

ASI's roadmap towards scientific downstream applications of satellite data

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Session ESSI4.3 Faster Uptake of Earth Observation Based Services for the Geosciences

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National context & downstream

“**Telecommunications, Earth Observation and Navigation**” (TLC/EO/NAV) sector is the 1st by priority order within the Italian Government’s guidelines on space and aerospace matters to achieve the strategic objectives of the national space policy [1].

TLC/EO/NAV satellite services and applications (the so-called “*downstream*”) will be exploited by citizens and valorized by Institutions under an integrated application perspective.

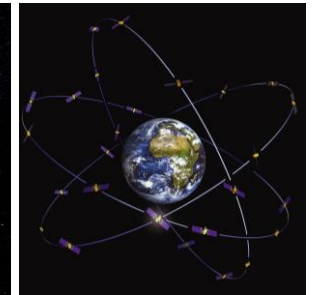
[1] https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta_CONTE/COMINT/DEL_20190325_aerospazio.pdf



ASI's Earth Observation missions and EC Copernicus Programme



Athena-Fidus



Galileo
constellation

Scientific downstream

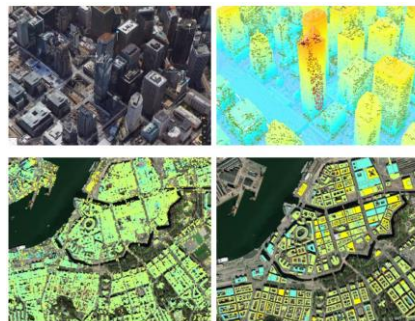
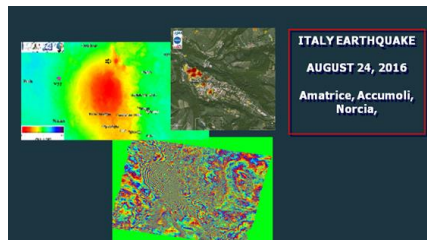
What is “**scientific downstream**”? Which role does satellite data-based geosciences play?

- *applications enabled by the exploitation of mature and validated algorithms that have been originally developed to answer scientific questions and/or retrieve geophysical parameters, and have been brought to the stage that they can generate products addressing specific user needs beyond scientific and academic purposes only*
- from Earth observations and data to information and products

