



A Satellite-based analysis Tool for Rapid Evaluation of Aquatic environments (STREAM)

Nima Pahlevan, PhD
Research Scientist
NASA Goddard Space Flight center
Earth Science Division

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Objective

- **Facilitate the way satellite data are utilized in decision-making, i.e., augment existing field-based monitoring programs**

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STREAM's functionalities

- Detecting anomalies (e.g., HABs, sedimentation)
- Visualization & analyses

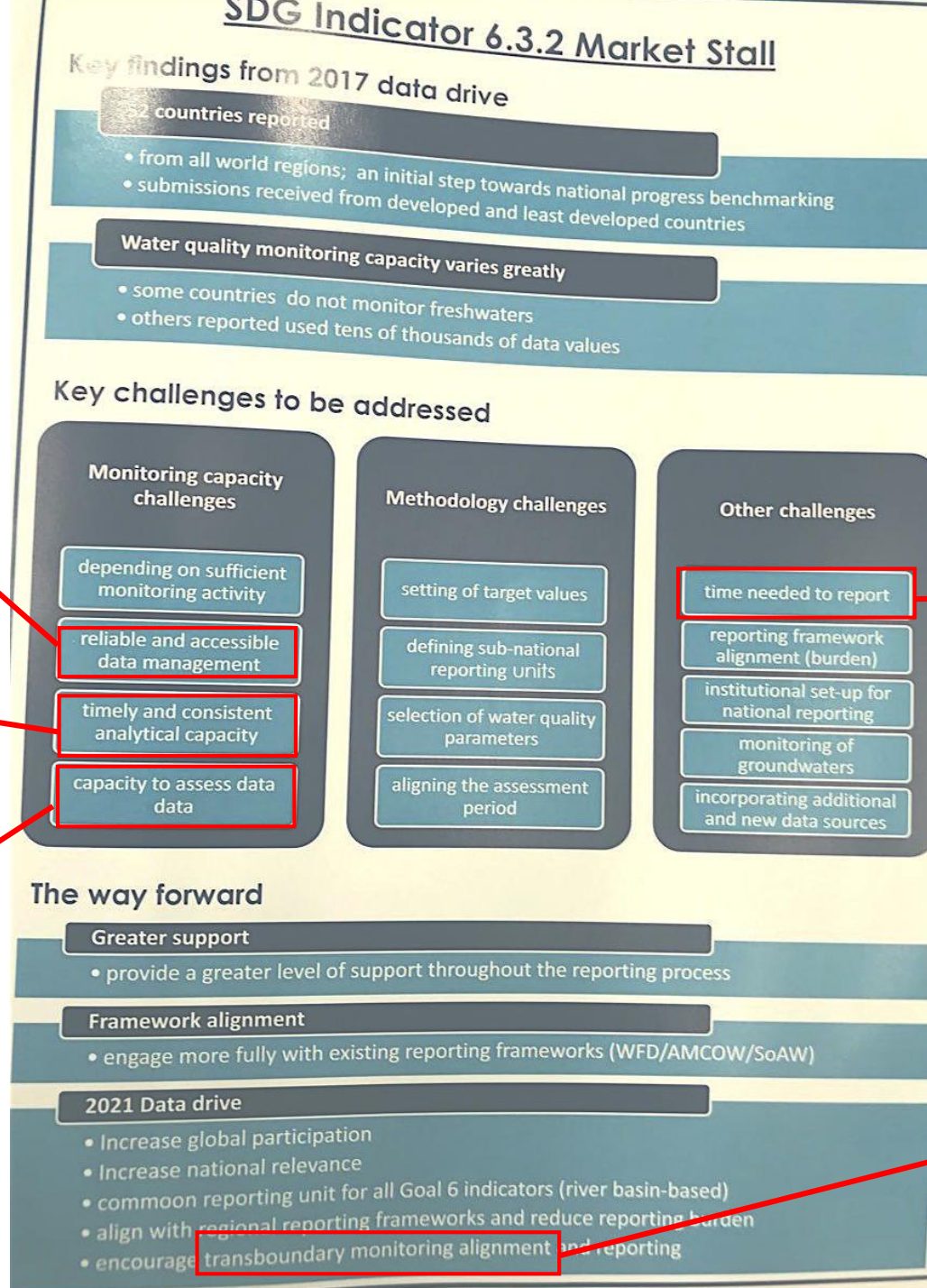
Visualization

Analysis

Reliable and accessible data management

