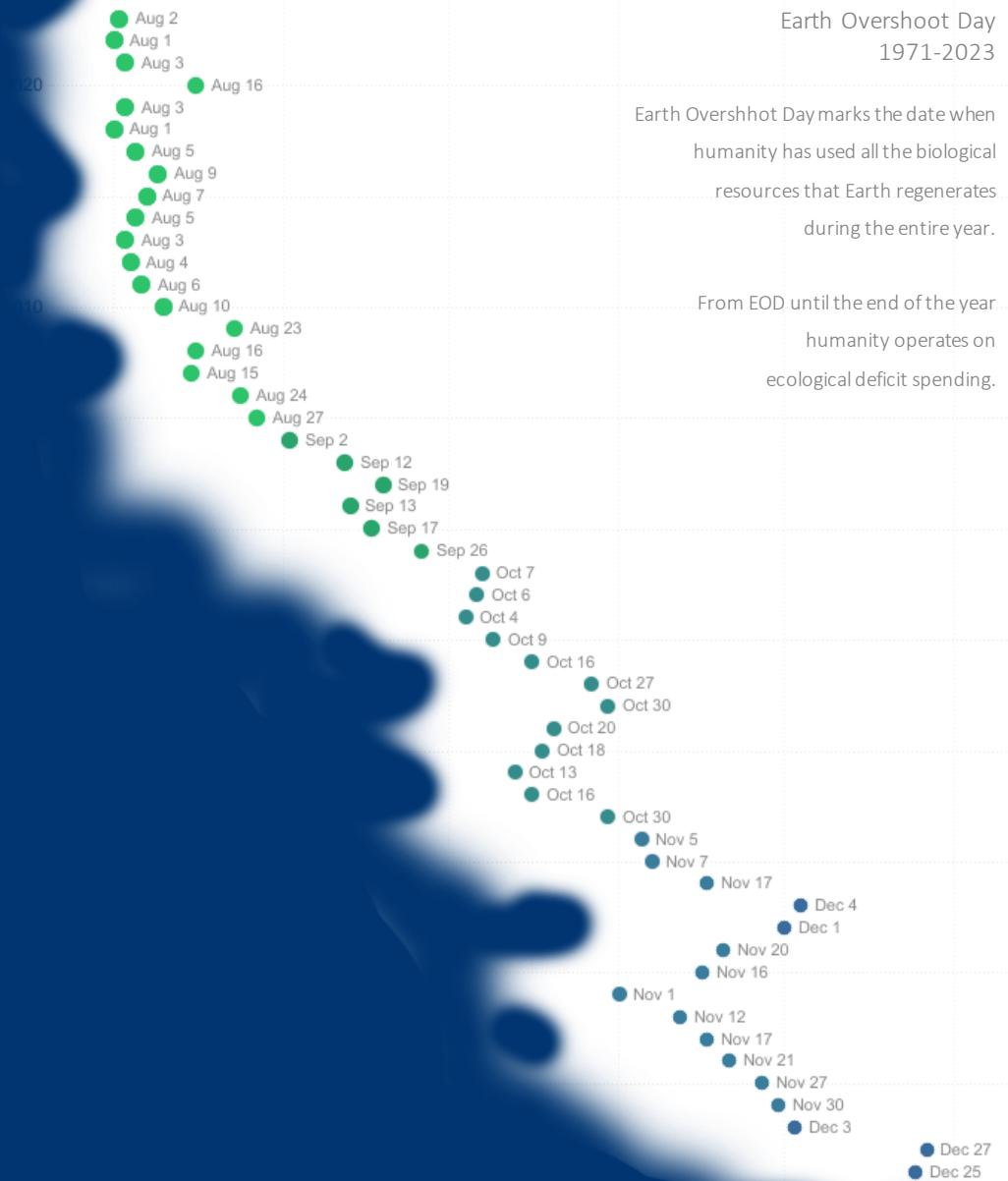


Sustainable development: a common goal on and above Earth

Presenter: Maria Elena Cianfanelli
UDS - Downstream & Applications Department
ASI - Italian Space Agency



«Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.»



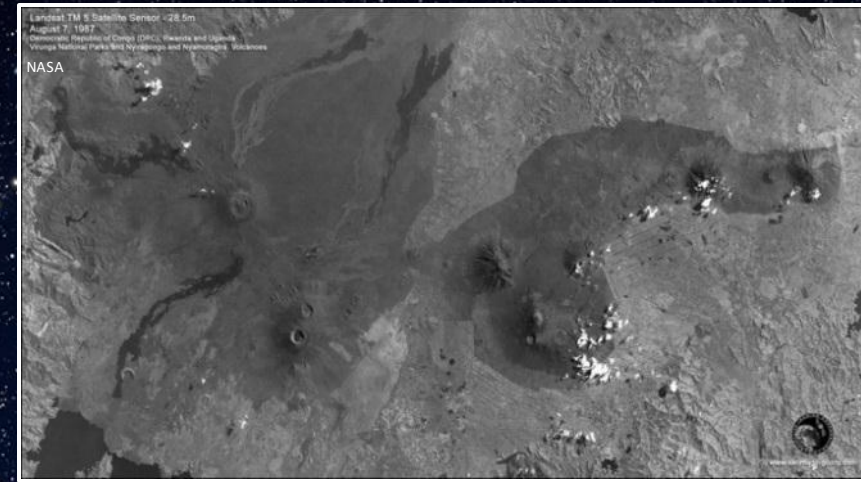
1987

The World Commission on Environment and Development (WCED) publishes the «Brundtland Report» after the Commission's chairwoman, Gro Harlem Brundtland. It developed guiding principles for sustainable development as it is generally understood today.

1989

The report was debated in the UN General Assembly, which decided to organize a UN Conference on Environment and Development.

11. *Stresses* that sustainable and environmentally sound development requires changes in the unsustainable pattern of production and consumption, particularly in industrialized countries, and the development of environmentally sound technologies, and, in this context, stresses also the need to examine, with a view to making recommendations on effective modalities for favourable access to, and transfer of, environmentally sound technologies, in particular to the developing countries, including on concessional and preferential terms, and on modalities for supporting all countries in their efforts to create and develop their endogenous technological capacities in the field of scientific research and development, as well as in the acquisition of relevant information, and, in this context, stresses further the need to explore the concept of assured access for developing countries to environmentally sound technologies, in its relation to proprietary rights, with a view to developing effective responses to the needs of developing countries in this area;

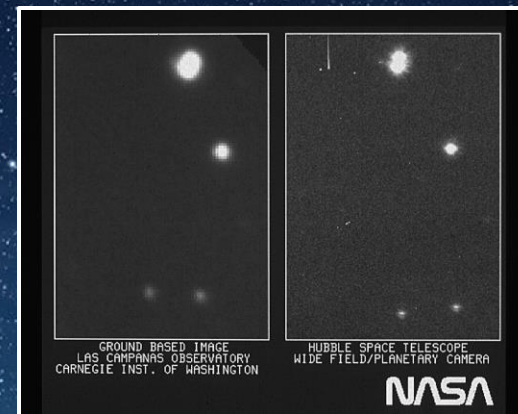


1987

A satellite image was taken by Landsat-4. It maps the protected area of the gorilla habitat, showing the Volcanic National Park area in Rwanda and the Mikeno sector of Virunga National Park.

1990

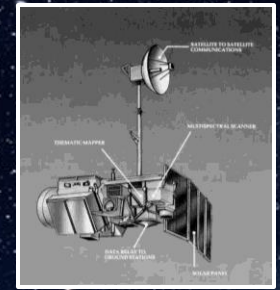
First large optical space telescope launched: Hubble Space Telescope, by U.S. and European Space Agency

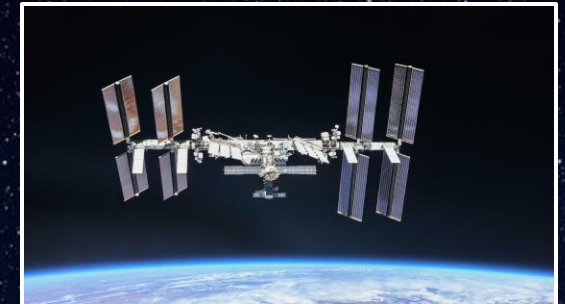
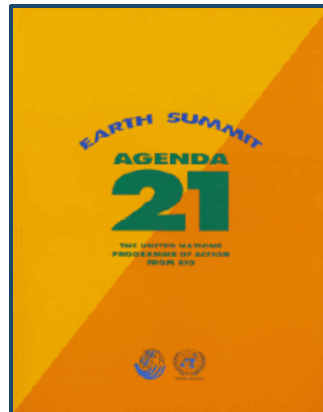


On the left: a ground-based picture from Las Campanas, Chile, Observatory of the same region of the sky.

On the right: part of the first image taken with the Hubble Space Telescope's Wide Field/Planetary Camera.