Early 1990s - Science



Today – operational products for civil protection & emergency response

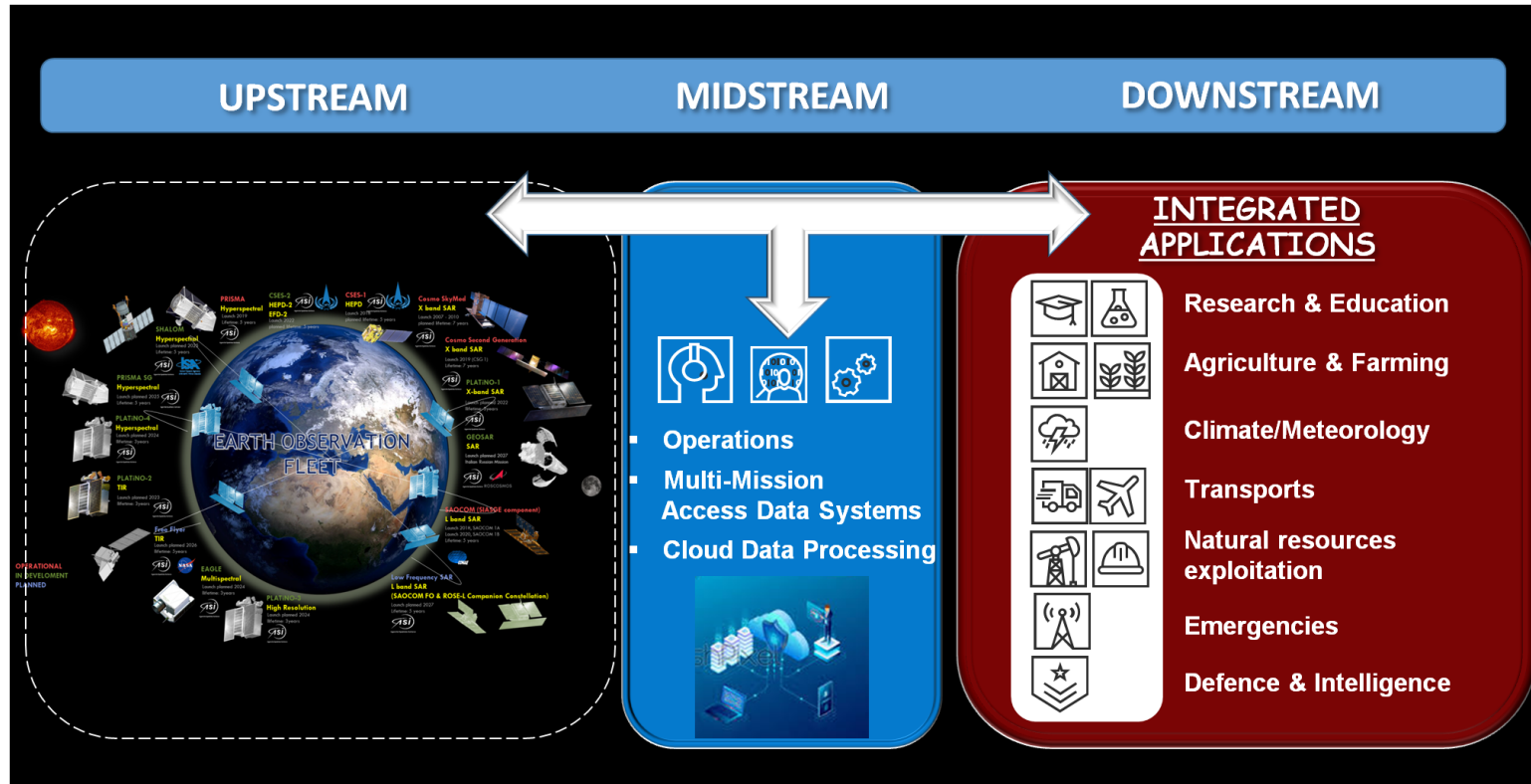


Today – value-added products & operational guidelines for users

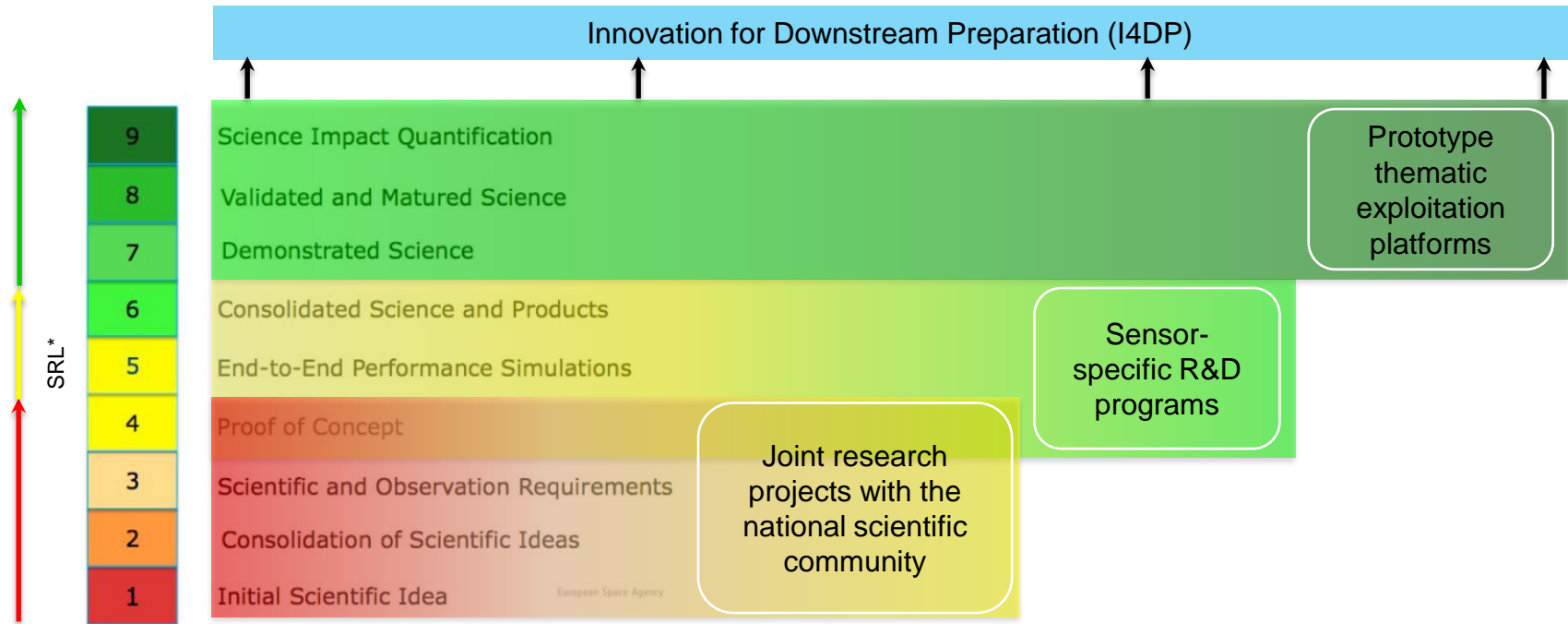
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From space assets to applications & services