Timely and consistent analytical capacity

Capacity to assess data quality

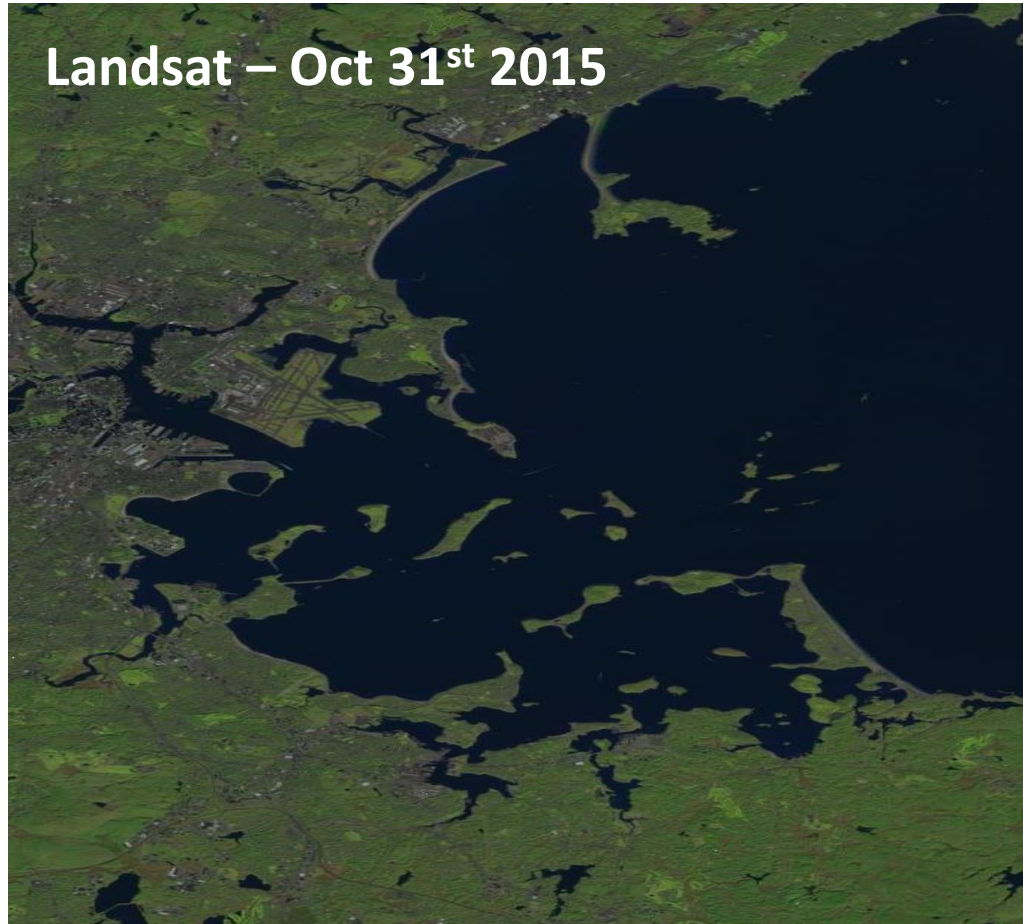


Time needed to report

Transboundary monitoring



Aquatic remote sensing: Turning an image into useful information

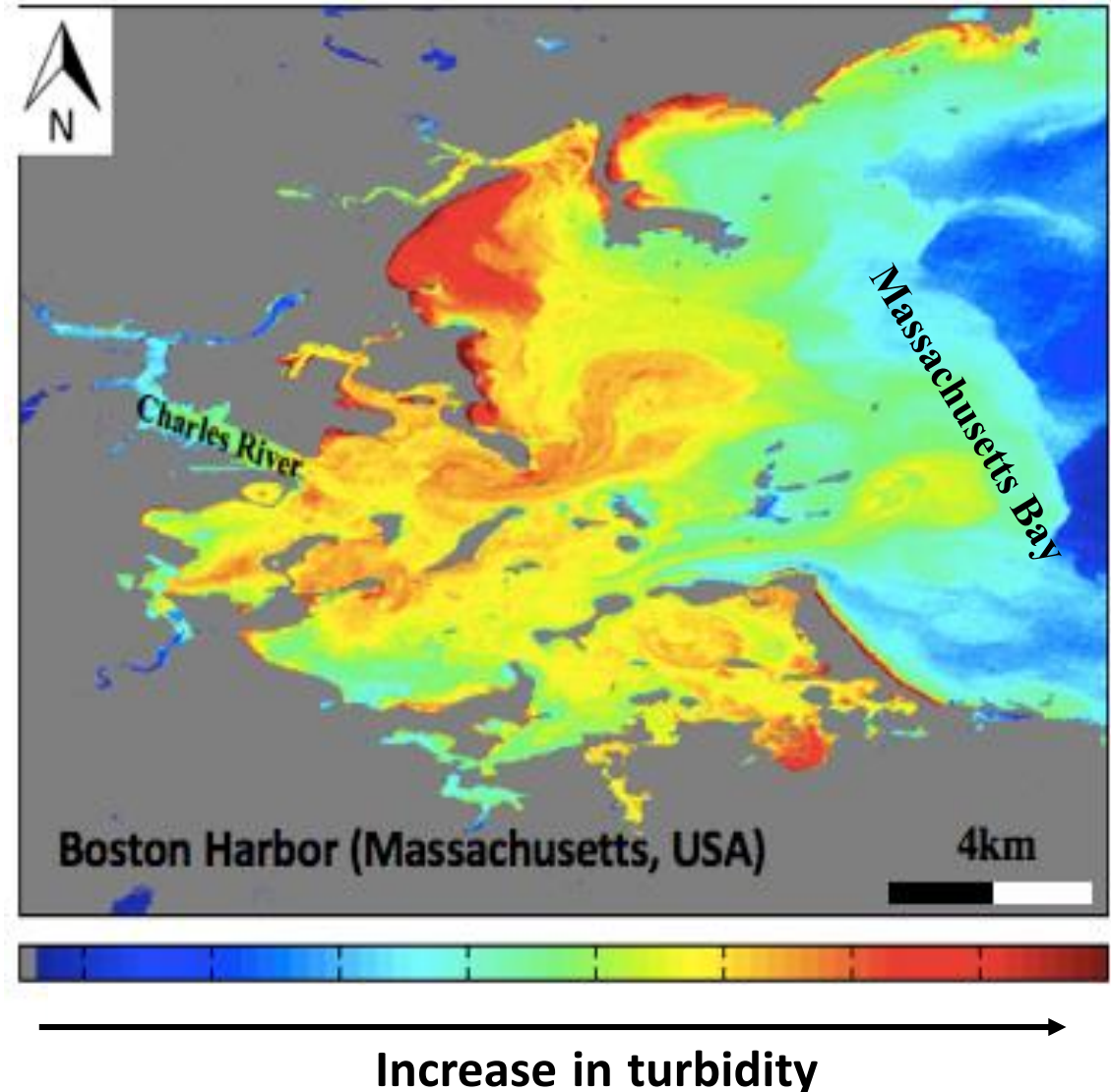


Boston Harbor, MA

Aquatic remote sensing: Turning an image into useful information



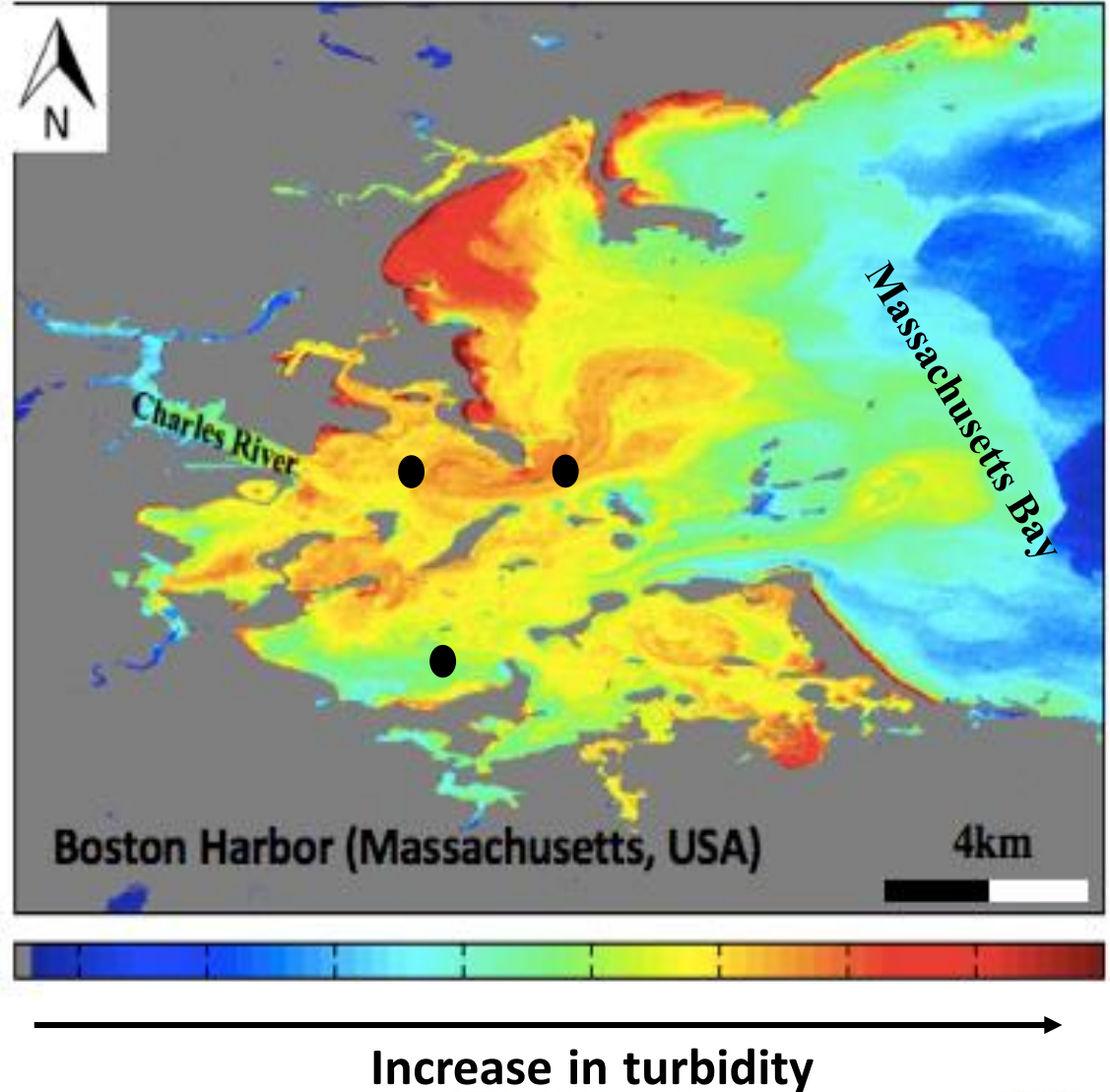
Boston Harbor, MA



Aquatic remote sensing: Turning an image into useful information



Boston Harbor, MA



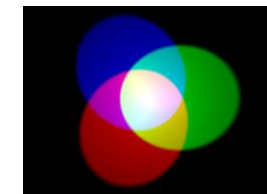
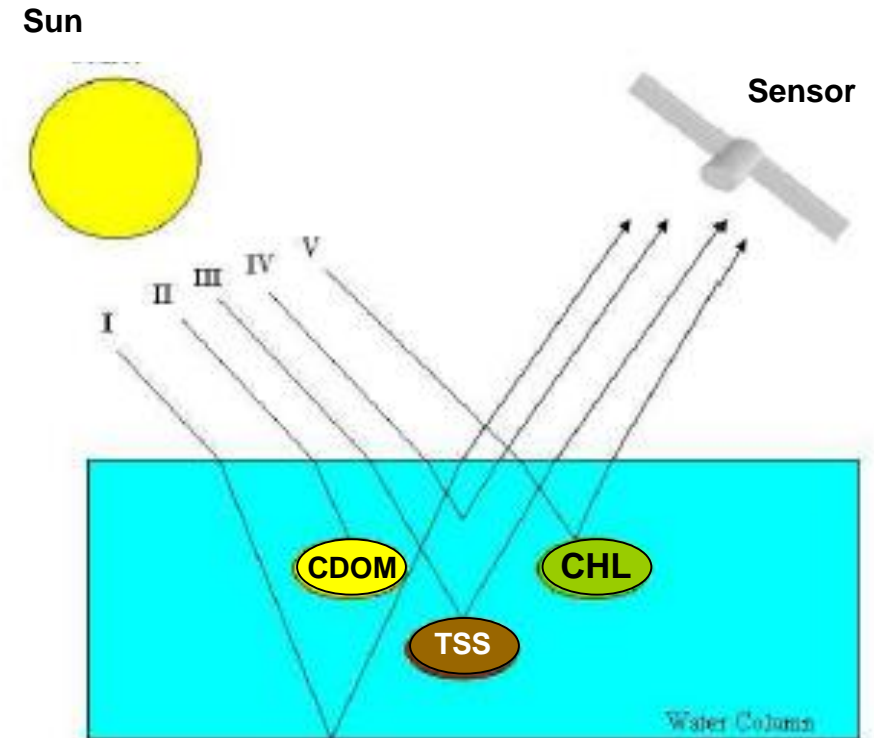
Which SDG 6 indicators can be monitored?