Ground Image: E. Persson (Las Campanas Observatory, Chile)/Observatories of the Carnegie Institution of Washington; Hubble Image: NASA, ESA, and STScI.





1992

At the Earth Summit in Rio de Janeiro, Brazil, more than 178 countries adopted Agenda 21, a comprehensive plan of action to build a global partnership for sustainable development to improve human lives and protect the environment.

2015

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future.

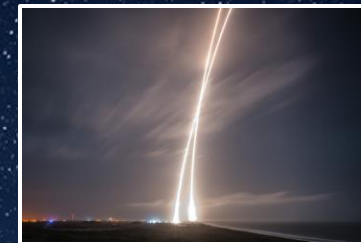


2000

First resident crew occupies the International Space Station: William Shepherd, Yuri Gidzenko, and Sergey Krikalyov, from U.S. and Russia.

2015

First rocket stage to return to its launch site: Falcon 9, U.S.



“According to the UN, the term “space society” refers to a society that carries out its institutional functions using space technologies...

...in the best and most extensive way possible, as well as services and applications based on space data and infrastructures.”



PRISMA
Hyperspectral
 Launch 2019
 Planned lifetime: 5 years



Agenzia Spaziale Italiana

CSES-2
HEPD-2
EFD-2
 Launch 2024
 Planned lifetime: 5 years



Agenzia Spaziale Italiana

CSES-1
HEPD
 Launch 2018
 Planned lifetime: 5 years



Agenzia Spaziale Italiana

OPERATIONAL
IN DEVELOPMENT
PLANNED
 Updated 2023



PRISMA SG
Hyperspectral
 Launch 2025
 Planned lifetime: 5 years



Agenzia Spaziale Italiana

PLATINO-4
Hyperspectral
 Launch 2024
 Planned lifetime: 3 years



Agenzia Spaziale Italiana

PLATINO-2
TIR
 Launch 2024
 Planned lifetime: 3 years



Agenzia Spaziale Italiana

Free Flyer
TIR
 Launch 2026
 Planned lifetime: 5 years



EAGLE
Multispectral
 Launch 2024
 Planned lifetime: 3 years



Agenzia Spaziale Italiana

PLATINO-3
High Resolution
 Launch 2024
 Planned lifetime: 3 years



Agenzia Spaziale Italiana

Cosmo Skymed
X band SAR
 Launch 2007 - 2010
 Planned lifetime: 7 years



Agenzia Spaziale Italiana

Cosmo Second Generation
X band SAR
 Launch 2019 - 2024
 Planned lifetime: 7 years



Agenzia Spaziale Italiana

PLATINO-1
X band SAR
 Launch 2024
 Planned lifetime: 3 years



Agenzia Spaziale Italiana

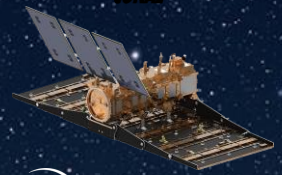
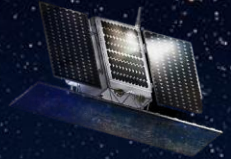
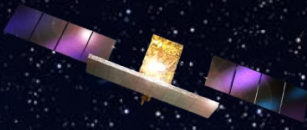
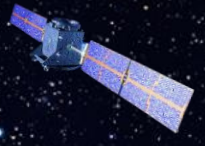
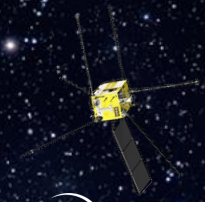
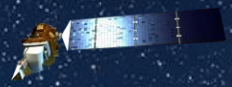
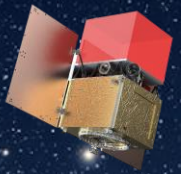
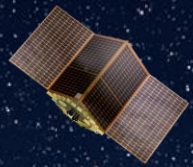
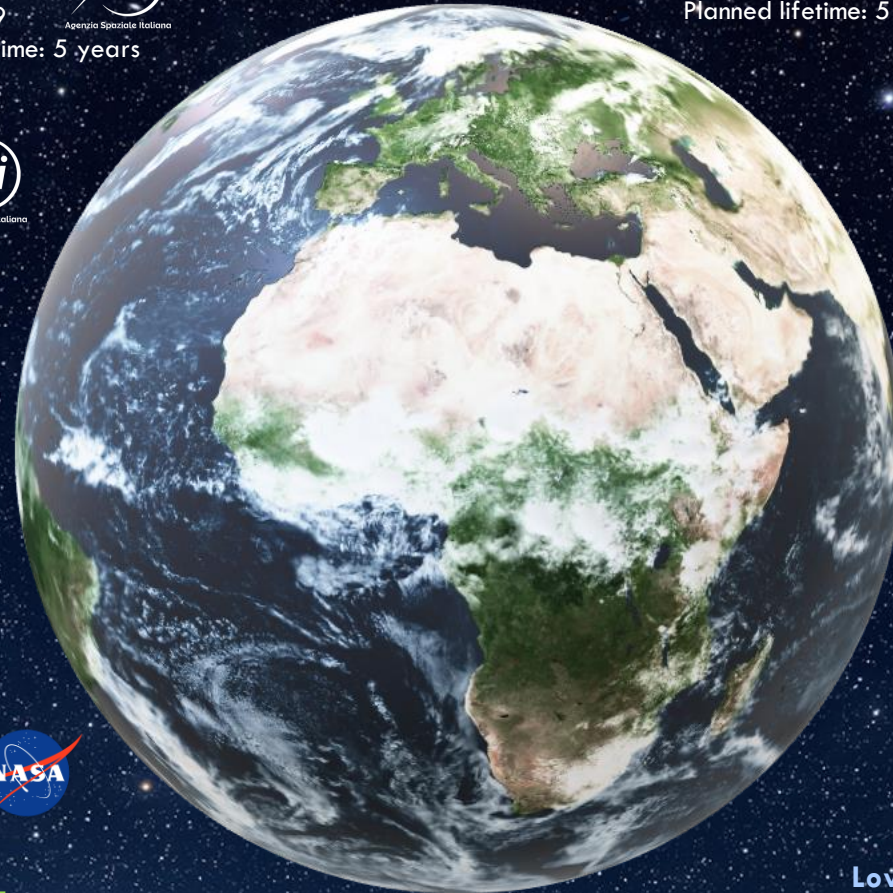
SAOCOM (SIASGE component)
L band SAR
 Launch 2018 - 2020
 Planned lifetime: 5 years



Low Frequency SAR
L band SAR
(SAOCOM FO & ROSE-L Companion Constellation)
 Launch 2027
 Planned lifetime: 5 years