ASI's initiatives & scientific downstream portfolio



* SRL – Scientific Readiness Level as per the definition in the European Space Agency (ESA) SRL Handbook EOP-SM/2776

Joint research projects with the national scientific community

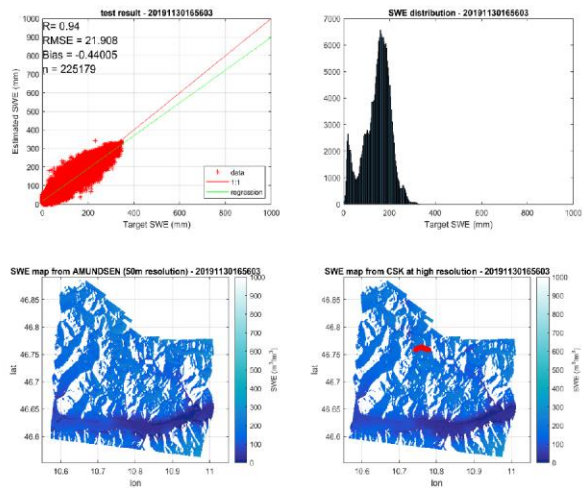


Agenzia Spaziale Italiana

“Development of algorithms for estimation and monitoring of **hydrological parameters** from satellite and drone” (2019-2022) funded by ASI under grant agreement n. 2018-37-HH.0



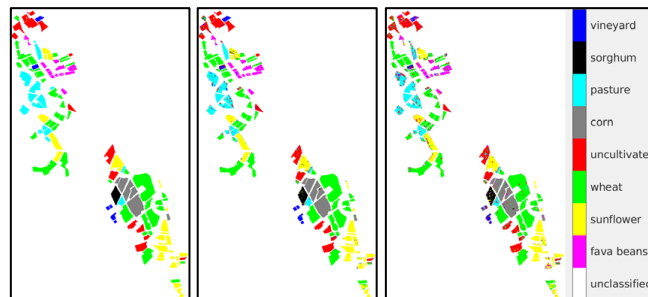
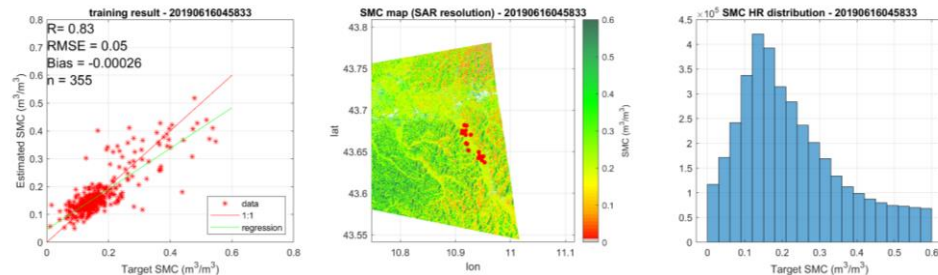
Snow Water Equivalent (SWE) map generation using COSMO-SkyMed StripMap and PingPong time series