- Concentrations of
 - Chlorophyll-a (**CHL**)
 - Total suspended solids (**TSS**)
- Colored Dissolved Organic Matter (**CDOM**)
- Turbidity/transparency

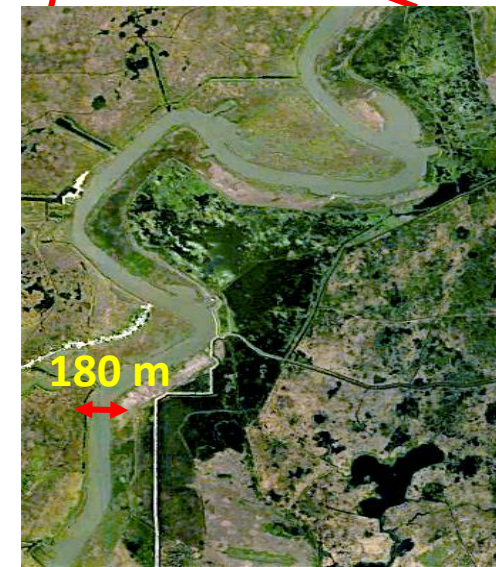
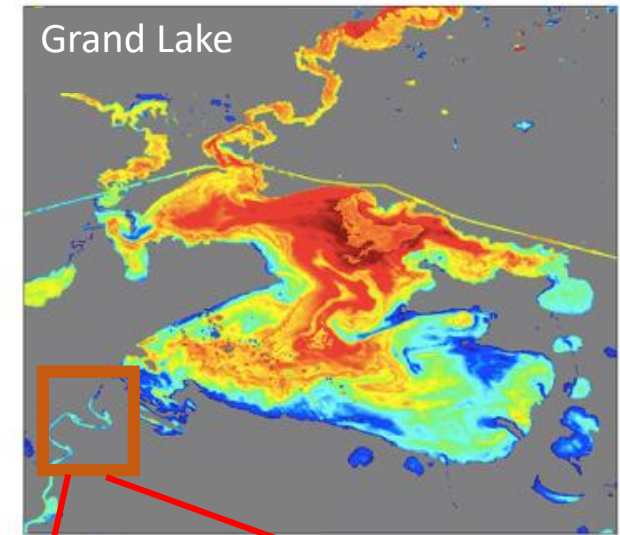
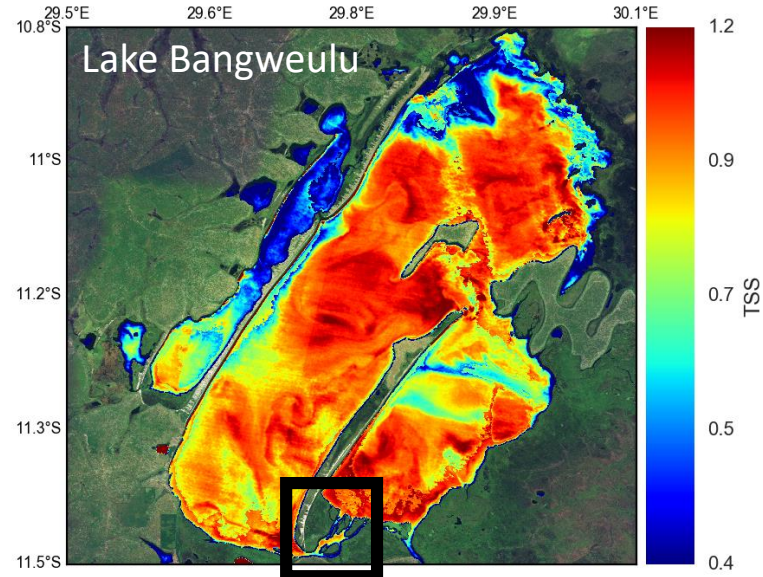
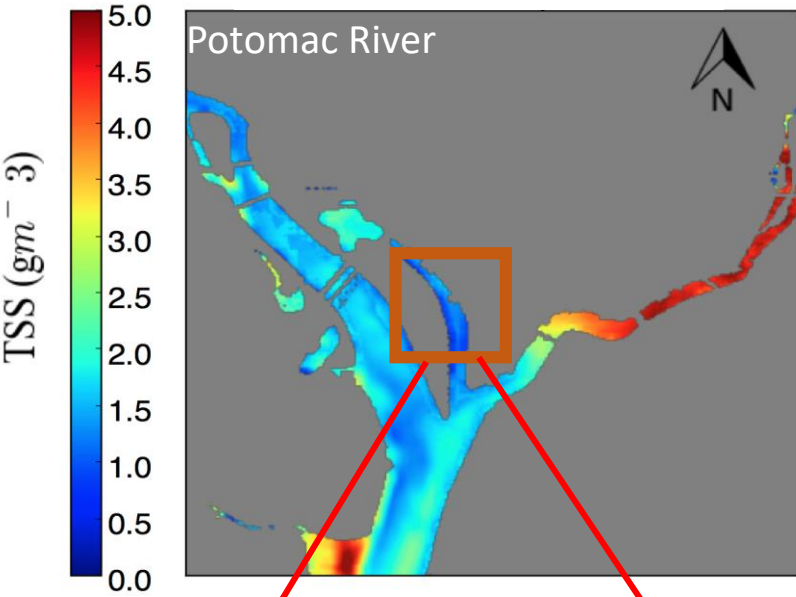
- Inverse Modeling

$$L_w \propto \frac{b_b}{a + b_b}$$

b_b Total backscattering
 a Total absorption
 L_w Water-leaving radiance

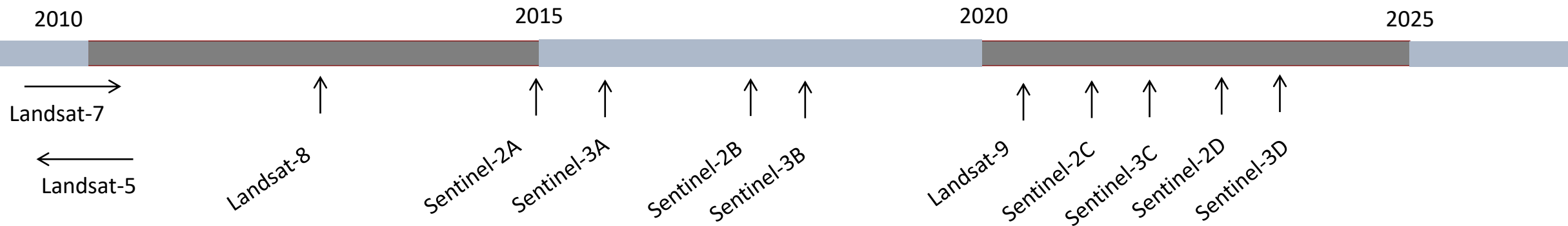


At what scale?



Why now?

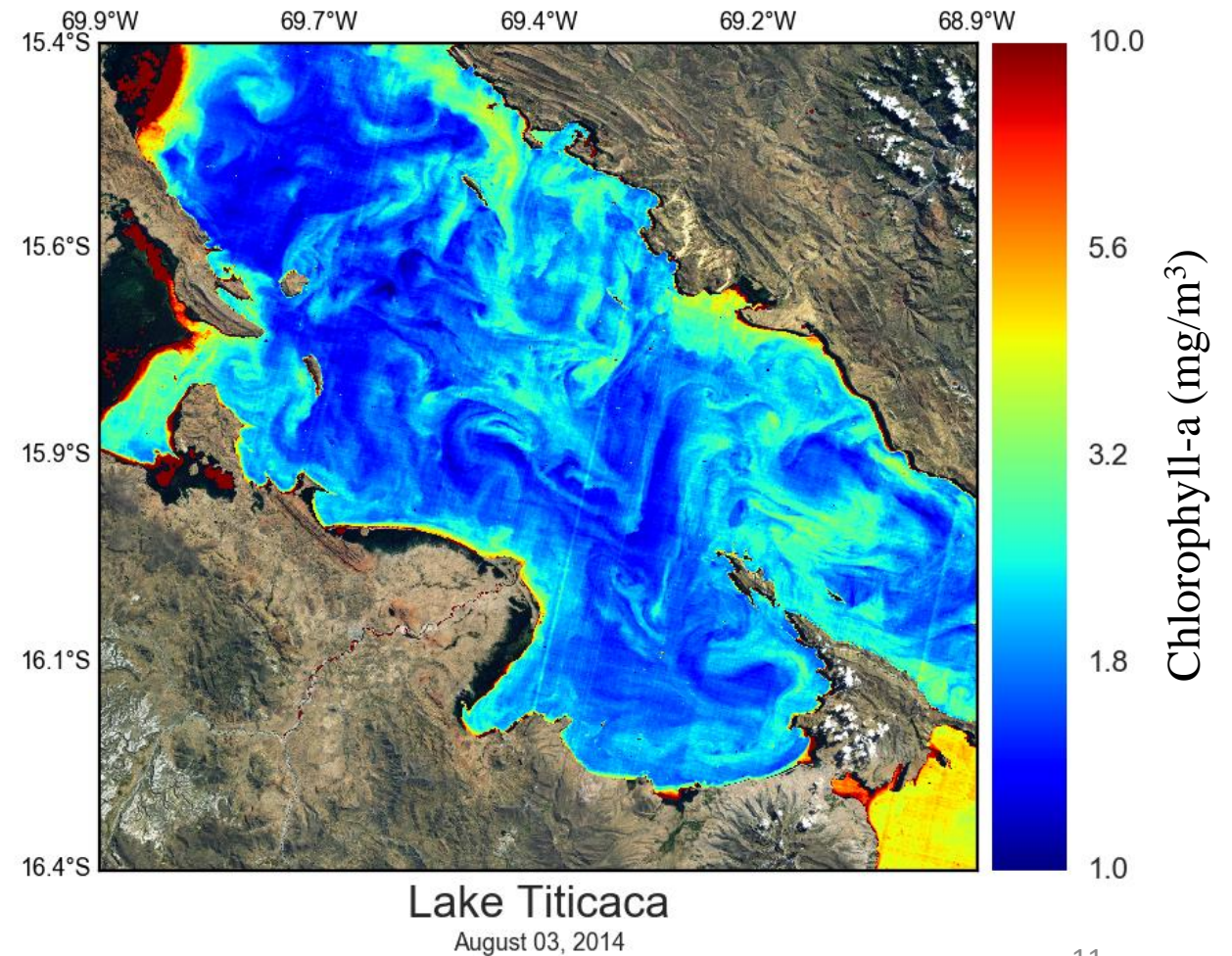
- Open data policy: Enhanced data quantity & quality