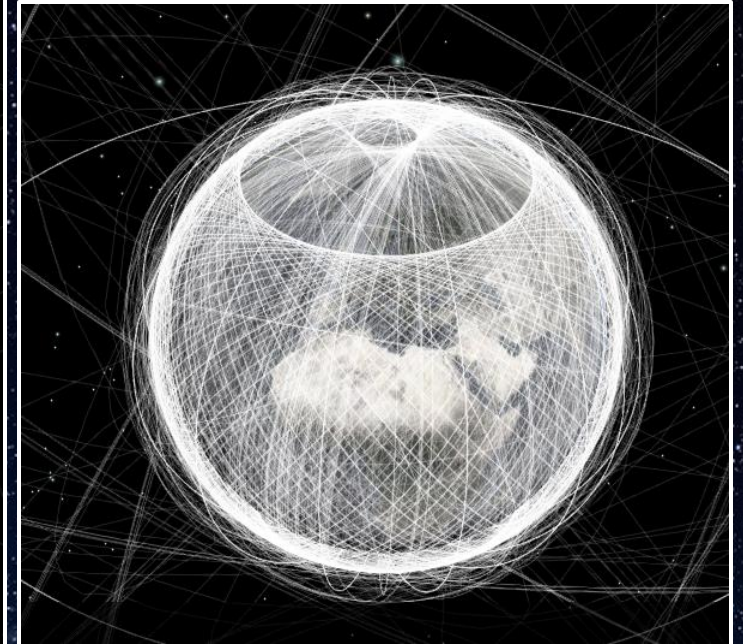
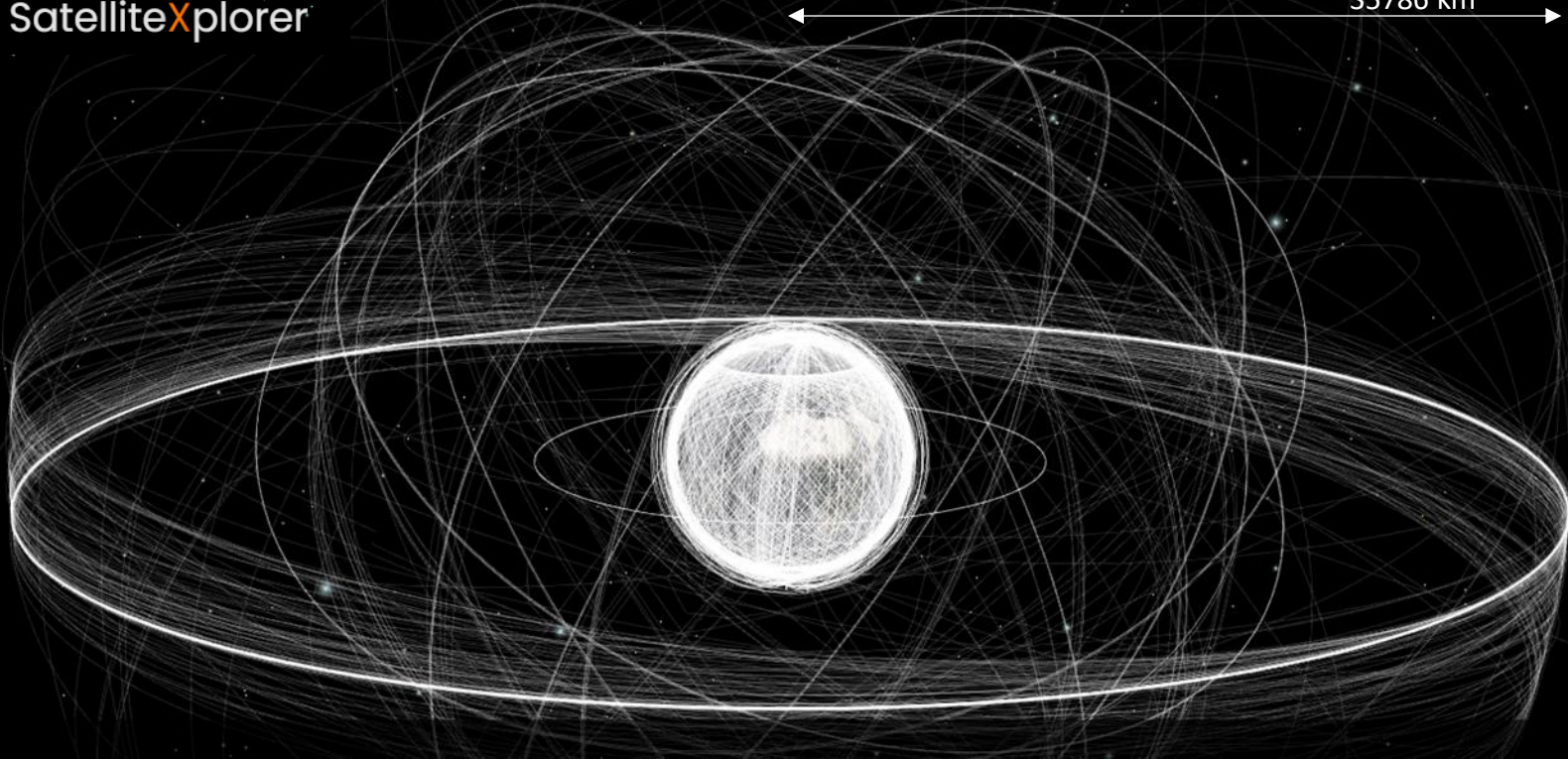


Agenzia Spaziale Italiana



SatelliteXplorer

35786 km



Launches since 1957: 6,340

Satellites in Earth orbit: 14,710

Satellites still flying: 9,780

Satellites still operational: 7,100

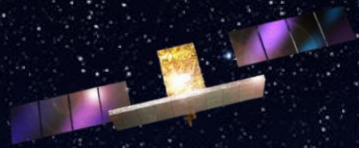
Estimated number of debris:

> 10 cm: 36.500

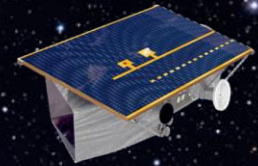
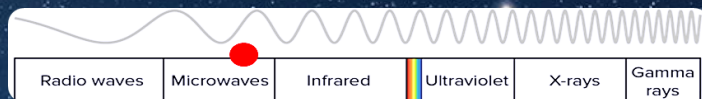
10 cm – 1 cm: 1.000.000

1 cm – 1 mm: 130.000.000

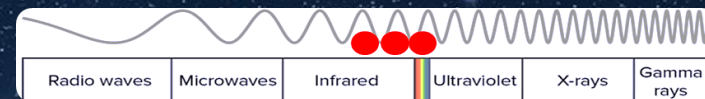




PRAGUE BY RADAR COSMO-SkyMed



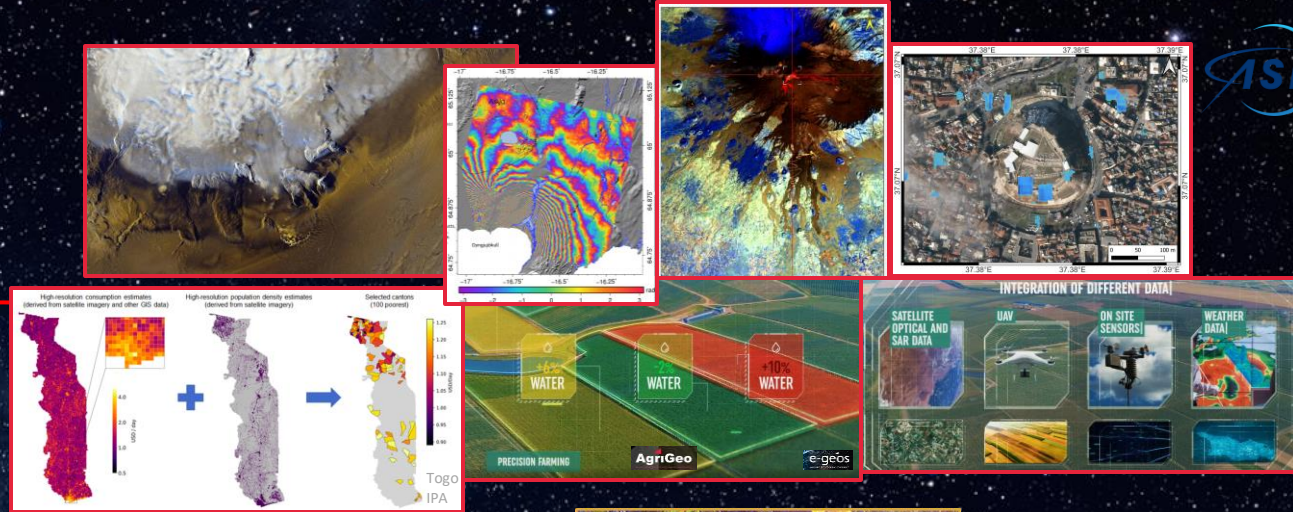
COLOURS OF PRAGUE [RGB NIR(FC) SWIR] PRISMA





Disaster monitoring

Natural resource use optimization



Agricultural monitoring and forecast

Precision agriculture

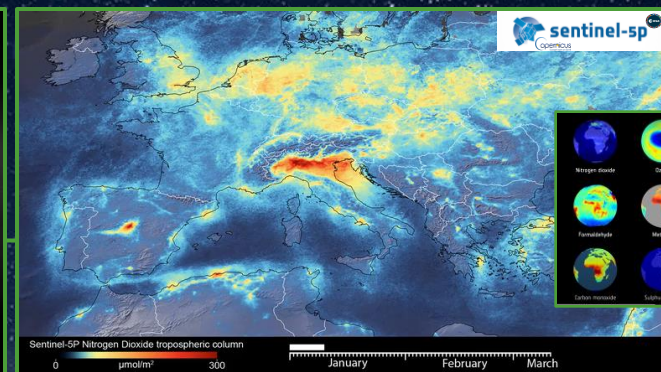


- to monitor **land use**
- to reduce the **waste of water**
- to make **predictions** about crop yields, drought, insects
- to provide indications on differential use of **fertilizers**
- to get information relating to the **loss of biodiversity**