Scan the QR code to request a copy of the paper




Soil moisture mapping at high resolution by merging SMAP, Sentinel-1 and COSMO-SkyMed data with the support of machine learning



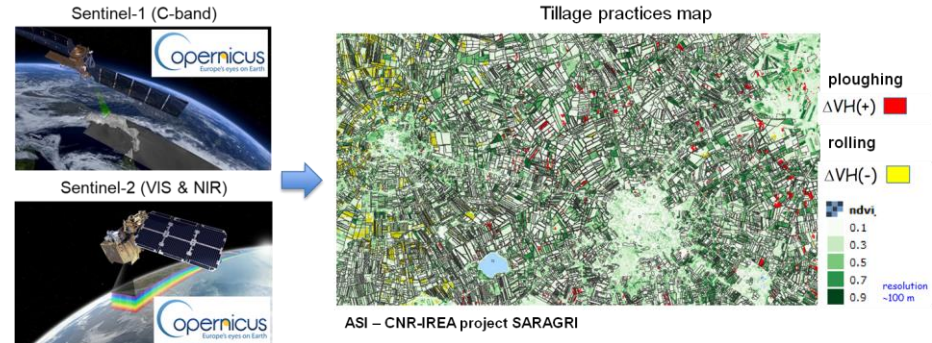
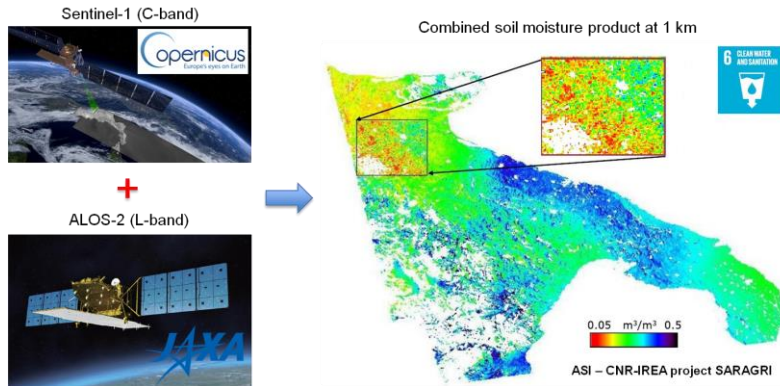
Crop classification & early-season crop mapping using Sentinel-1 and COSMO-SkyMed data and convolutional neural networks

Multi-mission & multi-frequency SAR programme

- 10 projects for 5 R&D areas of specific interest
- Algorithms development and integration of multi-mission L/C/X-band SAR data from (i) national, (ii) Copernicus and (iii) other bilateral cooperation missions
- Prototype / pre-operational products

Agriculture • SARAGRI • CLEXIDRA		Urban areas • MultiBigSARData		Natural hazards • MUSAR • MEFISTO • DinSAR-3M	
Cryosphere • CRIOSAR • SMIVIA		Sea & coast • APPLICAVEMARS • COAST			

Validation of products generated from multi-frequency SAR data by using ground-truth data