Constellations of satellites until ~2030
2-3 day revisit time
10 to 300 m resolution

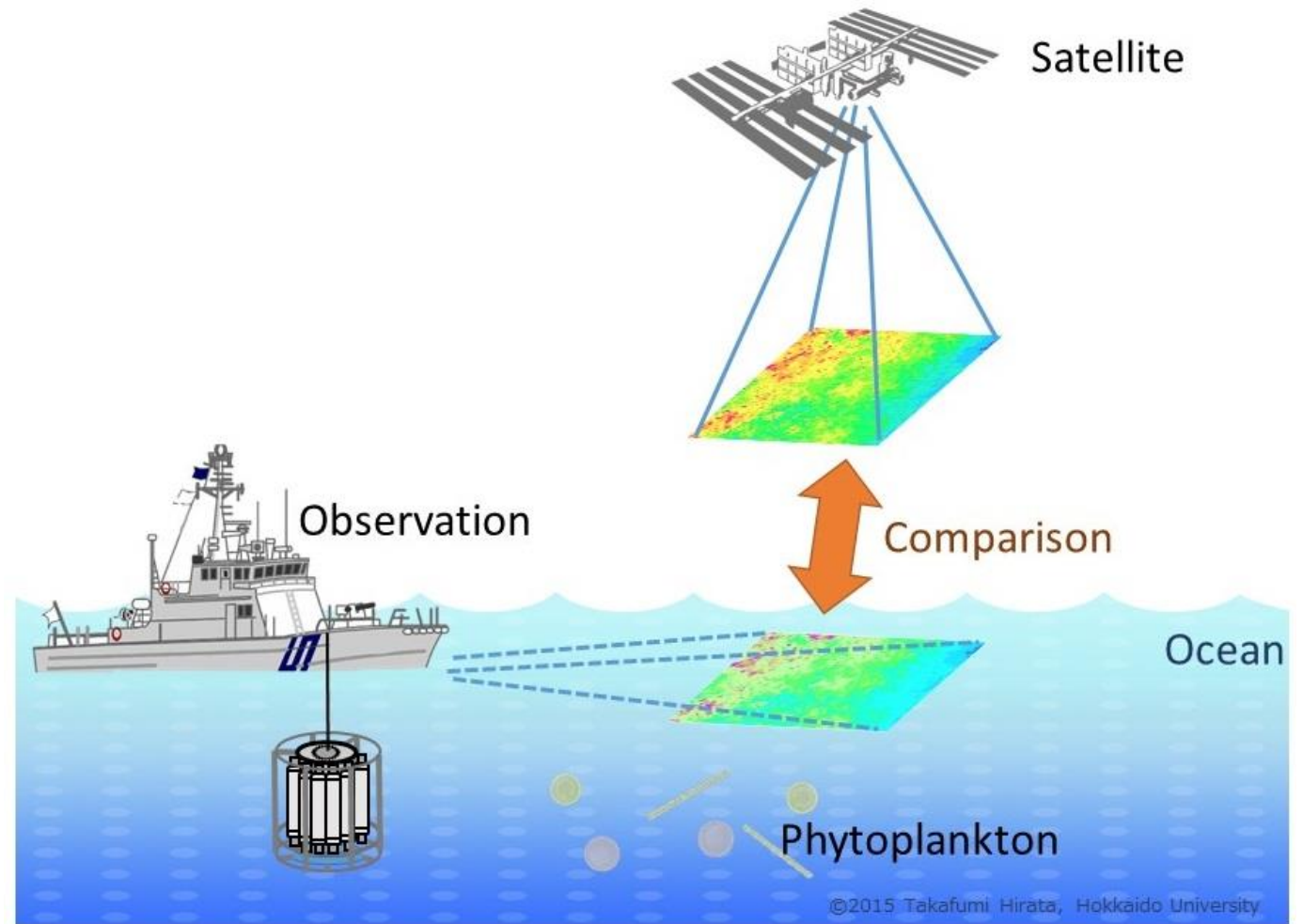
Where are we now?

- **Prototyping & validating** this tool at select sites



Validation

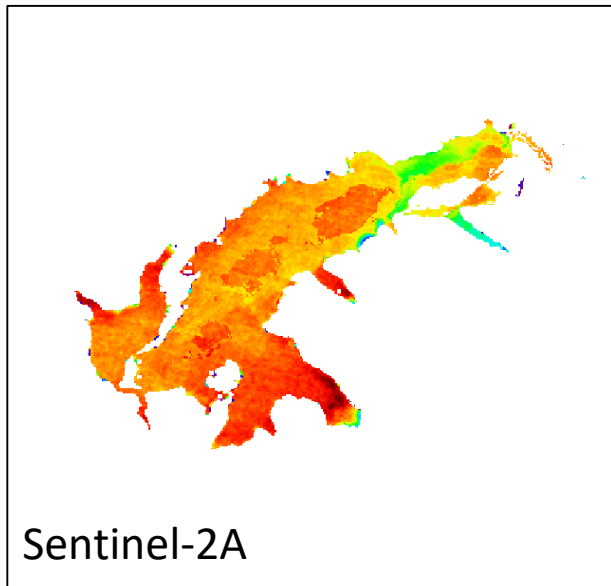
- Feedback on how realistic satellite products are
- A strong partnership with **Perú, Uruguay, Brazil** exists. Representatives (POCs) in countries are identified.



Example: El Frayle

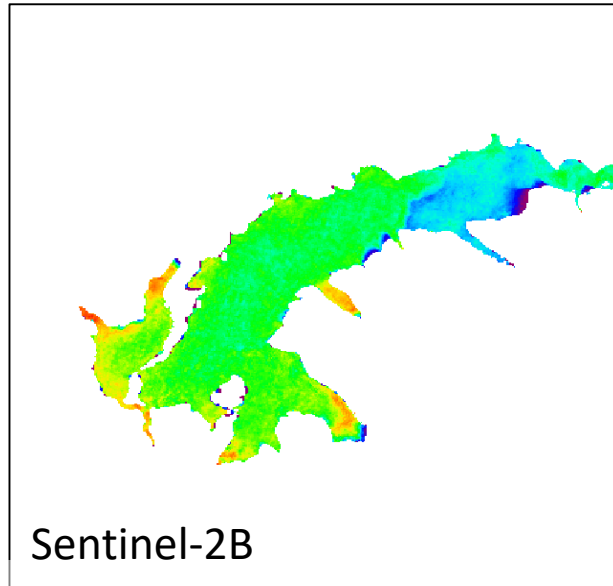
Reservoir in Perú: water supply
for Arequipa city

