Hyperspectral data exploitation:
the ASI PRISMA SCIENZA programme

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Downstream and applications Unit

PRISMA
Hyperspectral
Launch 2019
Lifetime: 5 years

CSES-2
HEPD-2
EFD-2
Launch 2022
planned lifetime: 5 years

CSES-1
HEPD
Launch 2018
planned lifetime: 5 years

Cosmo SkyMed
X band SAR
Launch 2007 - 2010
planned lifetime: 7 years

SHALOM
Hyperspectral
Launch planned 2025
Lifetime: 5 years

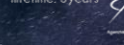PRISMA SG
Hyperspectral
Launch planned 2025
Lifetime: 5 years

Cosmo Second Generation
X band SAR
Launch 2019 (CSG 1)
Lifetime: 7 years

PLATiNO-4
Hyperspectral
Launch planned 2024
lifetime: 3years

PLATiNO-1
X-band SAR
Launch planned 2022
lifetime: 3years

EARTH OBSERVATION
FLEET

OPERATIONAL
IN DEVELOMENT
PLANNED

PLATiNO-2
TIR
Launch planned 2023
lifetime: 3years

SAOCOM (SIASGE component)
L band SAR
Launch 2018, SAOCOM 1A
Launch 2020, SAOCOM 1B
Lifetime: 5 years

Free Flyer
TIR
Launch planned 2026
lifetime: 5years

EAGLE
Multispectral
Launch planned 2024
lifetime: 3years

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

PLATiNO-3
High Resolution
Launch planned 2024
lifetime: 3years

ASI Downstream and Applied Services Unit

New ASI unit with the aim of supporting and accelerating the economic growth and scientific know-how of the Italian companies operating in the downstream sector.

- **Encouraging** the use of the Italian space infrastructure

- **Supporting** the exploitation of data from Italian space infrastructure the and from partner institutions

- **Promoting** the use of space-derived products and services among traditional market sectors

- **Addressing** needs from Industrial, Scientific and Public Administration sectors

- **Focusing** on specific thematic areas (Marine monitoring, air quality, Ground motion, etc.)

Agenzia Spaziale Italiana

PRISMA SCIENZA programme

PRISMA is the ***first hyperspectral satellite*** mission in Europe and represents the technological vanguard in the field of satellite remote sensing.

PRISMA can offer the opportunity to:

- develop new skills in the frontier sector of hyperspectral data processing

- test products that can provide a unique and significant added value to Earth Observation applications

PRISMA SCIENZA programme

- **R&D projects:** New techniques, methods and algorithms for the exploitation of Hyperspectral data

- **R&D activities**: supporting Italian public research and industry in the development of new solutions based on Hyperspectral data data

- **Long term strategies**: analyze the state of the art on the Italian hyperspectral community to define ASI long-term strategies in the field of new EO applications

- **Full data exploitation:** allow the development of advanced services based on hyperspectral data, in particular with other EO data

- **Functional analysis**: understanding the effectiveness of hyperspectral data in the study of the different aspects of Earth Science

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PRIMARY

Project for the development of a novel methodology based on PRISMA data and Machine Learning techniques for the extraction of information on the chemical compopsition of atmospheric particulate

Build a synthetic database of optical properties of the aerosol profile representative of the global atmospheric particulate

AOT C

AOT C (unitless)