Air monitoring

New technologies

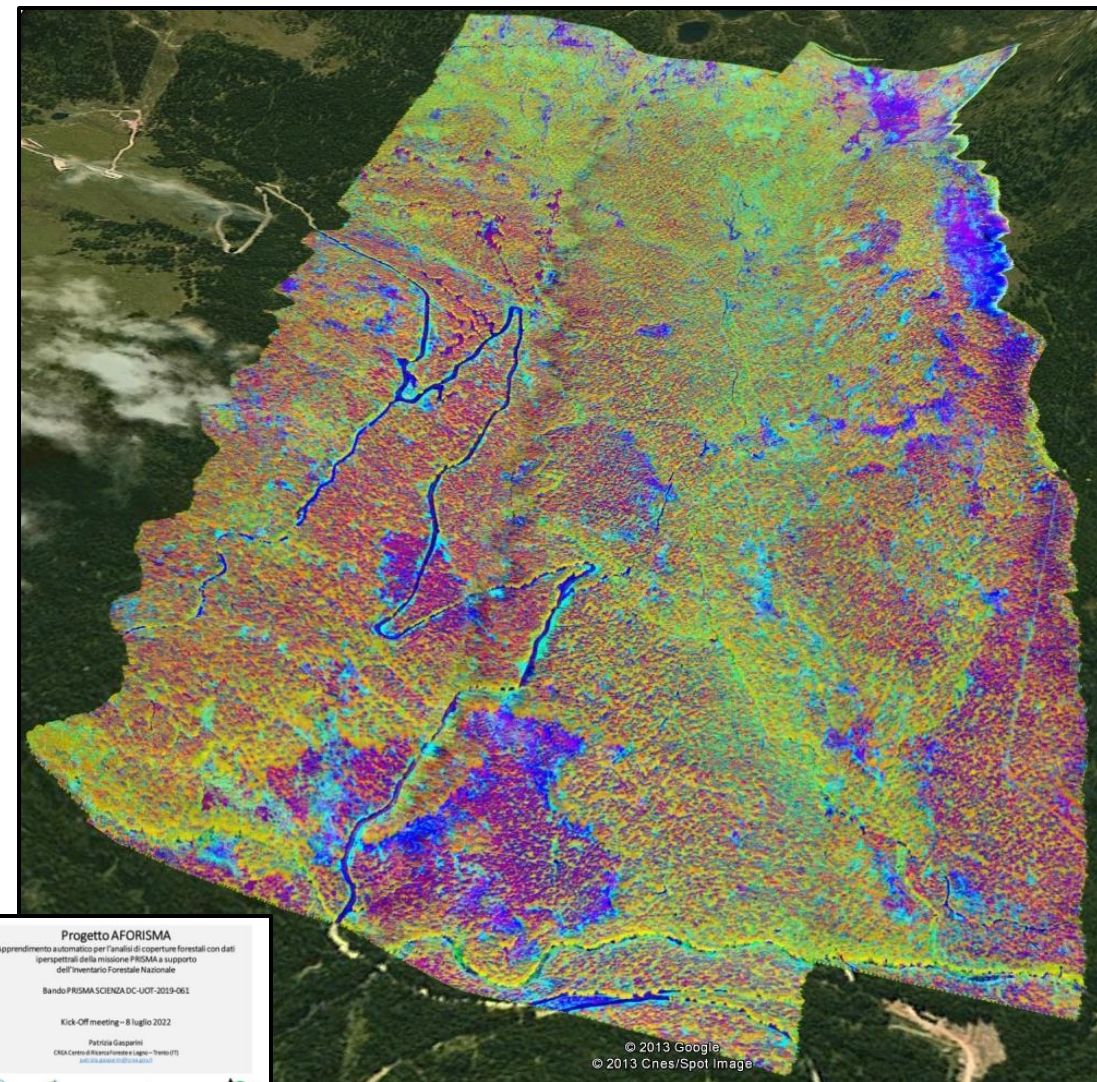
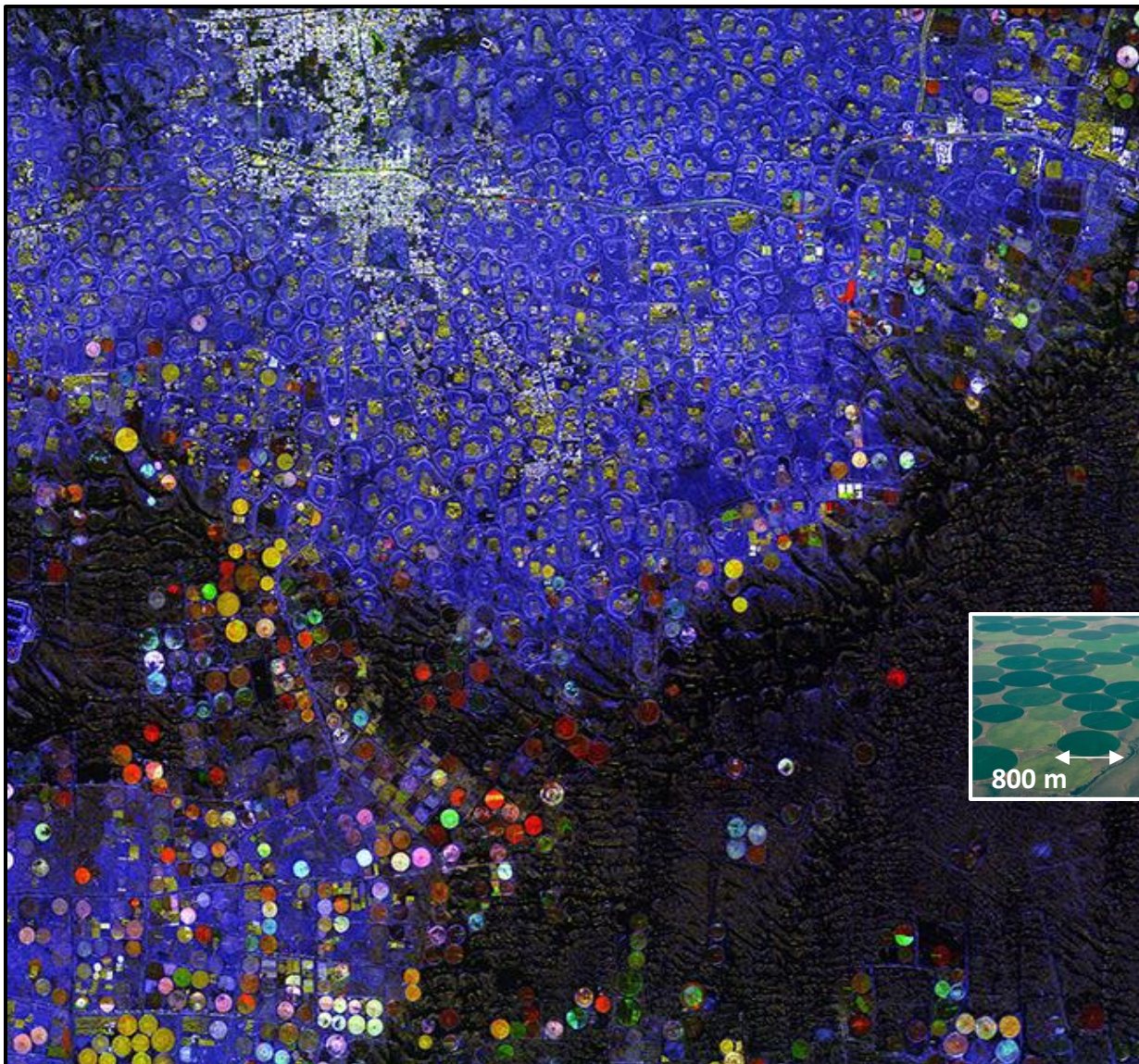


- **Memory foam**: to make customizable seats for astronauts.
- **Space Blanket**: gold/silver in color, reflect up to 97% of radiation.
- **HACCP**: food safety guideline to ensure any food sent to space was safe.
- **Air purifier**: developed to help astronauts grow plants in space.

Central Pivot Irrigation Crops El Oued – Algeria

processed by e-geos

Forest classification



Progetto AFORISMA
Apprendimento automatico per l'analisi di coperture forestali con dati
ipercolorati della missione PRISMA a supporto
dell'Inventario Forestale Nazionale
Bando PRISMA SCIENZA DC-UOP-2019-061
Kick-Off meeting - 8 luglio 2022
Patrizia Gasparini
CRNA Centro di Ricerca Forestale e Lago - Trento IT
patrizia.gasparini@cnr.it

COSMO-SkyMed Change Detection for vegetation



November
September
Coherence

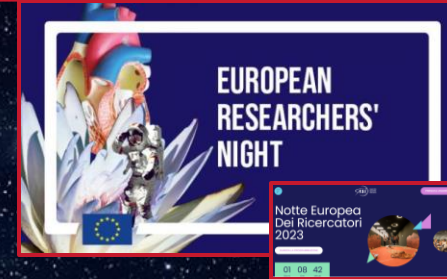
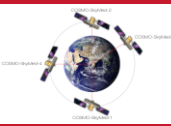
70% farming
15% plowing
15% harvested

FUCINO
SPACE CENTRE
Telespazio



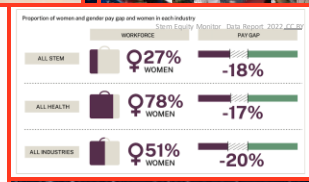
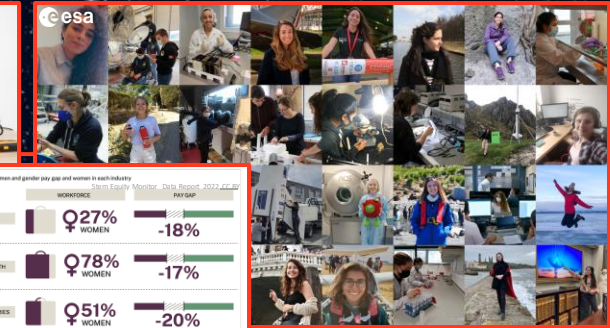
4 QUALITY EDUCATION