31st March 2018



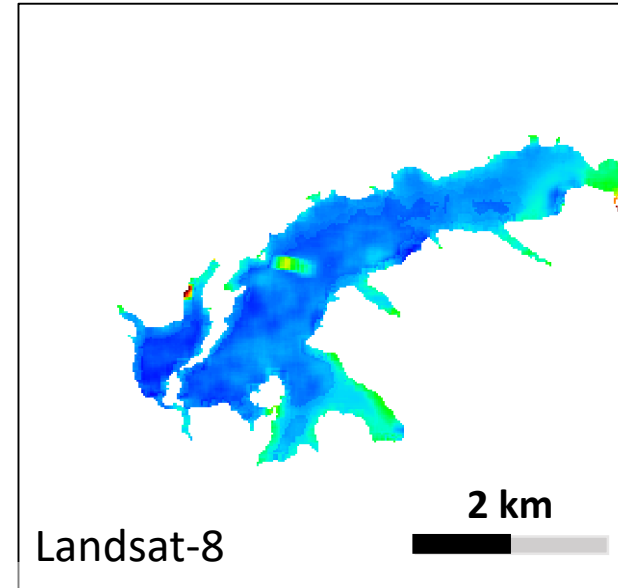
Sentinel-2A

05th April 2018



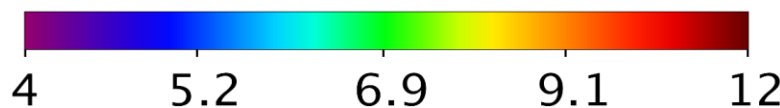
Sentinel-2B

15th April 2018



Landsat-8

chlor_a (mg m⁻³)



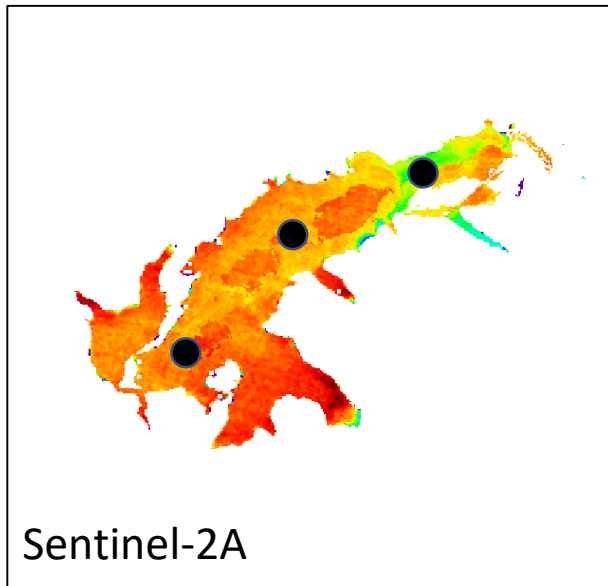
Chlorophyll-a

Example: El Frayle

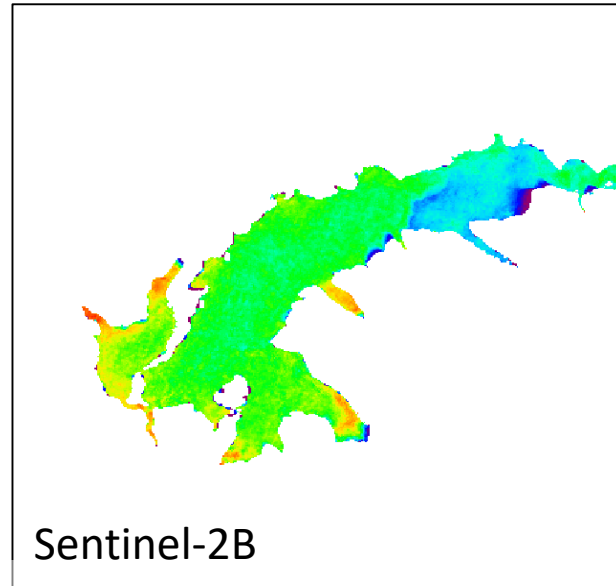
Reservoir in Perú: water supply
for Arequipa city

Current monitoring:
Monthly at 3 locations

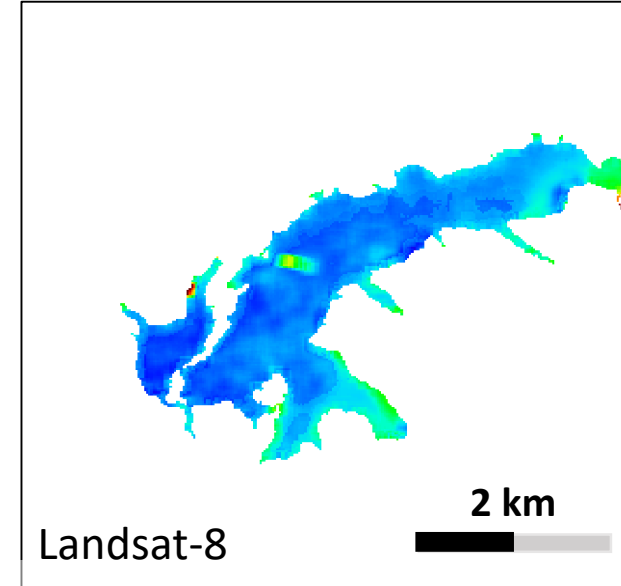
31st March 2018



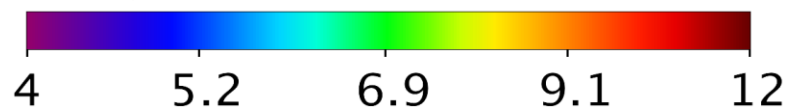
05th April 2018



15th April 2018



chlor_a (mg m⁻³)

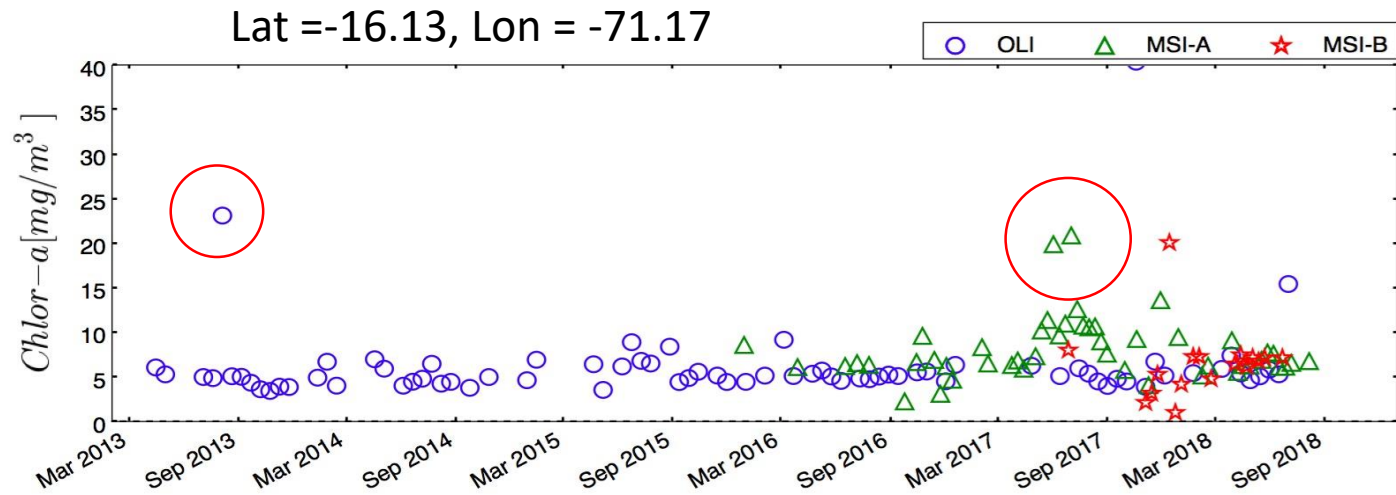


Chlorophyll-a

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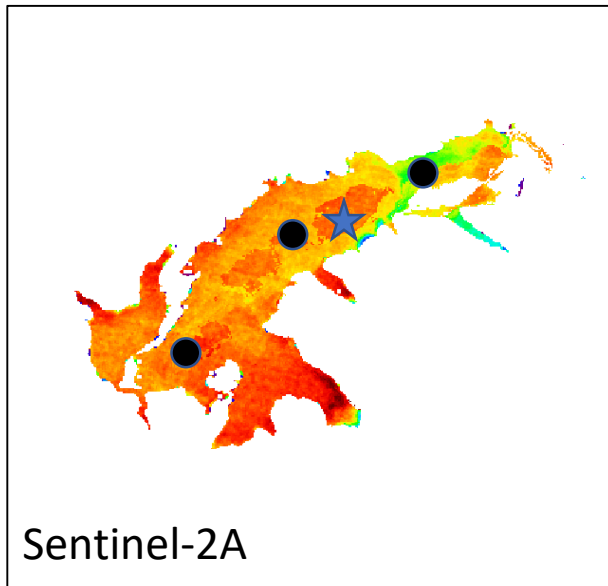
Reservoir in Perú: water supply for Arequipa city

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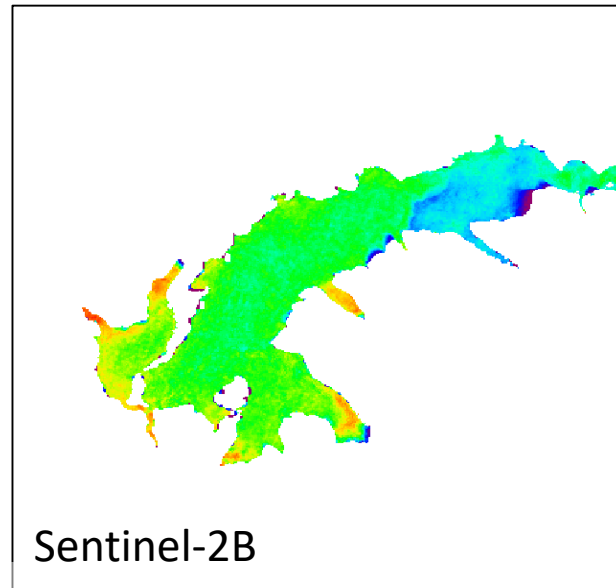