0.0   0.7   1.5   2.2   2.9   3.7

Data Min = 0.0, Max = 3.7, Mean = 0.2
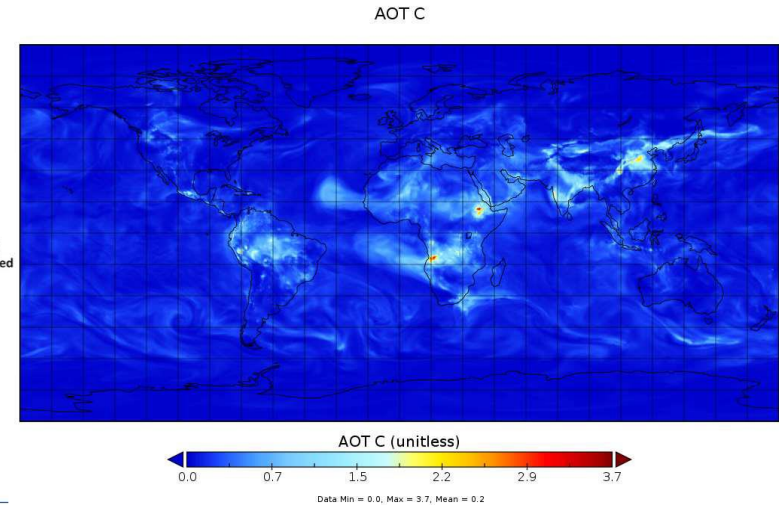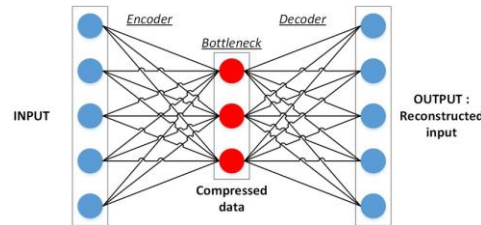
SAPP4VU

Demonstrate how the hyperspectral data analyzed with appropriate ML (Machine Learning) techniques, allow the early detection of the triggering of Land Degradation phenomena

Demonstrate the effectiveness of PRISMA data in accurately estimating damage to ecosystems and evaluating post-damage recovery from disasters (eg. fires and weather events)

IMAA soilspectrallibraries(SSL)
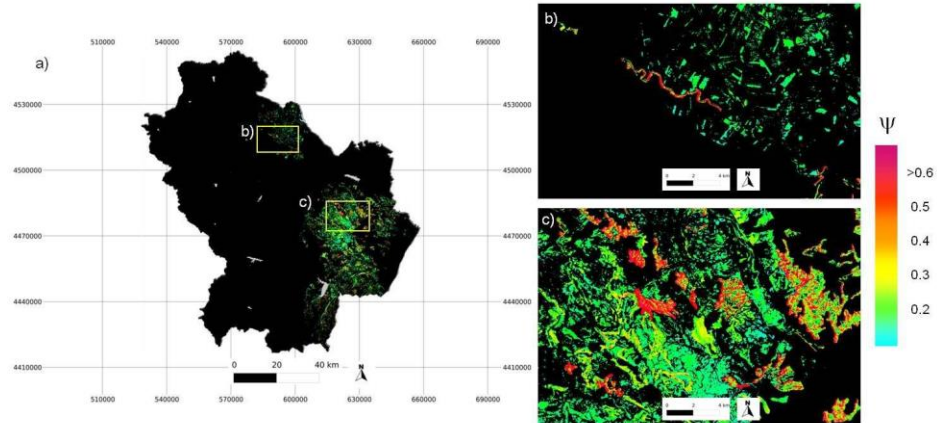
PANDA-WATER
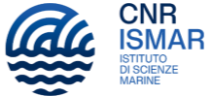
Provide new water products, derived from PRISMA data, for:

- A more accurate estimation of optically active parameters (Chl-a, suspended matter, CDOMn etc…)
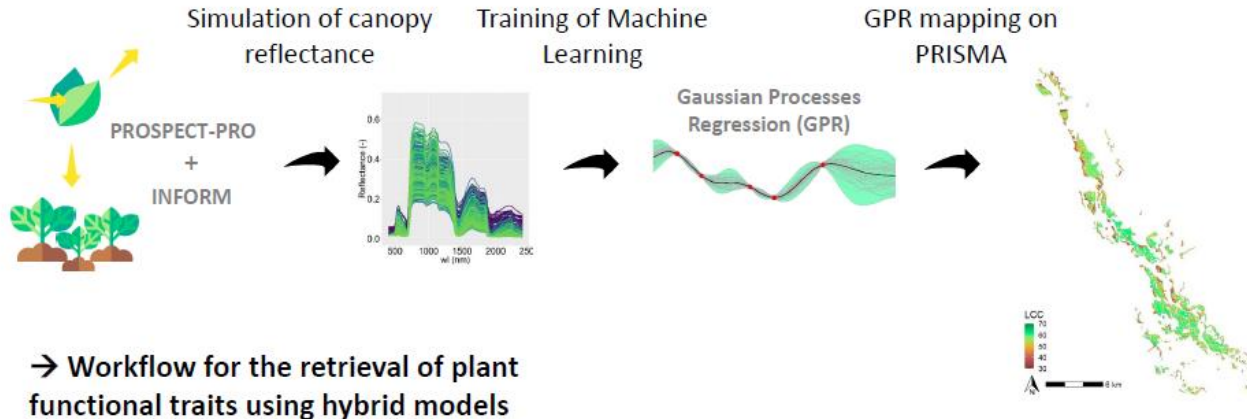- The detection of suspended sediment, transparency, cyanobacteria and algae
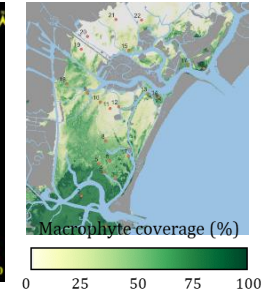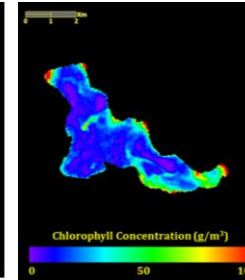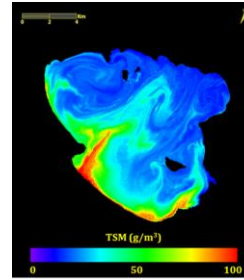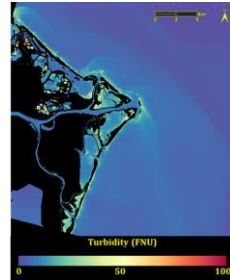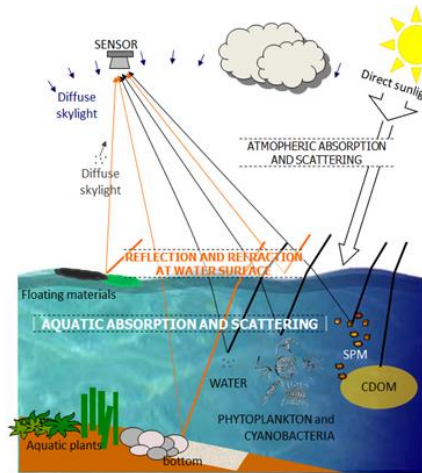
PRIS4VEG

Estimation of functional parameters of vegetation from PRISMA data, for agro-forestry applications

- Generation of **level 3 products related to vegetation**
- Level integration) o assimilation into agronomic / environmental modeling

Simulation of canopy reflectance

PROSPECT-PRO + INFORM

Training of Machine Learning

Gaussian Processes Regression (GPR)

GPR mapping on PRISMA

→ Workflow for the retrieval of plant functional traits using hybrid models
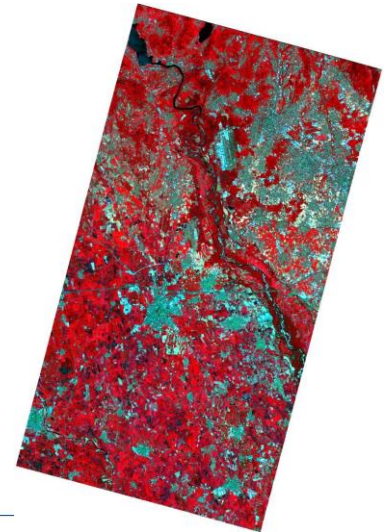
CLEARUP