Communication development
improvement of outreach tools



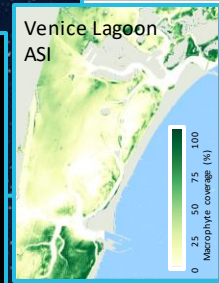
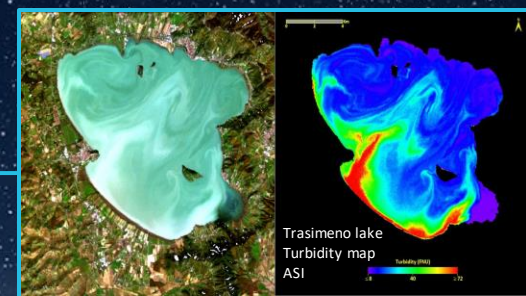
5 GENDER EQUALITY

Promotion of STEM discipline access
Role models and salary gap reduction



6 CLEAN WATER AND SANITATION

Water monitoring
New technologies



7 AFFORDABLE AND CLEAN ENERGY

Clean sources exploitation improvement

Cost and material reduction

Caltech About Research Academics Admissions & Aid Campus Life & Events

Home / News / In a First, Caltech's Space Solar Power Demonstrator Wirelessly Transmits Power in Space

In a First, Caltech's Space Solar Power Demonstrator Wirelessly Transmits Power in Space

12 June 01, 2023

A space solar power prototype that was launched into orbit in January is operational and has demonstrated its ability to wirelessly transmit power in space and to beam detectable power to Earth for the first time.

THE EUROPEAN SPACE AGENCY

ENABLING & SUPPORT

SOLARIS

36930 views 113 likes

ESA / Enabling & Support / Space Engineering & Technology / SOLARIS

To prepare Europe for future decision making on Space-Based Solar Power, ESA has kicked-off a preparatory initiative, called SOLARIS, for which funding was approved at the ESA Council at Ministerial Level in November 2022.

The goal of SOLARIS is to prepare the ground for a possible decision in 2025 on a full development programme by establishing the technical, political and programmatic viability of Space-Based Solar Power for terrestrial clean energy needs.

8 DECENT WORK AND ECONOMIC GROWTH

Space economy contribution to economic growth

Inclusive and productive working environments

OECD Home

OECD Home / Innovation / The Space Economy in Figures - How Space Contributes to the Global Economy - en

The Space Economy in Figures
How Space Contributes to the Global Economy

The space economy is expanding and becoming increasingly global, driven by the development of ever-more governmental space programmes around the world, the multiplication of commercial actors in value chains, durable digitalisation trends, and new space systems coming of age. This report describes

FORTUNE

SEARCH

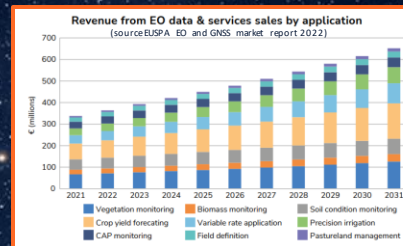
The global space economy grew 8% to \$546 billion in 2022 and is projected to climb another 41% over the next five years, according to a leading space nonprofit.

The sector is expected to show resiliency in the coming years, despite uncertainty about the global economy and a recent slowdown in space investment.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Industry and innovation growth

Infrastructure development and monitoring



Example: European Copernicus program
From 2008 to 2020, with an investment ~ 7.5 billion €, generated an estimated value of 13.5 billion € (by the added value for the upstream industry, the sale of services based on Copernicus applications and the use of products made available through Copernicus in various economic sectors).

THE SPACE REPORT

- 90%+ of industry & government space expenditure
- 6.4% global economic growth
- 90 nations operating in space
- \$469 Billion generated in 2022
- 1,022 successful launches in 2022 (January-June)
- 72 successful landers
- 19% increase in government spending

The Space Report 2022 Q2 shows 9% growth of global space economy over the last year's record of \$453 billion. The new global space economy number, \$469 billion (up from \$449 billion in 2021) is from products and services delivered by space firms. Nearly \$138 billion was spent on infrastructure and support for commercial space enterprises.

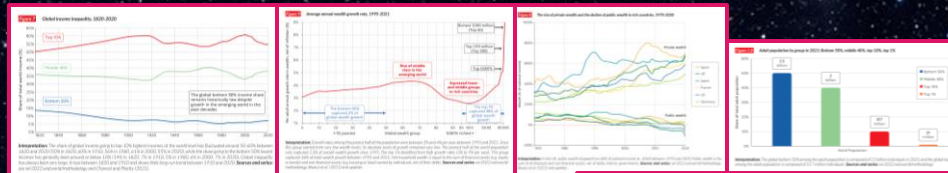
Today most of the money generated by the space industry comes from the commercial sector, which saw a 6.4% boost in revenues of \$362 billion (which is 77% of \$469 billion global space economy). Of that amount more than \$224 billion is from products and services delivered by space firms. Nearly \$138 billion was spent on infrastructure and support for commercial space enterprises.

Read the Report

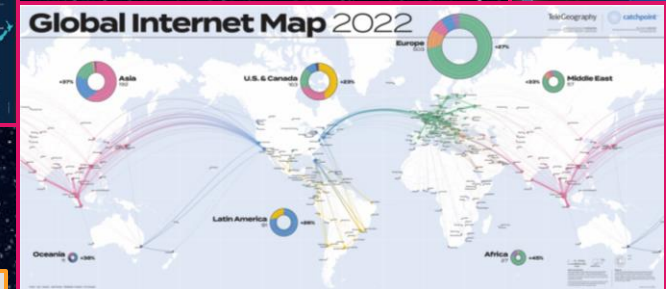
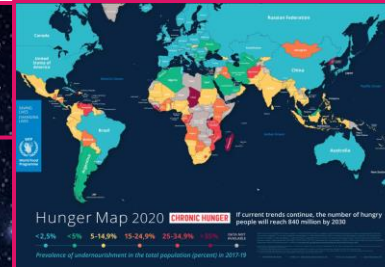
10 REDUCED INEQUALITIES

Communication and information improvement

Knowledge dissemination



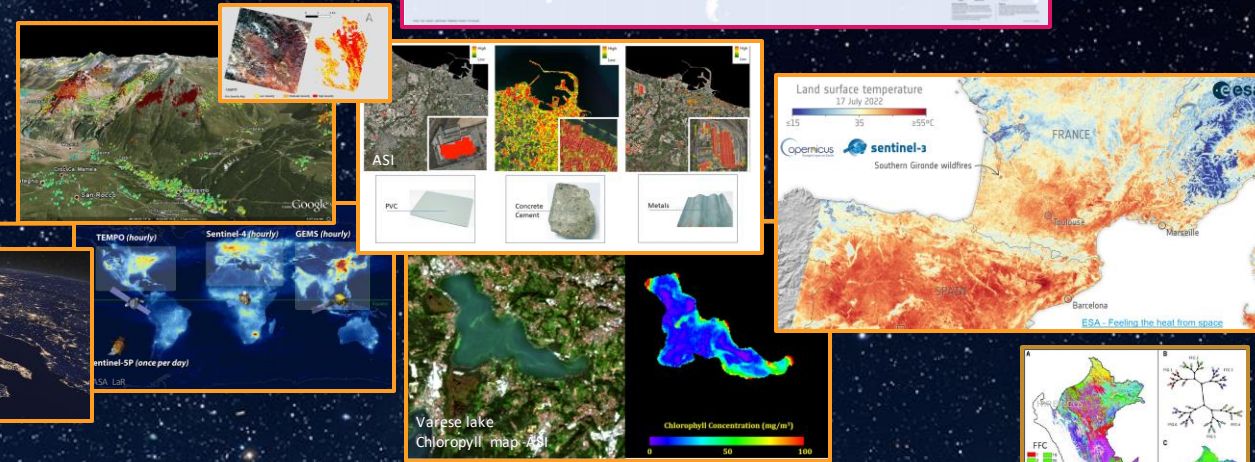
Space technology can provide support to:
 allow continuous access to information
 connect remote areas
 replace compromised terrestrial networks
 also in case of disasters