Time-series corresponds to the marked star

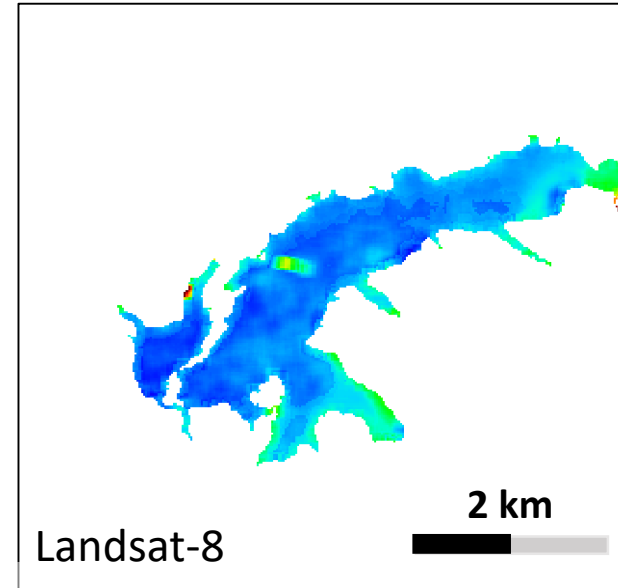
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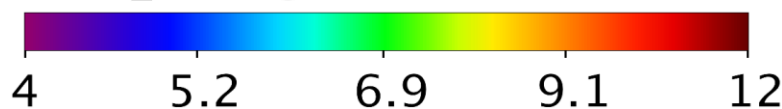
05th April 2018



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chlor_a (mg m⁻³)



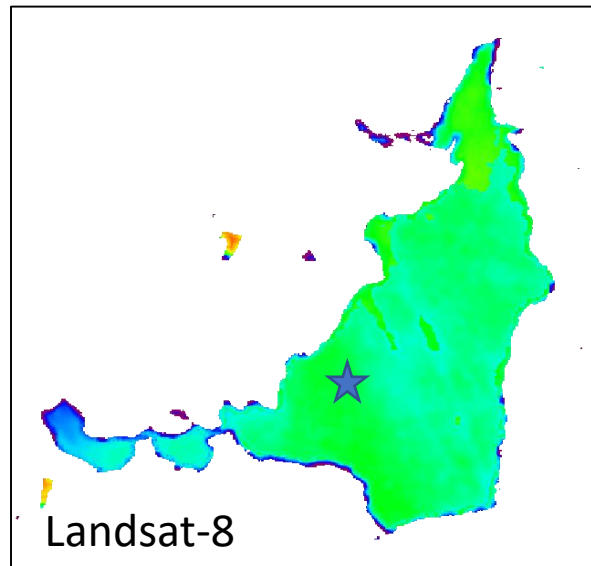
Chlorophyll-a

Example: Laguna del Sauce

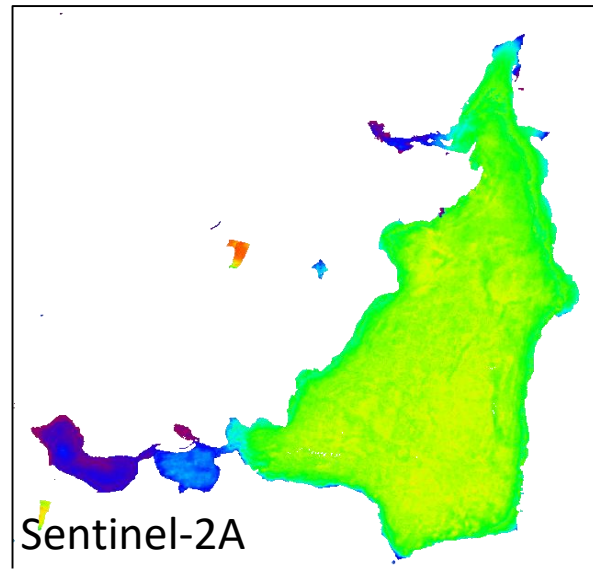
Reservoir in Uruguay: water supply for a major resort

Current monitoring
Monthly at 4 locations

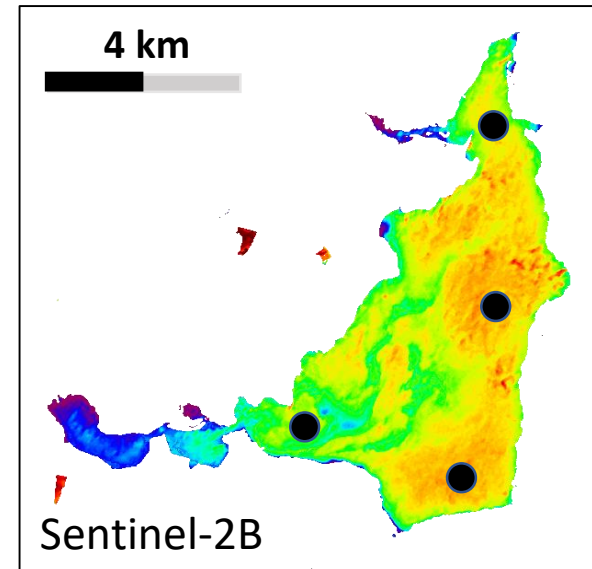
24th Sept 2017



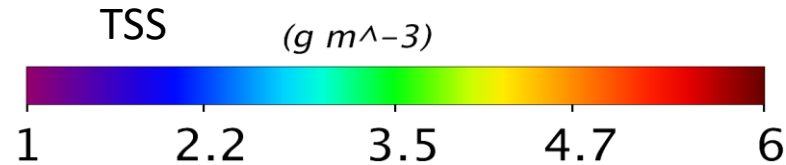
15th Oct 2017



29th Nov 2017



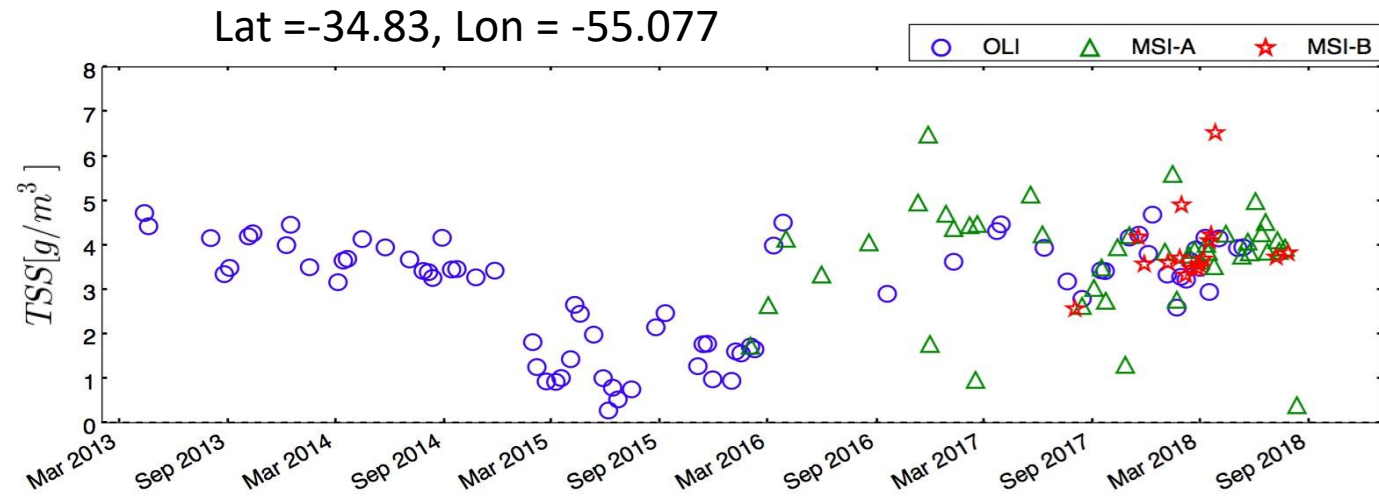
Total Suspended Solids
(TSS)



