

# THE PRISMA MISSION

## Status and updates

**Ettore LOPINTO – ASI**

Prepared by: E.Lopinto, P.Sacco



Agenzia Spaziale Italiana



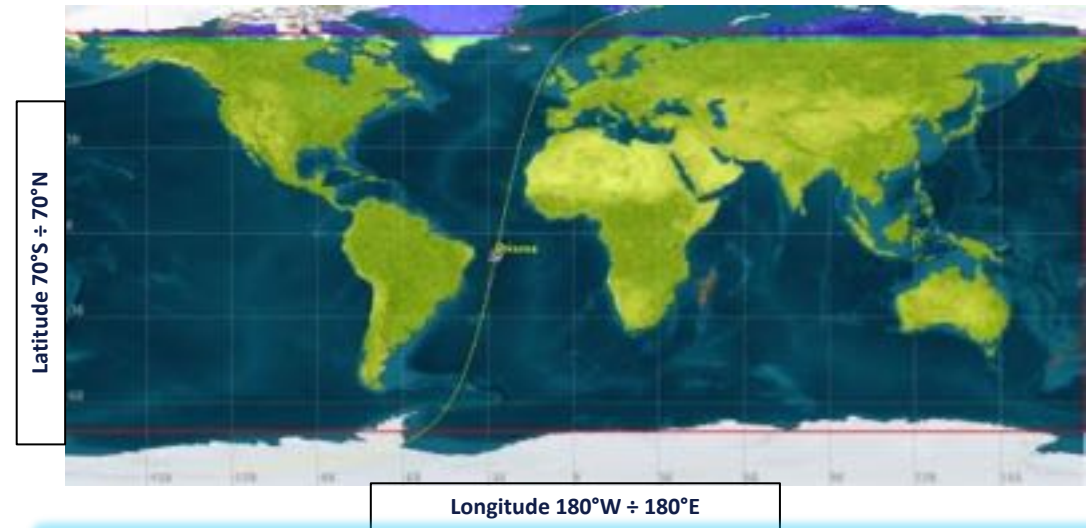
# Mission Overview



## PRISMA: PRecursores IperSpettrale della Missione Applicativa

- ❖ National EO hyperspectral Mission fully funded by ASI and realized by Italian Industries Consortium led by OHB Italia, Leonardo and Telespazio
- ❖ Mission conceived as a Pre-operational and technology demonstrator, with focus on
  - Space qualification of PAN/HYP payload
  - Development of PAN/HYP products up to Level 2D (BOA geocoded reflectance)
- ❖ Access to Users opened on May 2020 <https://prisma.asi.it/>

- ❖ PRISMA Records (pushbroom scanning mode) the radiation reflected from the Earth surface (spectral cubes) in 400nm – 2505nm spectral window
  - 240 total bands in VNIR (#66, 400–1010 nm) & SWIR (#174, 920–2505 nm), partial spectral overlap
  - High spectral Resolution (better of 14 nm)
  - Medium spatial resolution (30m) and swath (30km)
  - PAN camera (400–700 nm) offers added capability with 5m spatial resolution



### ❑ Primary mode – Manage user requests

- CALVAL sites (highest priority)
- Nominal requests from all registered users, subject to quota and a priority level (depends by the user type)
- Mission Manager can promote Nominal Requests already Accepted to Very Urgent, for insertion in next day plan

### ❑ Background mission – Optimize system resources usage

- Generated to fill-up resources still available after planning of users requests or for systematic acquisitions

# Products and performances



All Product are in **HD5-EOS** format and include HYP data cube + PAN image + metadata

- ❖ **Level 1: Top-of-Atmosphere Radiance** radiometrically corrected and calibrated in physical units (incl. Cloud mask; Sun-glint Mask; Classification Mask; Calibration and characterization data)
- ❖ **Level 2B: Geolocated at Bottom-of-Atmosphere Radiance**
- ❖ **Level 2C: Geolocated at Bottom-of-Atmosphere Reflectance** (incl. Aerosol Characterization Product (VNIR); Water Vapour Map Product (HYP); Cloud Characterization)
- ❖ **Level 2D: Geocoded version of the level 2C** products
- ❖ No further higher level products are foreseen