Carry out an analysis of PRISMA hyperspectral images for the study, development and implementation of indicators of the environmental impact of landfills and the presence of pollutants in the soil and in the air, in proximity of areas affected by their presence.
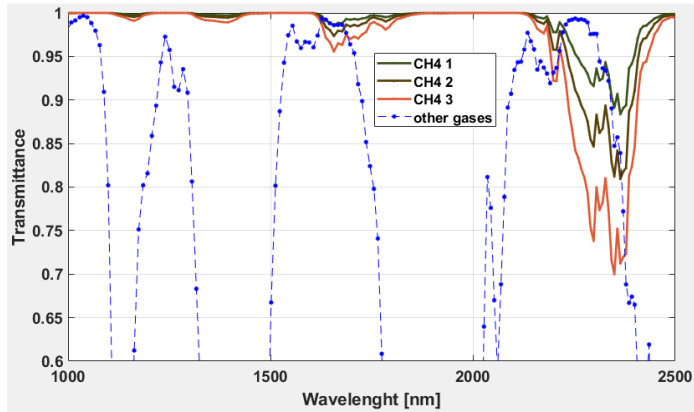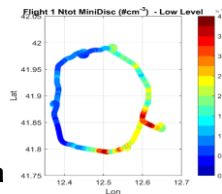

Monitoring emission in atmosphere
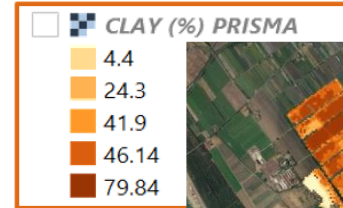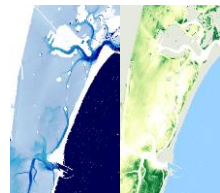

Monitoring of the soil contamination

PRISMA SCIENZA: Thematics of interest
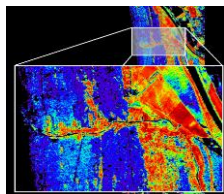
Air quality

Inland and coastal water

Raw Materia

Cryosphere
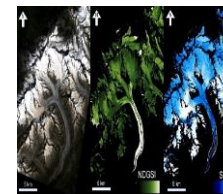
Agriculture & Forestry

Cultural heritage
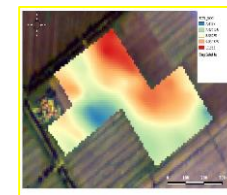
Soil properties
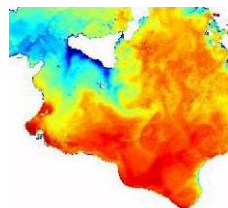
Open air activity

Natural disasters

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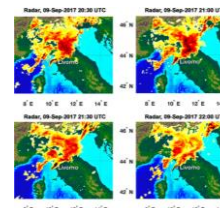
PRISMA SCIENZA: Technological solutions

Modelling
– Biophisical modelling, inversion, etc.

Artificial Intelligence/Deep learning
– NN, GAN

Machine Learning
– SVM,random forest, classification, clustering, etc.
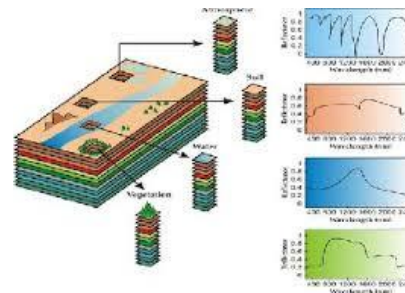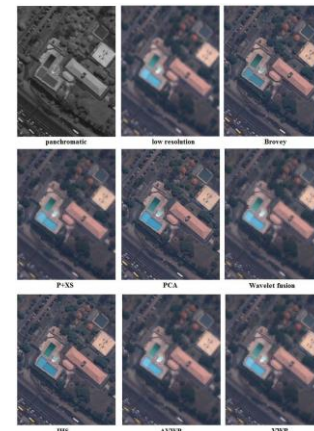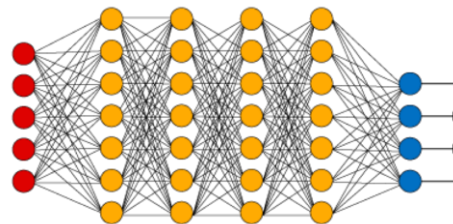
Resolution/quality enhancement
– Pan-sharpening, Super-resolution, denoising, destriping

Spectral unmixing
– Linear, bilinear, nonlinear

Data fusion
– Sensor fusion

Thank you
for your attention

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