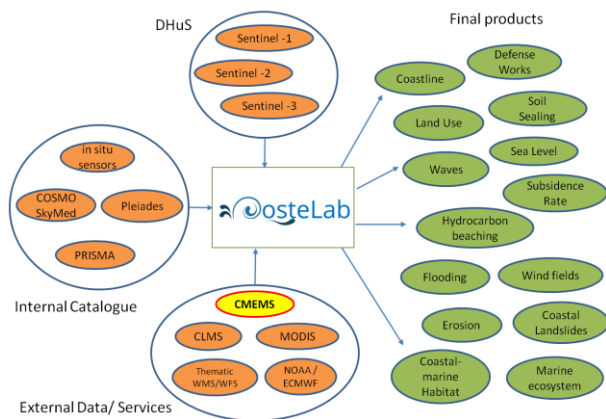


Prototype thematic exploitation platforms

Scan to know how *costeLAB* works



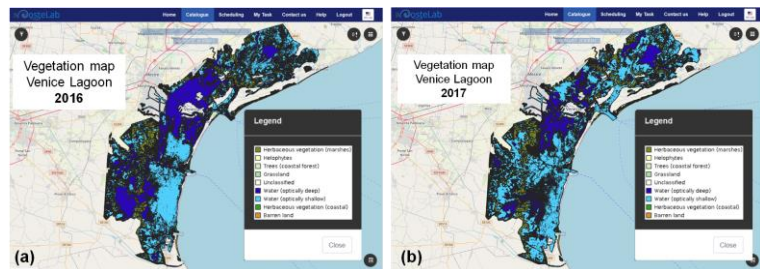
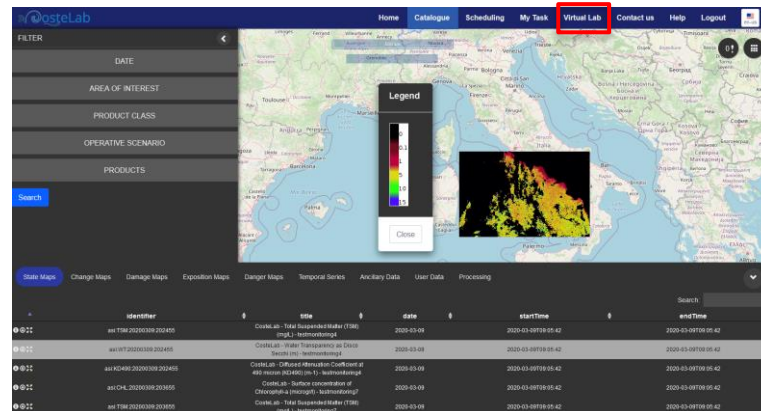
costeLAB operational context



for **coastal and marine** downstream applications

"Progetto Premiale Rischi Naturali Indotti dalle Attività Umana - COSTE", n. 2017-I-E.O, funded by the Italian Ministry of University and Research (MUR)

User interface & consolidated products that users can generate



Examples of **research products** generated by Researcher Users in the **Virtual Lab** (i.e. morphological evolution of terrestrial coastal ecosystems based on Sentinel-2 data (a) 2016 and (b) 2017 by P. Villa, IREA-CNR, & F. Braga, ISMAR-CNR).

- Coastline
- Defense works
- Coastal land use
- Coastal soil sealing
- Sea level
- Habitat maps
- Coastal subsidence rate
- Landslide activities
- Wave movement
- Wind fields
- Marine ecosystem (CHL, TSM, WT,CDOM)
- Marine ecosystem (SST)
- Marine ecosystem (day SST cycle)
- Coastline change map
- Defense works change map
- Land use and soil sealing change map
- Habitat change maps
- Flooding maps
- Hydrocarbon beaching
- Coastal pollution at national scale
- Pollution at coastal scale
- Flood exposure
- Erosion exposure

Innovation for downstream preparation for Science

- **DEMONSTRATE** innovative services with users through use cases and pilot projects – [user-driven approach](#)

Demonstrate capabilities vs. user needs that are currently not fully addressed by existing services

Application domains of national & international interest



1st Call for ideas
“Sustainable Cities”
closed on 28/03/2022



2nd Call for ideas
to be launched soon



- **TRAINING** new operators capable to deliver application services based on demonstrated algorithms & products



Thank you for your attention!

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