Absolute HYP **radiometric accuracy** better than **5%** (TOA or BOA)

**SNR 160:1** in VNIR and **100:1** in SWIR (240:1 in PAN)

**MTF (@Nyquist) 0.3 for HYP** and 0.2 for PAN

**Geometric localization errors** (CE90) better than **200m** (15m with GCPs, available starting in Q1 2023)

**System can acquire 223 spot (30x30 Km) images/day** (200.000 Km<sup>2</sup>) and **process 200 images/day up to L2D**

**Average response time** (from user order to product ready) is **7.5 days** (measured)

Images can be acquired **worldwide** but with illumination conditions **Solar Zenith Angle < 70 deg**



# Data Policy & Exploitation



- ❖ A simple policy has been approved by ASI: Free of charge & quasi-Open data to all for the 2020 year duration (renewable)
- ❖ This will allow
  - ❑ to lower the PRISMA data access barriers (to new acquisitions and archived data too)
  - ❑ to expand the PRISMA user community
  - ❑ to simplify the data exploitation
  - ❑ to build customer loyalty to PRISMA data
  - ❑ to gather a feedback from users, unbiased by external factors like user nationality, data price, etc

- ❖ A «quasi-Open» policy
  - ❑ Full support to National security needs
  - ❑ User Registration and Licence explicit acceptance **is required**
  - ❑ Each User will be allowed to use only a portion of the system resources, through **Priority and Quota**
  - ❑ Products use is allowed for scientific research, R&D of new applications, prototype services, **commercial purposes under specific rules**
  - ❑ Products are **costless** for the users
  - ❑ Products **cannot be redistributed**

- ❖ Exploitation with Science and User Community deep involvement
  - ❑ PRISMA Advisory Group for data Exploitation supporting the definition/updating of the mission exploitation scenario
  - ❑ International Collaborations: CNES, DLR, ESA, NASA-JPL mainly on CALVAL domain
  - ❑ Training & Outreach (Workshops, Education events,...)
- ❖ System improvement project foreseen in 2023

# Acquisition pre-feasibility tool



A PRISMA acquisition feasibility tool is online

<http://192.106.234.116/>

(<http://prisma-prefeasibility.asi.it>)

- ❖ is freely accessible even without a PRISMA account
- ❖ performs the analysis on a single or multiple Areas of Interest (Aoi) described by the lat,lon of their central point
- ❖ gives in output the UTC time at which the satellite has in view the Aoi plus characteristic parameters of that view (roll angle, solar zenith angle)

The screenshot shows the PRISMA Pre-Feasibility Tool interface. It includes a header with the tool name and version information. Below the header, there is a text box explaining the tool's purpose and a 'Multiple Points' button. The main section contains several input fields for parameters such as Start epoch, Strip length, Lat, Lon, LookAngle Min, MinSunZenithAngle, Step epoch, LookAngle Max, and MaxSunZenithAngle. A 'Submit' button is located below the input fields. Below the submit button, there is a message indicating that the calculation is finished and a table of results. The table has two columns for 'Updated on' and 'Following ILE'. The table contains two rows of data. Below the table, there are two world maps showing satellite coverage over the Americas, with a red arrow pointing from the 'Submit' button to the first map.