Example: Laguna del Sauce

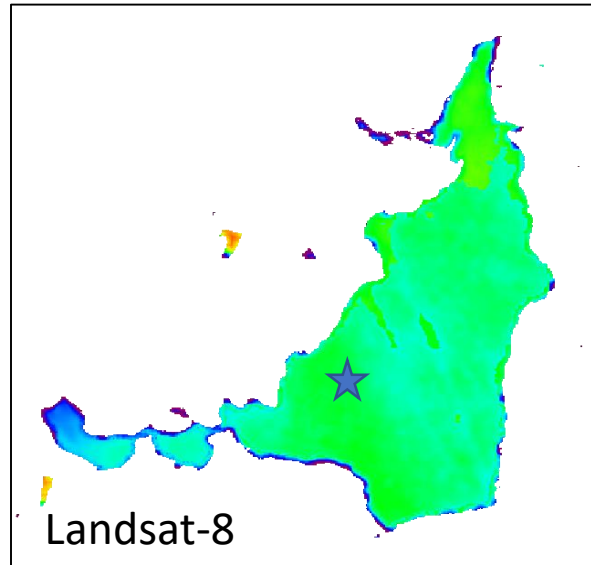
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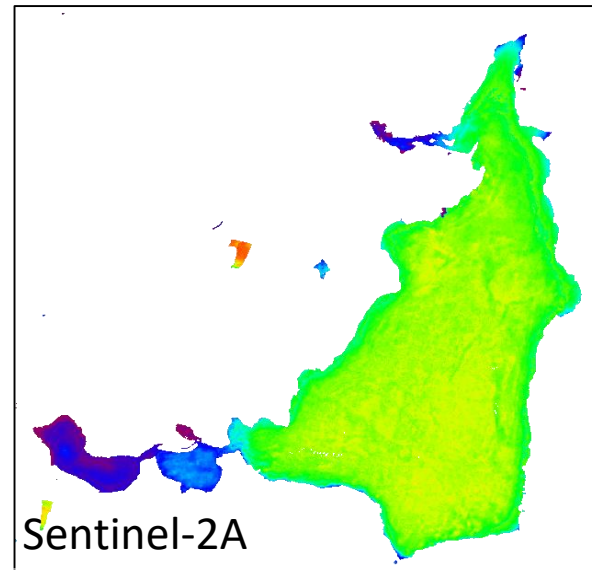


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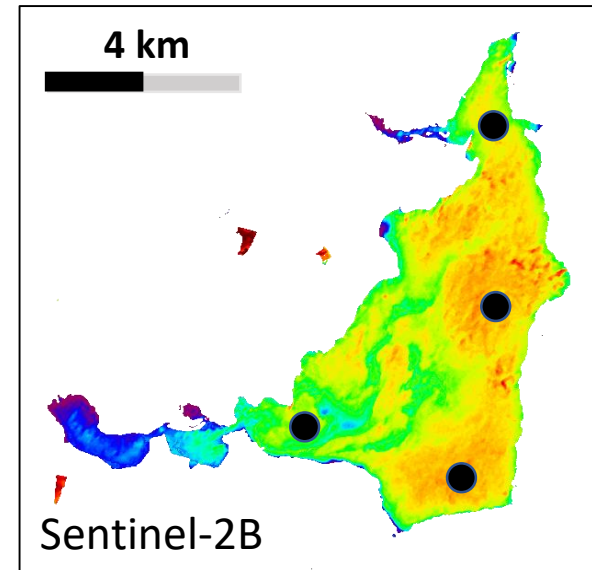
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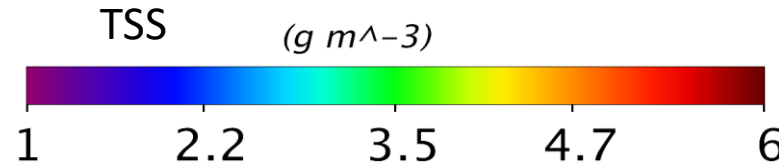
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29th Nov 2017



Total Suspended Solids
(TSS)

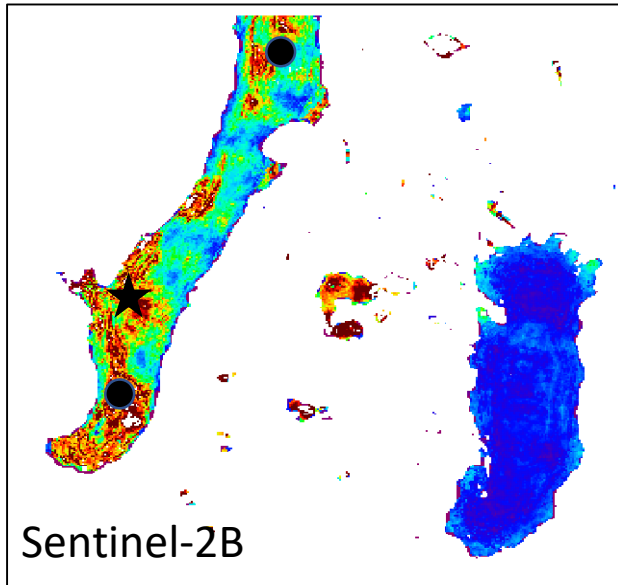


Example: El Pañe

Reservoir in Perú: water supply
for Arequipa city

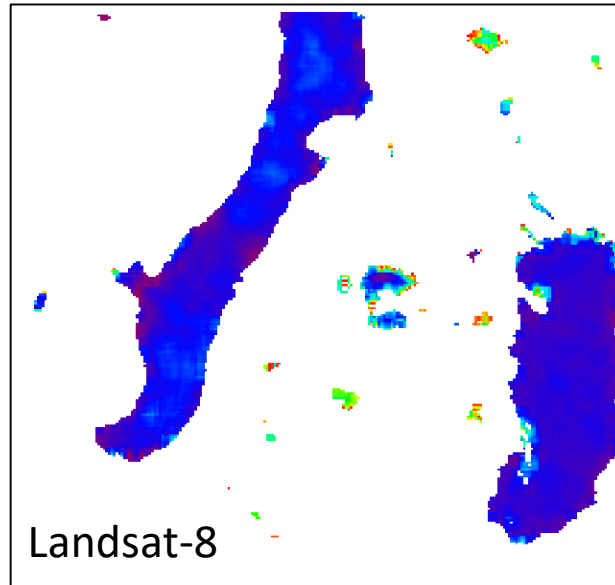
Current monitoring:
Monthly at 2 locations

29th June 2017



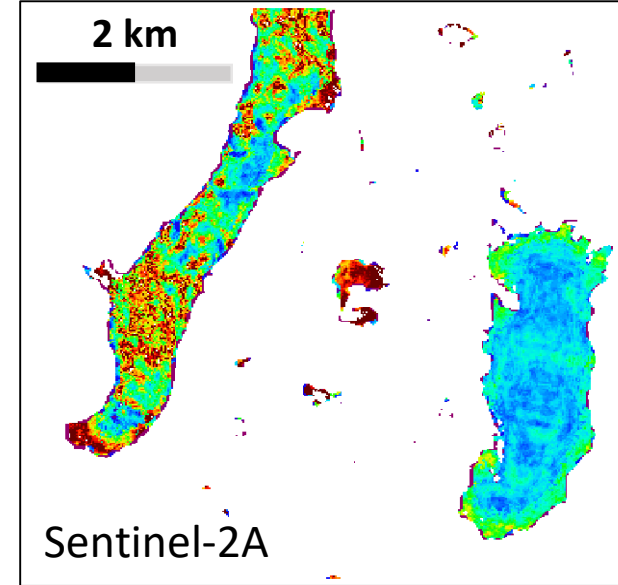
Sentinel-2B

17th July 2017



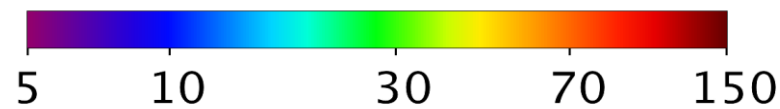
Landsat-8

13th August 2017



Sentinel-2A

chlor_a (mg m⁻³)



