WELCOME
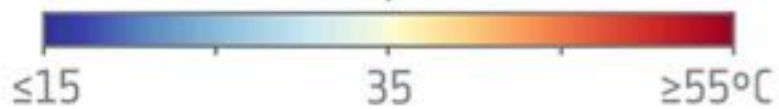
Rune Floberghagen
Head of Science, Applications & Climate Department
Earth Observation Directorate
European Space Agency (ESA)

International Workshop on High-Resolution Thermal EO

10–12 May 2023 | ESA–ESRIN | Frascati (Rome), Italy

Land surface temperature
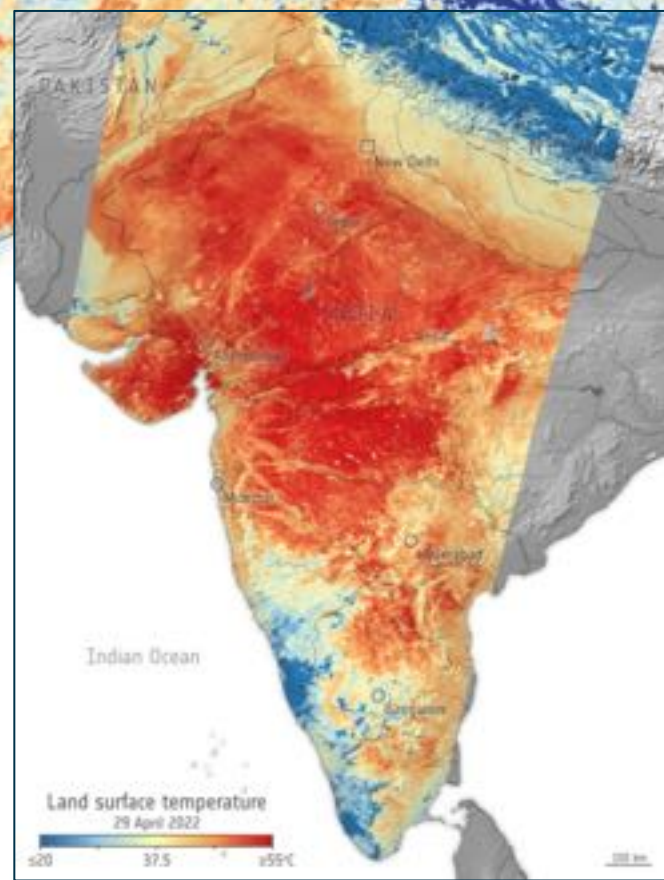17 July 2022
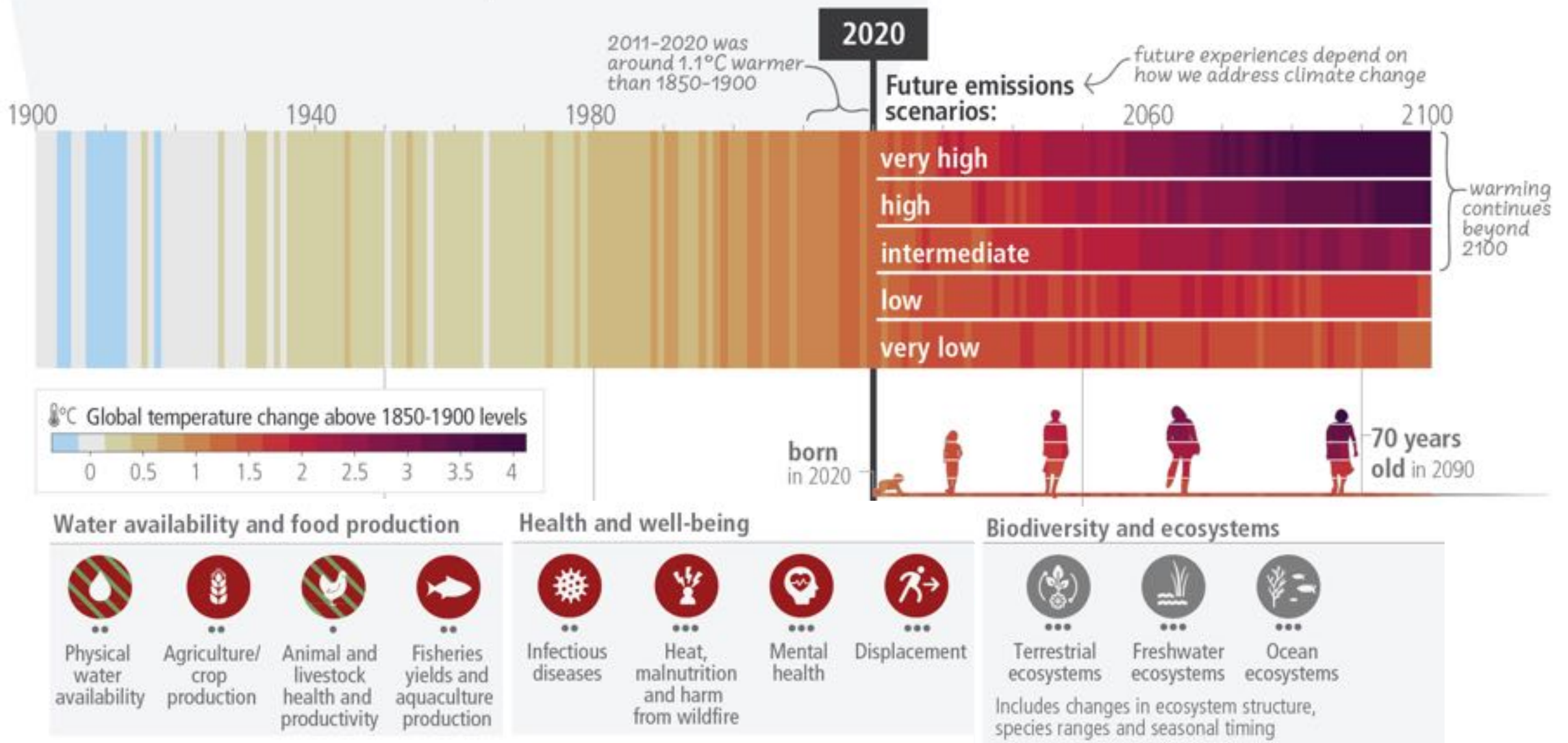
≤15   35   ≥55°C