11 SUSTAINABLE CITIES AND COMMUNITIES

Natural resources protection and saving

Pollution monitoring

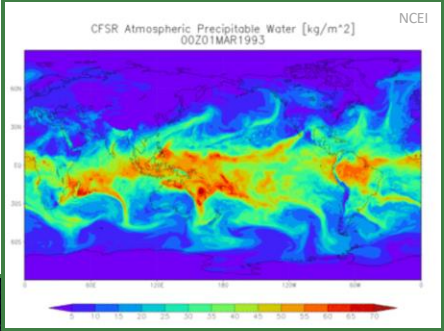
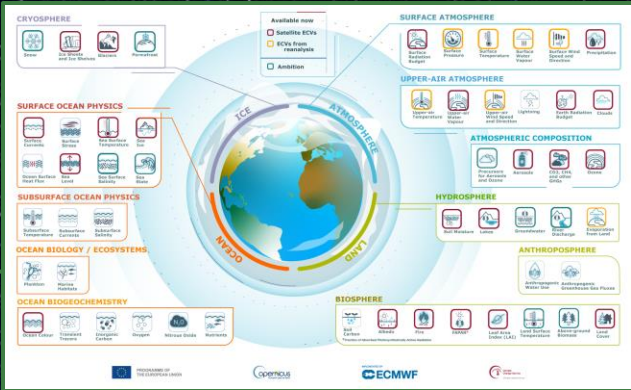


12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Land monitoring

Water monitoring





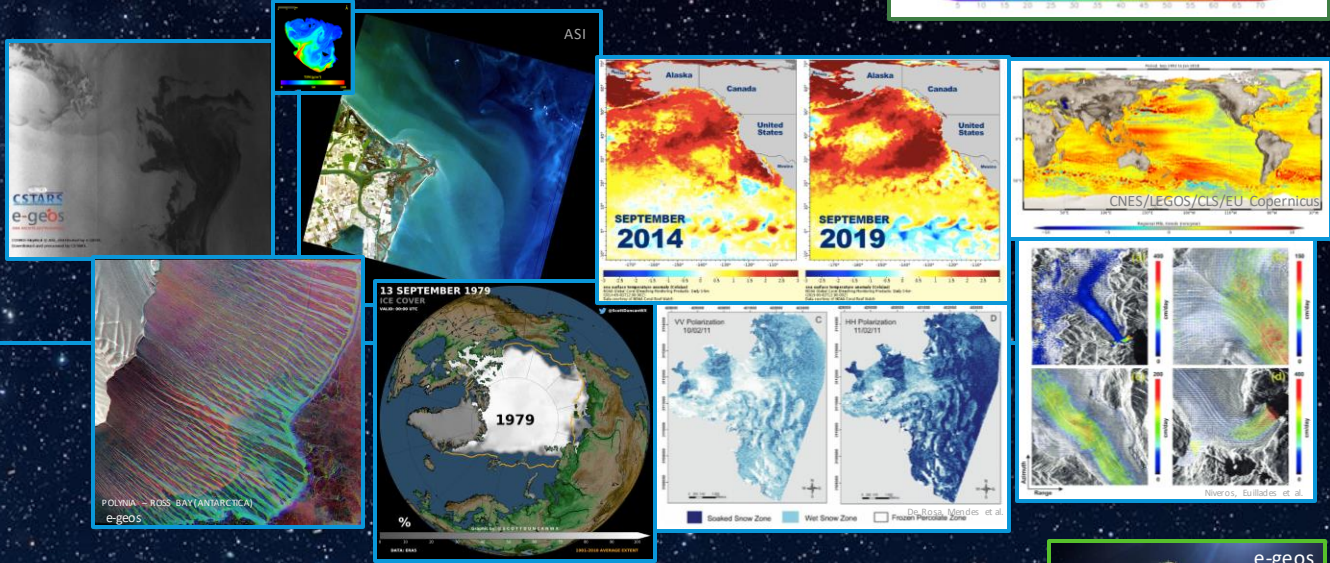
ECV (Essential Climate Variables) monitoring (32/54)

Aid in climate forecast



Water monitoring

Ice monitoring



Land monitoring

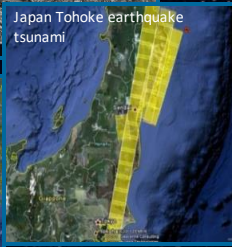
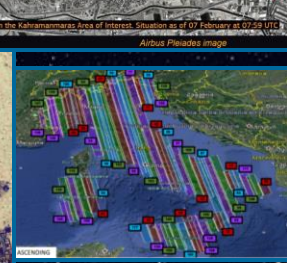
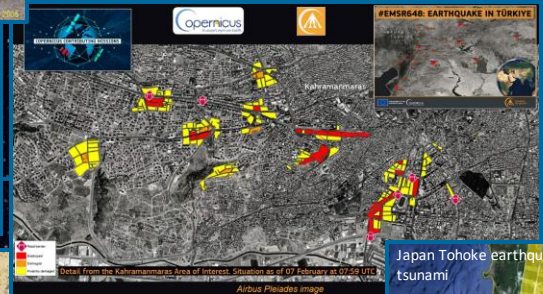
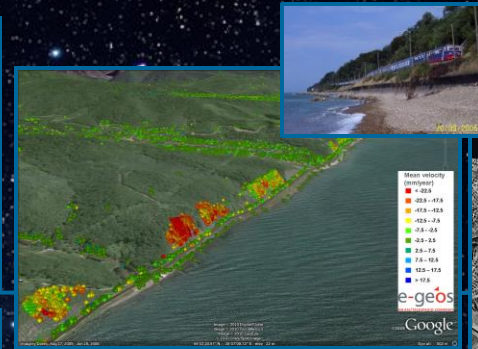
New indicator development





Continuous monitoring

Fight against crime

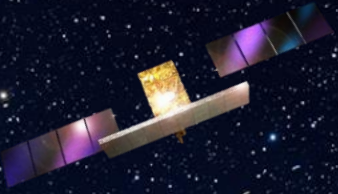


Peace, justice and strong institution

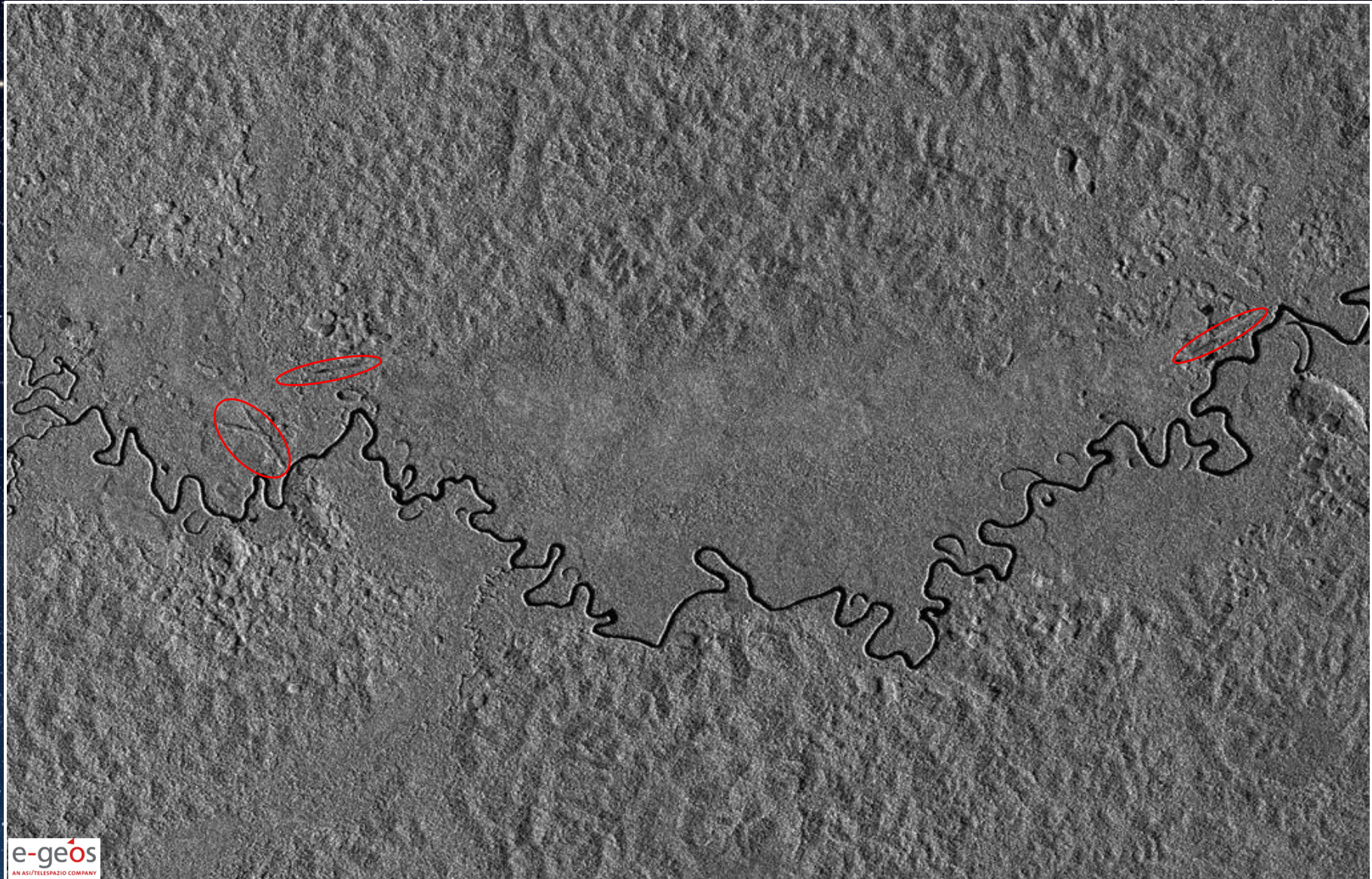
...what are we looking at?