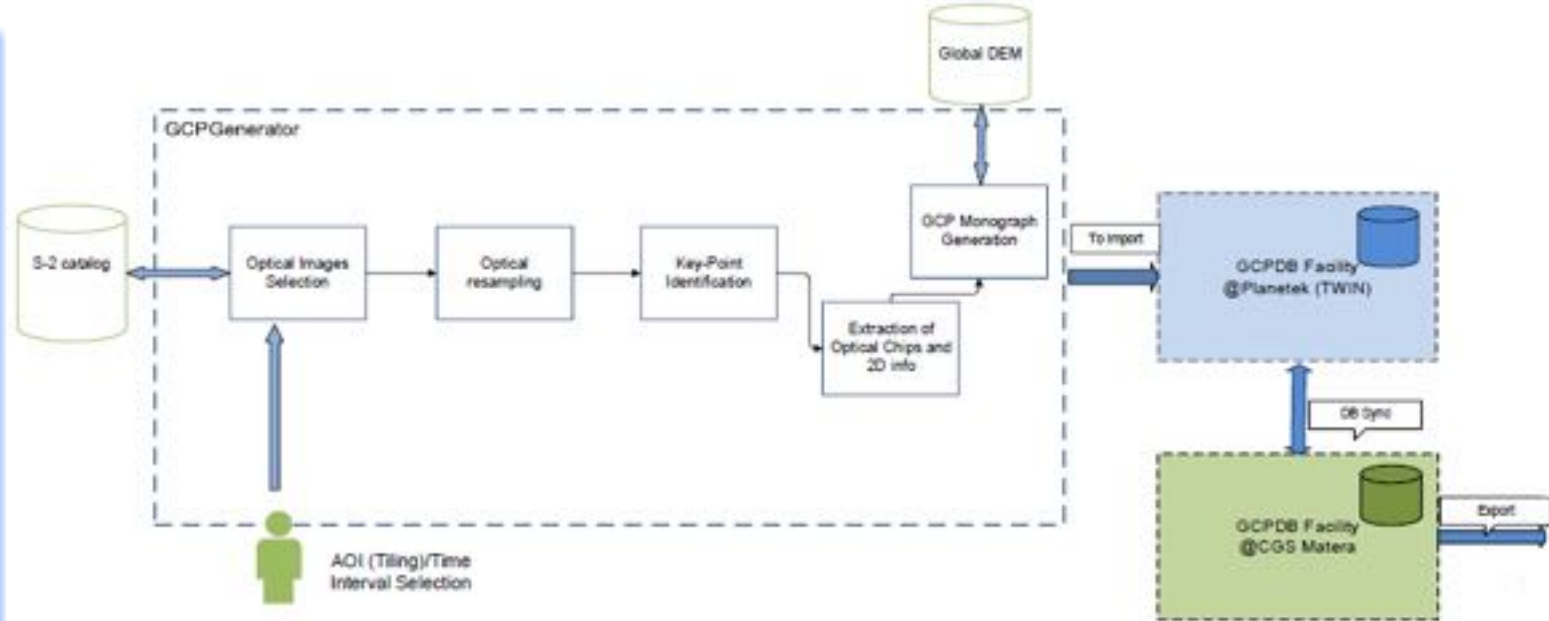
```
Start Time,Stop Time,Latitude (deg),Longitude (deg),Roll (deg),SZA (deg),Site,,
2022-06-28 15:24:57.495594886,2022-06-28 15:25:01.605594886,18.975,-70.23,10.2,19.0,Lake Hatillo,,
2022-07-03 15:11:43.722824553,2022-07-03 15:11:47.832824553,18.975,-70.23,-20.4,22.2,Lake Hatillo,Acquisition can be discarded due to roll uncertainties,
2022-07-04 15:28:15.025870293,2022-07-04 15:28:19.135870293,18.975,-70.23,17.7,18.4,Lake Hatillo,,
2022-07-09 15:14:56.967587175,2022-07-09 15:15:01.077587175,18.975,-70.23,-13.1,21.6,Lake Hatillo,,
```



# High Geolocation accuracy L2x



- ❖ On Q1 2022 has been started the development of a system for enabling the higher geolocation accuracy on PRISMA products
- ❖ The project is executed by an Italian company (Planetek), with a contract placed after a competitive procedure
- ❖ The system will allow to generate L2x products at the full 15m CE90 PRISMA geometric accuracy, by using GCPs automatically extracted by Copernicus Sentinel-2 products



- ❖ The GCPs will be validated in Q3-2022 and then generated on a worldwide basis, gradually filling all the land areas
- ❖ Generation will be completed on Q1-2023 but high accuracy products will be available on many areas well before