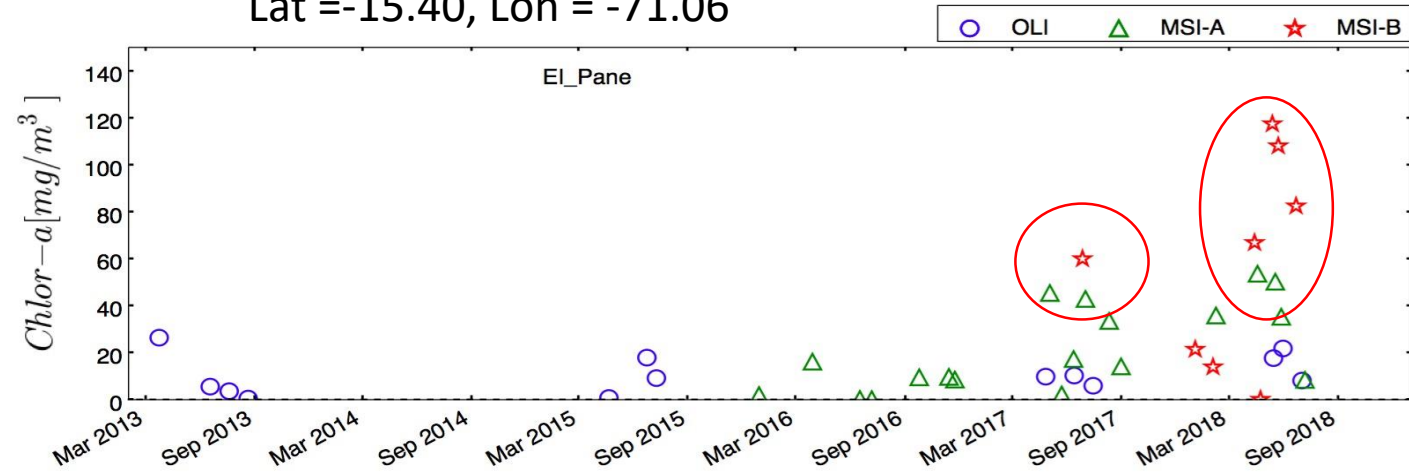
Chlorophyll-a

Example: El Pañe

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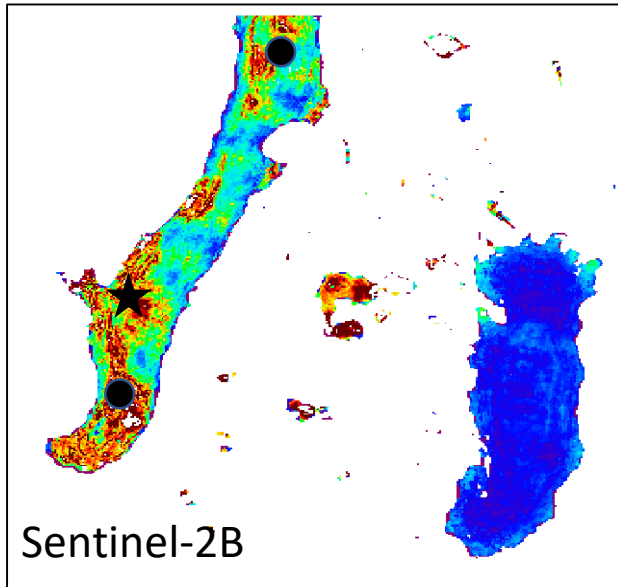
Current monitoring:
Monthly at 2 locations

Lat = -15.40, Lon = -71.06



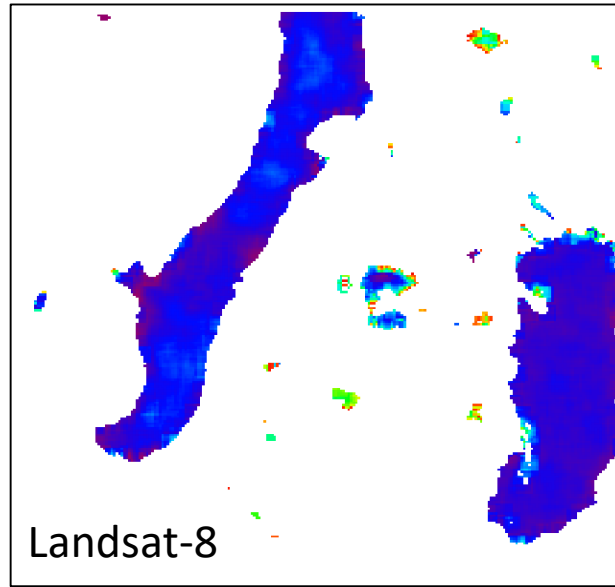
Time-series corresponds to the marked star

29th June 2017



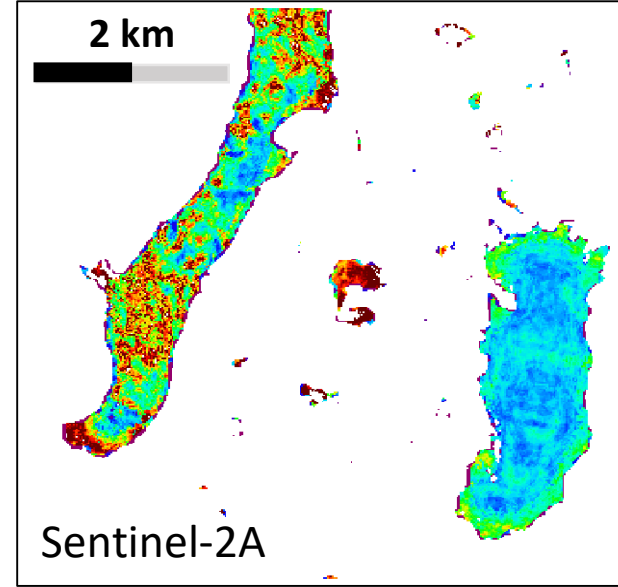
Sentinel-2B

17th July 2017

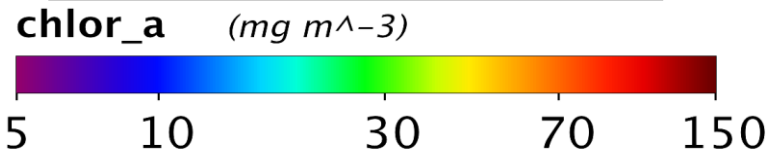


Landsat-8

13th August 2017



Sentinel-2A



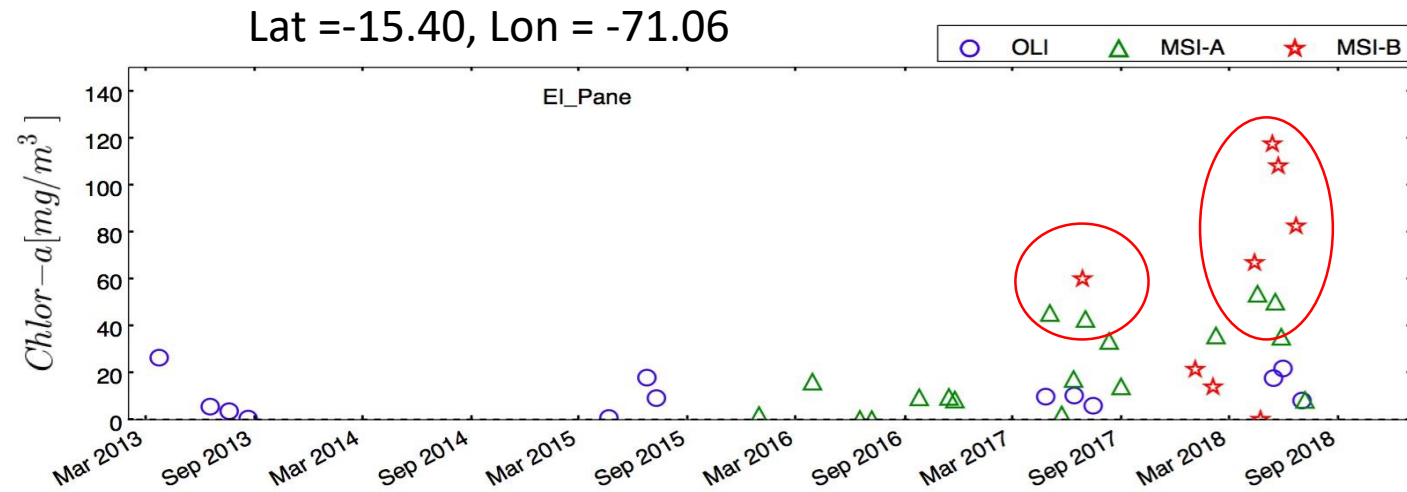
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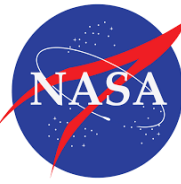


Time-series corresponds to the marked location (star)

Feedback from ANA/Perú

About a “recent bloom” around June-July at El Pañe reservoir, during these months we had an biovolumen increase of cryptophyceae algae.

I will refresh the results table, we made samplings at two dates according to the “satellite schedule”, also I’ll add the phytoplankton biovolumen data (mm³.L).



Acknowledgements

- NASA, Applied Sciences Program
 - Argyro Kavvada
- NASA, Goddard Space Flight Center
 - Sundarabalan Balasubramanian
- UNEP
 - Jillian Campbell, Francesco Gaetani
- Water Authority of Perú (ANA)
 - Melissa Salbatier and Anthony Salzar
- Ministry of Environment, Uruguay
 - Virginia Fernandez (Division of Environmental Information)
- City of Rio de Janeiro
 - Felipe Mandarino
- Colombia
 - Claudia Nicol (IDEAM)





Takeaway message

- Tell us **where** you want this system to be tested. These (pilot) sites
 - Should preferably be **monitored** on a regular basis and have experienced management issues (e.g., harmful algal blooms).
 - Should be **large/wide enough** (i.e., > 150 meters).
- Help us validate satellite products by collecting field data when satellite is overpassing. The satellite overpass dates over your areas of interest will be provided.
- Training material: <https://arset.gsfc.nasa.gov/sdgs#SDG6>
- Contact: nima.Pahlevan@nasa.gov