SIASGE
Italy -
Argentina



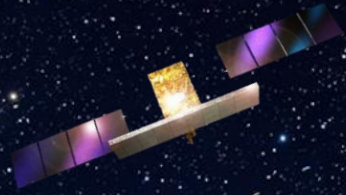
- *Camouflaged deforestation?*
- *Possible clandestine activity?*
- *By what means?*



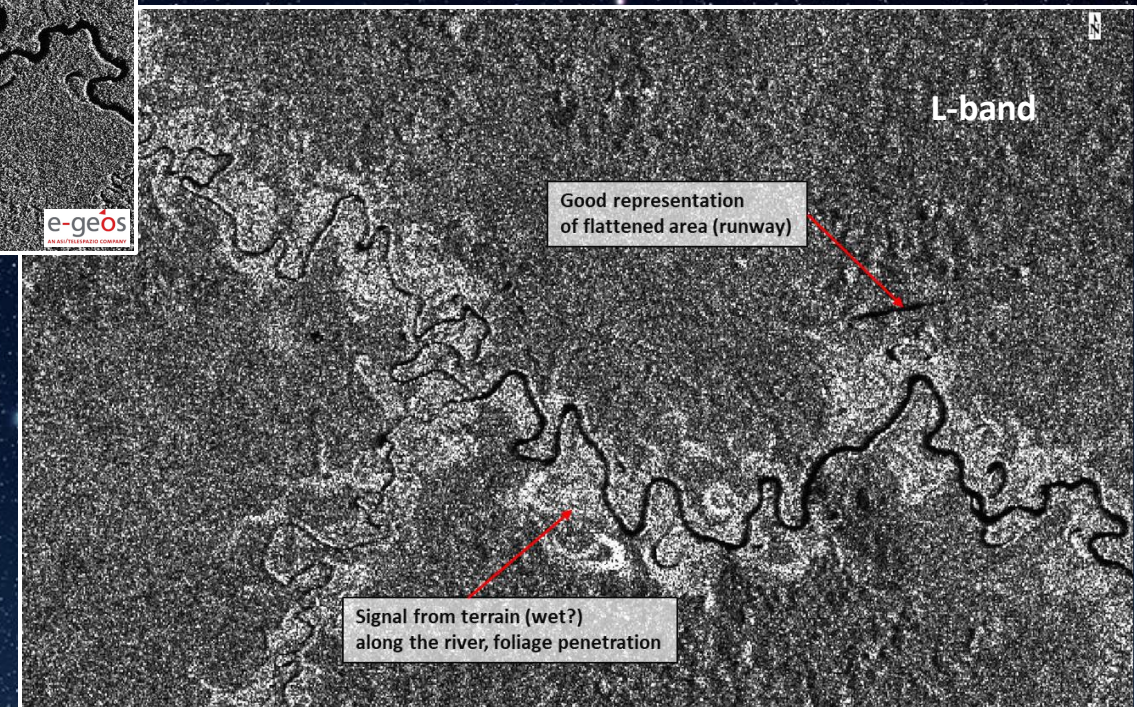
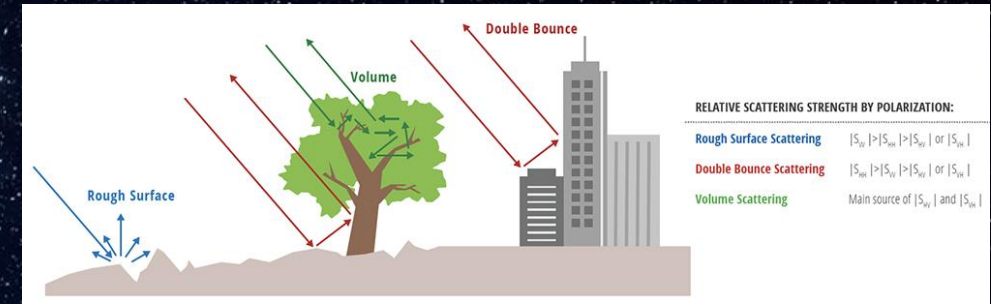
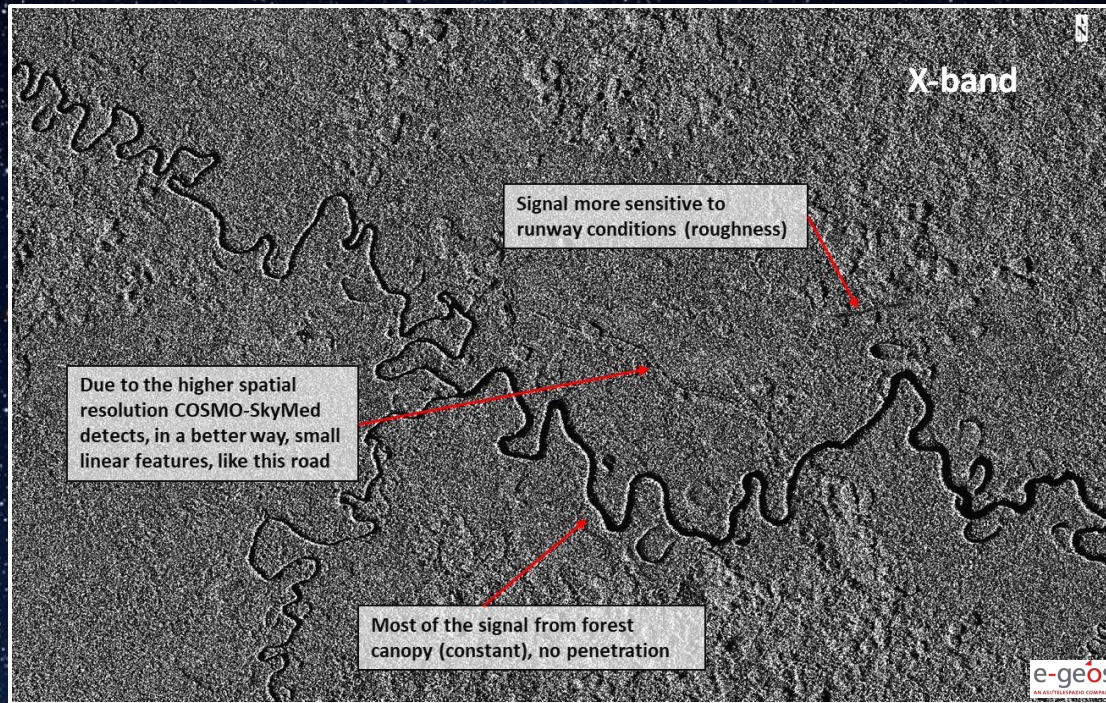
e-geos
AN ASI/TELESPAZIO COMPANY

Peace, justice and strong institution

...what are we looking at?



- *Camouflaged deforestation?*
- *Possible clandestine activity?*
- *By what means?*



