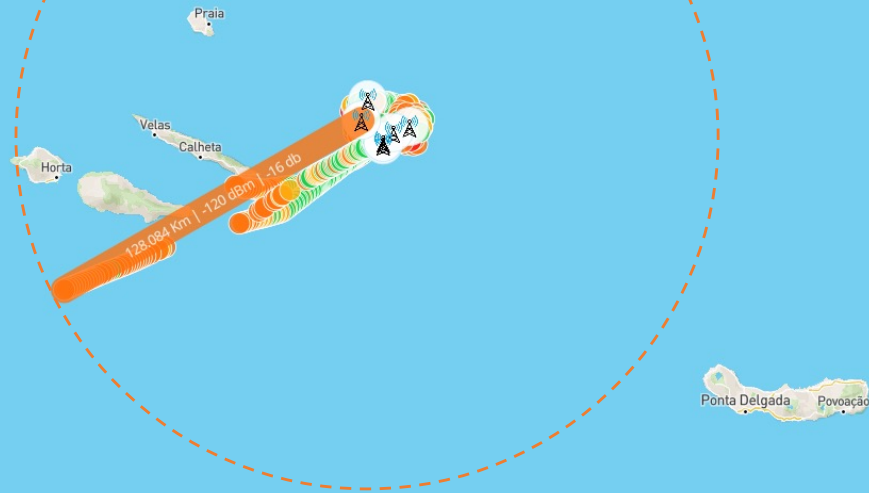
© Mapbox © OpenStreetMap Improve this map



AIR DATA CENTRE

Communications Network + ZLT = EEC Coverage

Azores IoT Network



Potential to cover most of the Azorean ZEE





AIR DATA CENTRE

Data centre + Direct Receiving Station

Direct Receiving Station

- 300GB of EO data, daily
- Real-time (Low-latency 6-13min.)
- Satellites:
 - Terra
 - Aqua
 - Suomi-NPP
 - FengYun
 - JPSS-1
- Several instruments
- Dozens of products



Info @ <https://aircentre.io/app/apis/>



AIRCENTRE



Data

Near real-time

Earth Observation Data
Access via API (soon)

Catalogue at

<https://aircentre.io/app/apis/>



AIRCENTRE

AIR Datacentre

Data centre + Direct Receiving Station

Compute Services

Co-location (available now)

Infrastructure-as-a-Service (soon)

Platform-as-a-Service (soon)

Software-as-a-Service (soon)

Including
Data Science Platform

Core Switch 2 x 2 100Gbps
High-av. NVMe storage





AIR DATA CENTRE

DRS

Examples of data products created daily

For a comprehensive list please visit:

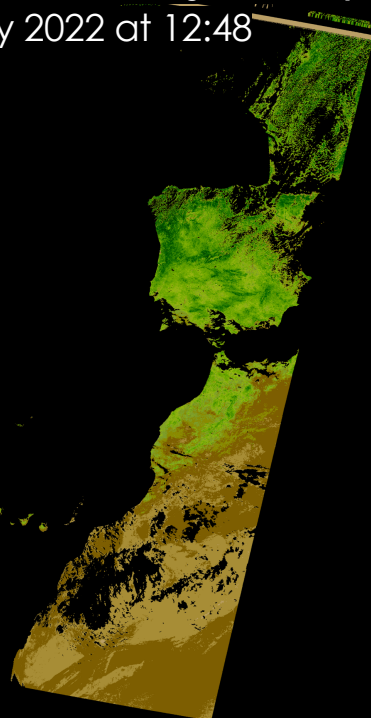
<https://www.aircentre.io/app/apis/>



Access the data via API (under development). API updates and access on the website above. API v1.0 estimated in January 2023

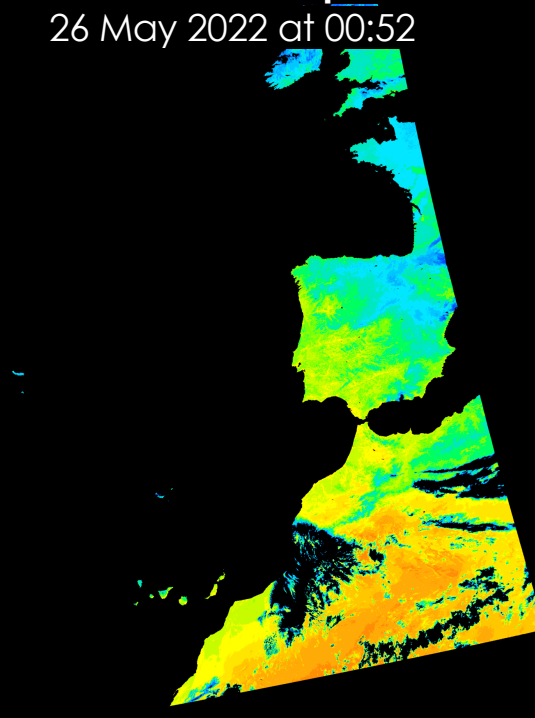
NDVI (Normalised Difference Vegetation Index)