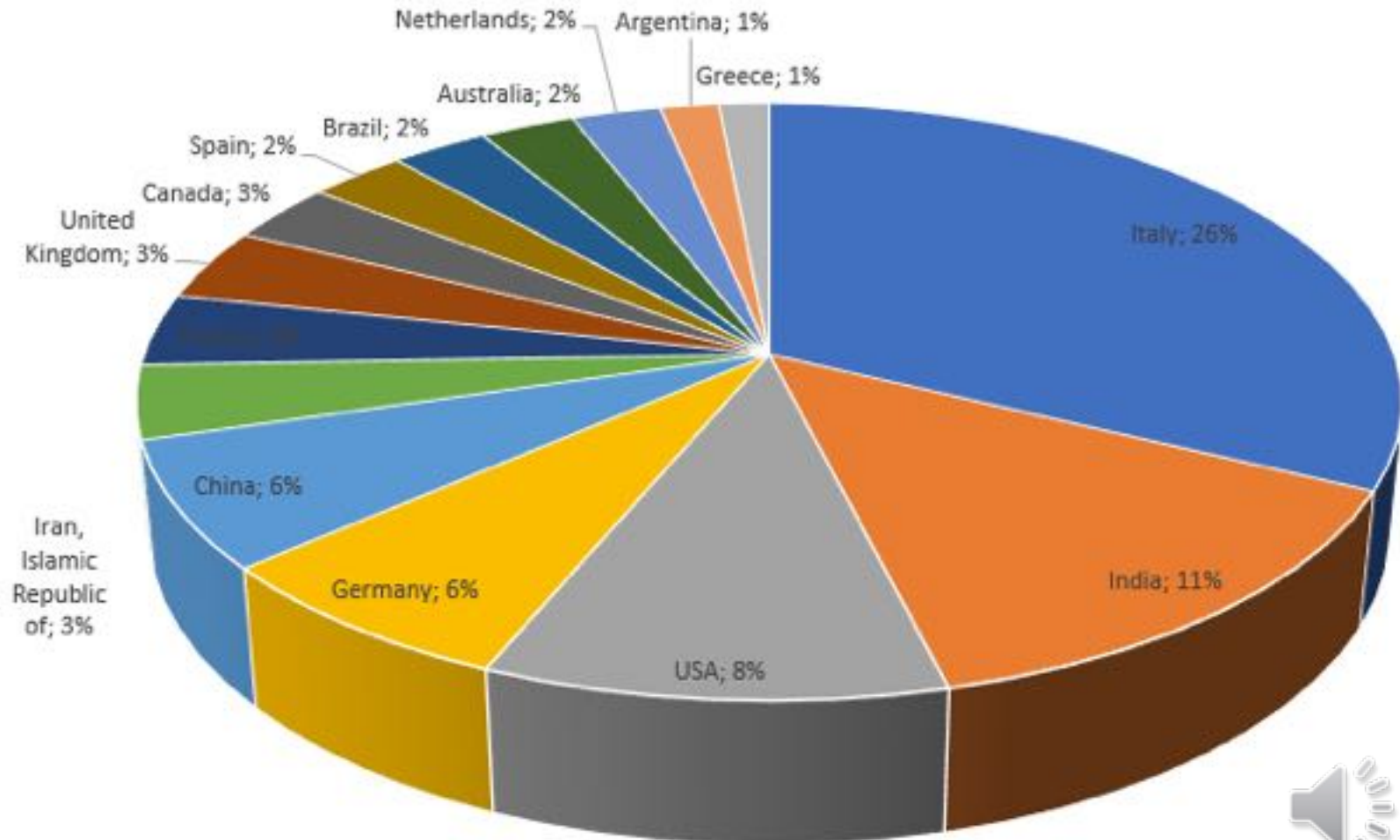
# Mission Statistics – Users Nationality



**1504** Licenses to Use activated @ 04.10.2022

Showing the (statistically) most representative part of the user population:

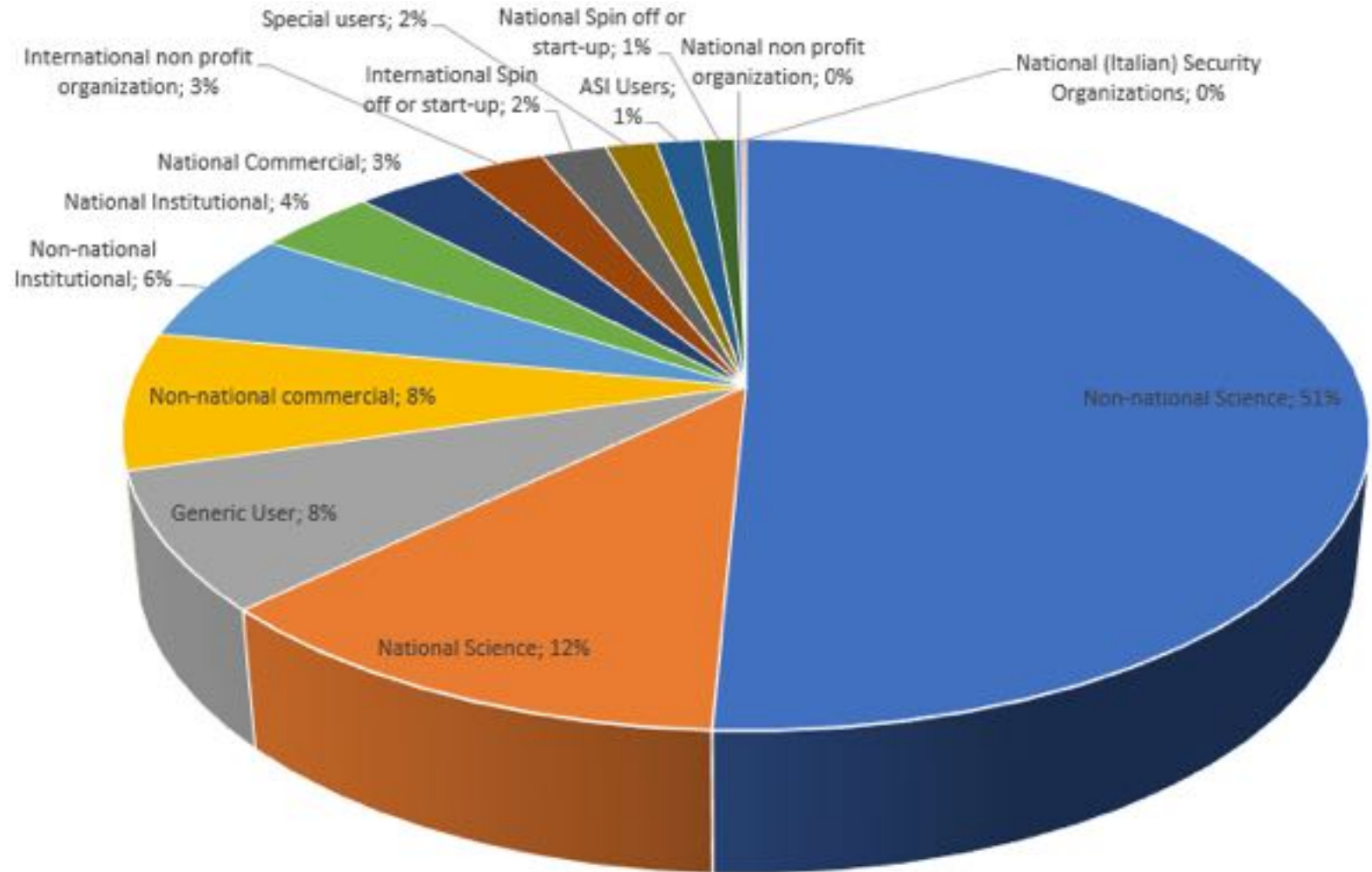
- 15 nations covers **80%** of the users
- the Italian users are only **1/4**
- India, USA, Germany and China together account the **1/3** of the users