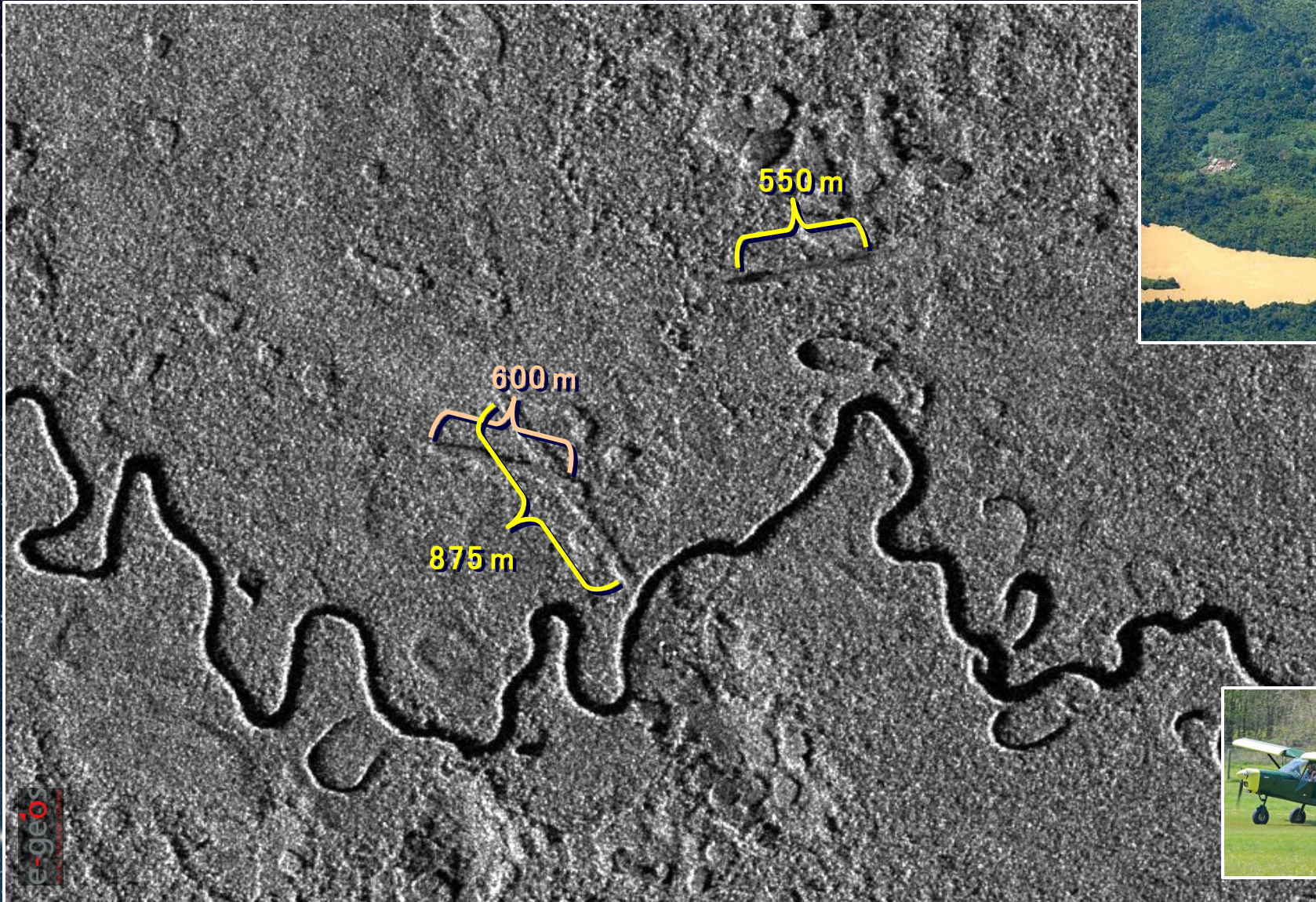
The monitoring of sparsely populated areas is more effective in the L band.

The X band allows for more detailed information.

The multi-band approach allows to improve understanding and investigation in heterogeneous areas.

Peace, justice and strong institution

...we are looking at drug trafficking!



An aircraft capable of clearing a 15 m high obstacle located 450 m from the start of its take-off run and, on landing, capable of landing to a stop within 450 m, after clearing a 15 m high obstacle.»
(NATO, AAP-06 Edition 2016 - NATO GLOSSARY OF TERMS AND DEFINITIONS)

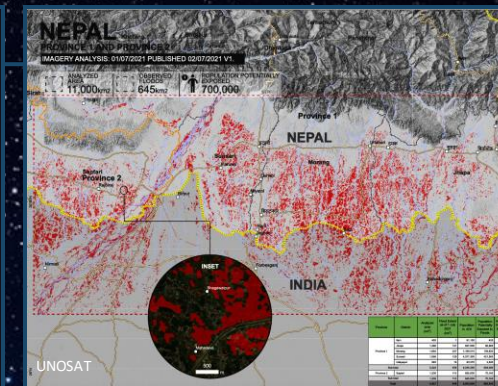
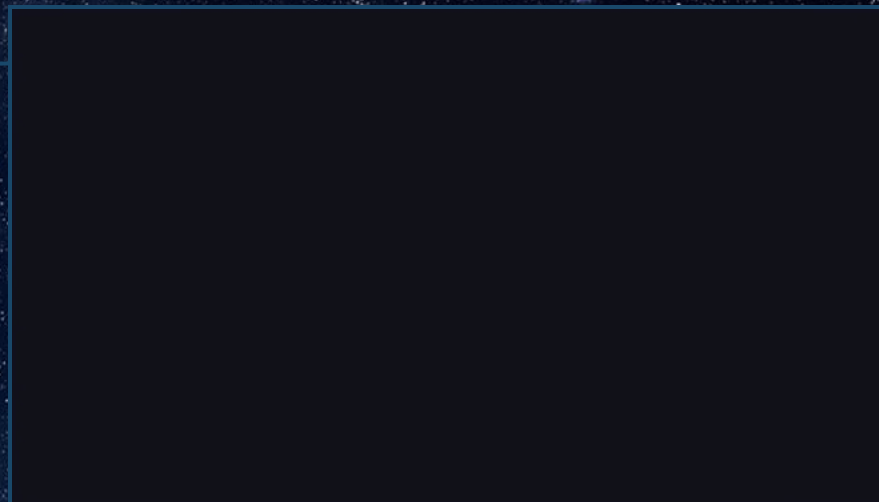




Country cooperation development

Improved goal envision

From 2000 on..



Useful links:

Earth observation:

<https://www.asi.it/scienze-della-terra/>

https://www.esa.int/About_Us/Earth_observation

<https://www.noaa.gov/>

<https://neo.gsfc.nasa.gov/>

Imaging:

<https://www.earthdata.nasa.gov/learn/backgrounders/what-is-sar>

<https://gisgeography.com/multispectral-vs-hyperspectral-imagery-explained/>

https://www.e-education.psu.edu/meteo3/l5_p5.html

Missions:

<https://www.eoportal.org/satellite-missions/cosmo-skymed#space-segment>

<https://www.asi.it/en/earth-science/cosmo-skymed/>

<https://www.asi.it/en/earth-science/prisma/>

<https://sentinels.copernicus.eu/web/sentinel/missions>

<https://earth.esa.int/eogateway/missions/pleiades>

https://www.esa.int/Applications/Observing_the_Earth/FutureEO/CryoSat

<https://earth.esa.int/eogateway/missions/terrasar-x-and-tandem-x>

<https://www.eumetsat.int/our-satellites/meteosat-series>

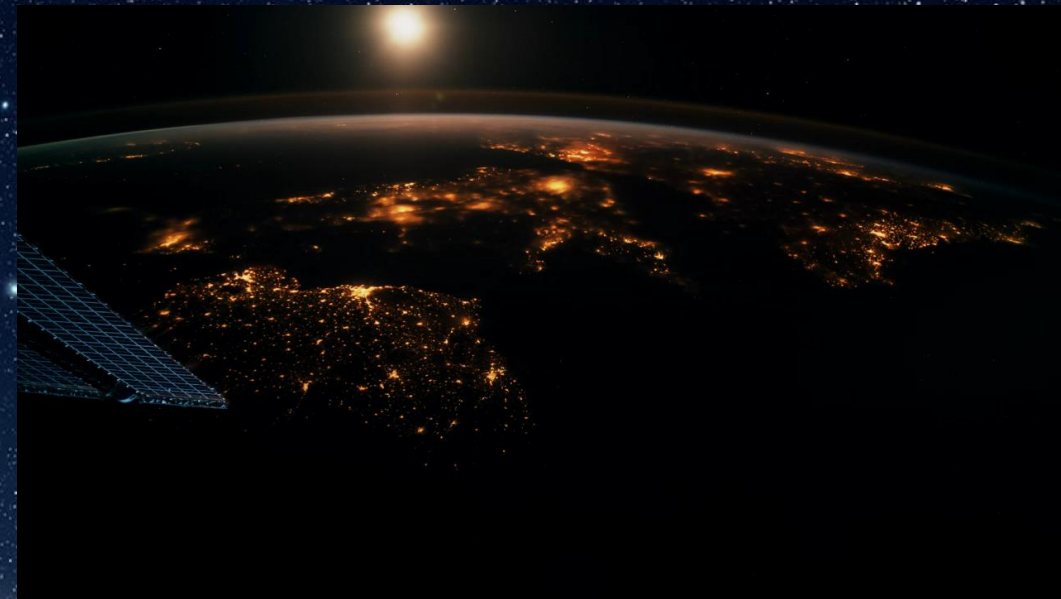
<https://earth.esa.int/eogateway/missions/alos>

Satellite images:

<https://scihub.copernicus.eu/dhus/#/home>

<https://worldview.earthdata.nasa.gov/>

<https://www.nhc.noaa.gov/satellite.php>



«The only true journey, the only bath of Youth, would not be to go towards new landscapes, but to have other eyes, to see the universe with the eyes of another, of a hundred others, to see the hundred universes that each of them sees, that each of them is.»

Marcel Proust



Thank you For Your Attention

Contacts:

mariaelena.cianfanelli@asi.it

ASI – Italian Space Agency
Via del Politecnico snc
00133 Roma, Italia

www.asi.it