25 May 2022 at 12:48



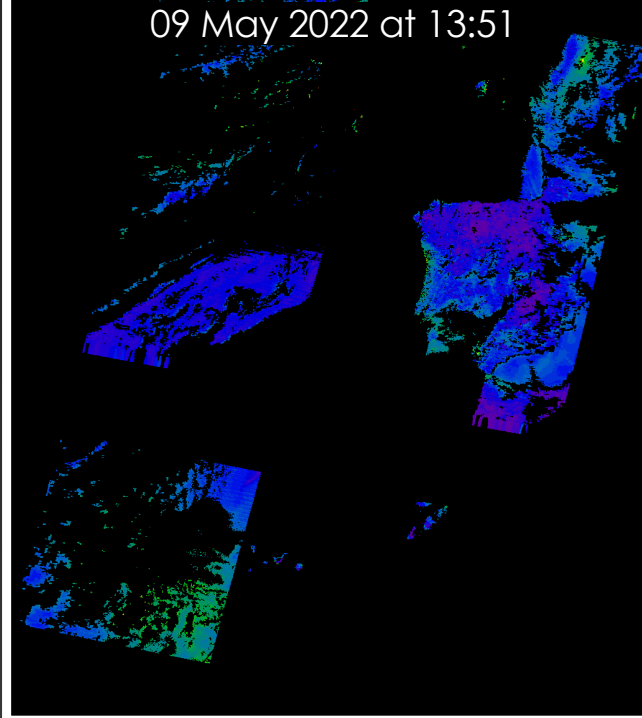
Land Surface Temperature

26 May 2022 at 00:52

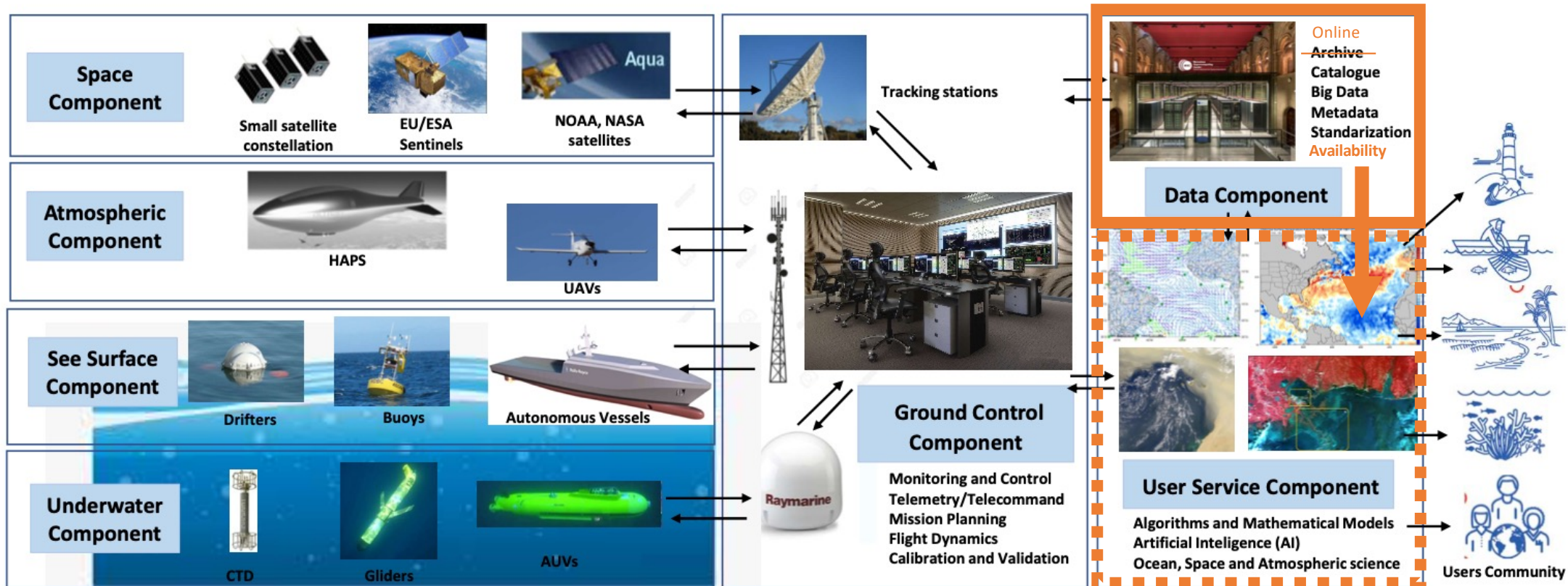


Aerosols

09 May 2022 at 13:51



(Atlantic Pole to Pole System Of Systems)



Integrating data from internal and external sources



AIR DATA CENTRE

API-first SOA Data Architecture



Human entry point



Machine entry point (Apps, AI, ML)

Software Packages

- + Provide easier and concentrated access to APIs
- + Provide access to data and to common operations
- + For most common data science programming languages R & Python
- + Open source
- + Chronological Synchrony

Programatic-only access Est. traffic: 90%

(Micro) Services (via API)

- + Flexibility, scalability, performance
- + Access and common operations (run close to data)

Programatic-only access Est. traffic: > 95%

APIs (Application Programming Interfaces)

- + Provide access to data (in a structured and safe manner)
- + Preserve data integrity
- + Provide scalability
- + Enable automation
- + Increase availability
- + Increase efficiency

Programatic-only access Traffic: 100%

Web interface

- + Available to any web user
- + Complete catalogue

Est. traffic: 10%

AIRCentre's data (@ AIR DATA CENTRE + Public Cloud)

Other data

Open source software ecosystem with high potential to create communities around user/developers

On-premises computation TERinov

Computation

Storage

Skill access level

Higher level



AIR DATA CENTRE

Quick facts

- **F**indability – Comprehensive indexing of metadata in searchable database
- **A**ccessibility – Open & free API + Platforms
- **I**nteroperability – Separation of concerns
- **R**euse – Comprehensively catalogued at acquisition

<https://www.go-fair.org/fair-principles/>



AIR DATA CENTRE

Quick facts - Hardware

- Core Switch speed 100 Gbit/s (Gigabit per second)
- 2 x 2 ports per node
- Storage + Web Servers
 - 100 TB NVMe + 5 TB SSD (RAID 6)
 - 1.5TB (8 x 192) + 96GB (3 x 32) Memory
 - 8 x 24 Cores + 3 x 32 Cores
- Serial and Parallel Processing
 - Under study