# Mission Statistics – User category

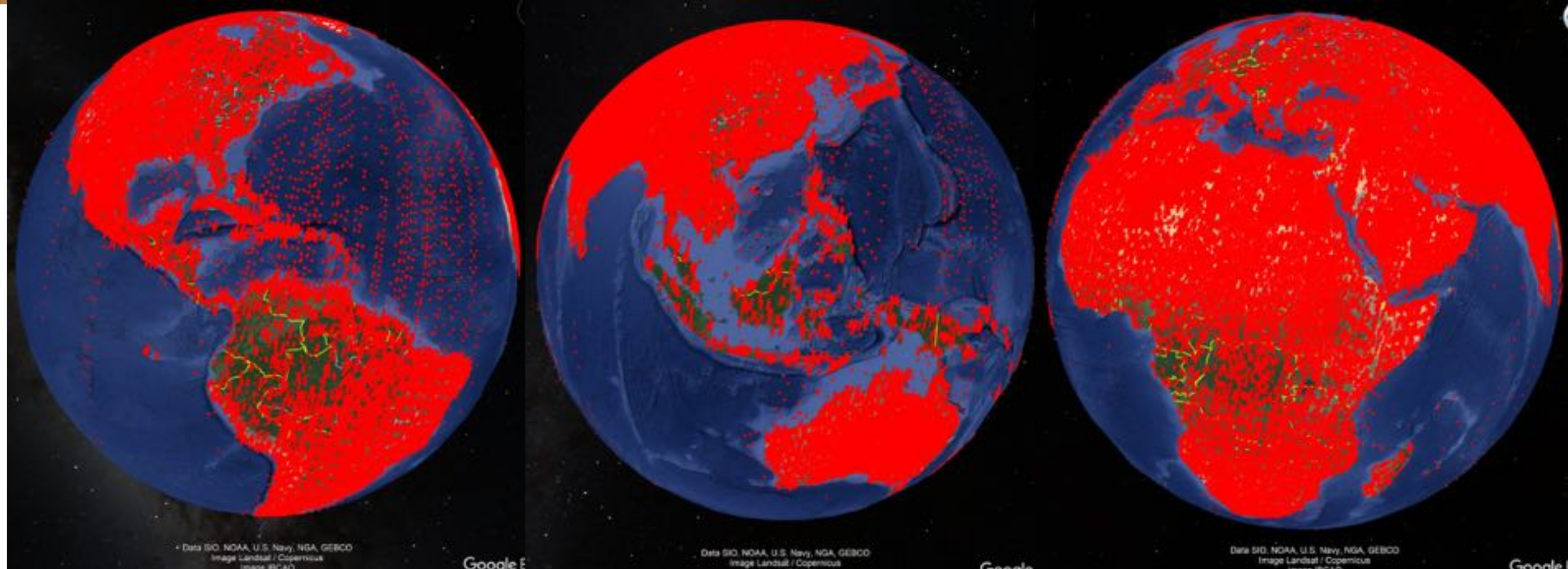


- **63%** of the total users are scientists (**51%** of the users belongs to non-Italian Science and is the largest category)
- Institutional (**10%**) and commercial (**11%**) represents **21%** of total users
- Foreign commercial (**8%**) is more than two times the Italian commercial (**3%**)
- **8%** of user are still freelance!





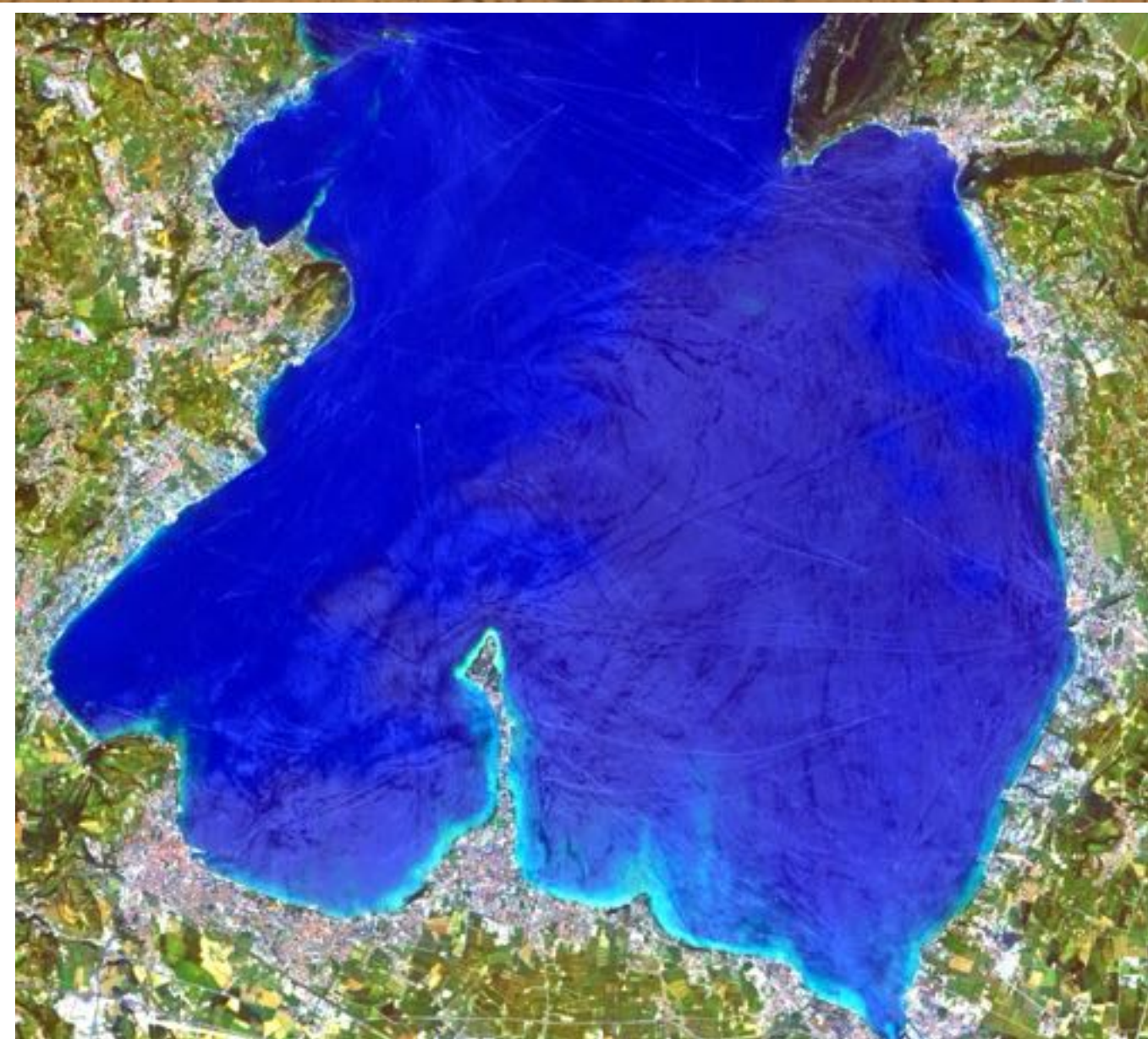
# Archive @06 October 2022



**186k** images (including those from the background mission) all over the world @06.10.2022; a new approach to background planning is used since Q3-2021 to improve global land coverage



**Garda lake, Italy, 21/07/2021, sharpened  
using the PAN layer @5m**



**Manhattan, USA, 17/02/2020, sharpened  
using the PAN layer @5m**



**Shanghai, China, 09/04/2021, sharpened  
using the PAN layer @5m**



**Port of Piraeus, Athens, Greece, 17/07/2021,  
sharpened using the PAN layer @5m**



**Svalbard archipelago, Norway, 27/07/2020,  
sharpened using the PAN layer @5m**





portal:  
<https://prisma.asi.it>

Info, contacts, inquiries:  
[prisma\\_missionmanagement@asi.it](mailto:prisma_missionmanagement@asi.it)