Southern Gironde wildfires

FRANCE

Toulouse

Barcelona

SPAIN

Madrid

PAKISTAN

New Delhi

Indian Ocean

Land surface temperature
29 April 2022

≤20   37.5   ≥55°C

2011–2020 was around 1.1°C warmer than 1850–1900

2020

future experiences depend on how we address climate change

Future emissions scenarios:

very high

high

intermediate

low

very low

warming continues beyond 2100

°C Global temperature change above 1850-1900 levels

0   0.5   1   1.5   2   2.5   3   3.5   4

born in 2020

70 years old in 2090

Water availability and food production

Physical water availability

Agriculture/ crop production

Animal and livestock health and productivity

Fisheries yields and aquaculture production

Health and well-being

Infectious diseases

Heat, malnutrition and harm from wildfire

Mental health

Displacement

Biodiversity and ecosystems

Terrestrial ecosystems

Freshwater ecosystems

Ocean ecosystems

Includes changes in ecosystem structure, species ranges and seasonal timing

International Cooperation for HR Thermal Monitoring

TRISHNA

SBG-TIR

LSTM

Landsat
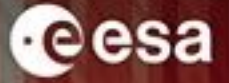
ECOSTRESS

New Space for thermal EO

164 abstracts

305 participants
+ online

39 countries
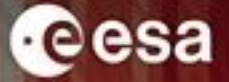
11 missions
(7 New Space)

5 space agencies
as co-organizers

International Workshop on High-Resolution Thermal EO

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Objectives

Benjamin Koetz, LSTM Mission Scientist & Head of Sustainable Initiatives Office
Giuseppe Ottavianelli, Head of Applications Section

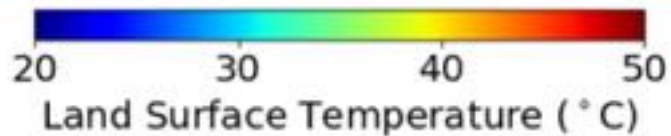Earth Observation Programmes Directorate, European Space Agency (ESA)
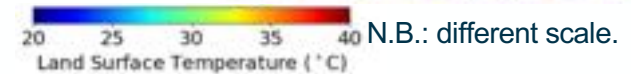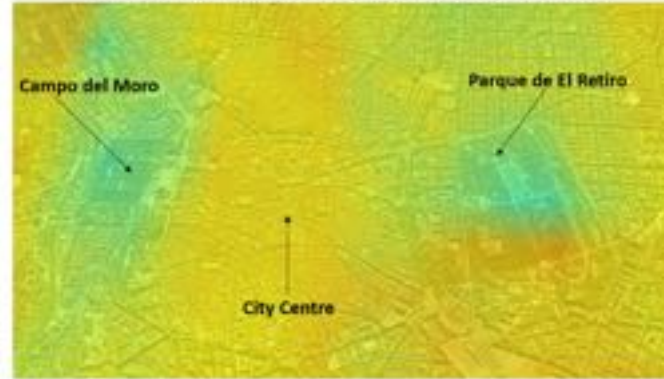
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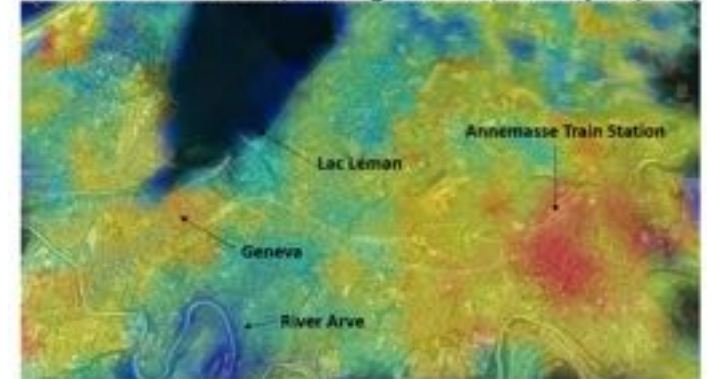
Need for High Resolution Thermal EO

Rome, north area, 13 August 2021, 2:17 pm (UTC)

River Tiber
Large infrastructure
Shopping centers
Train networks
Clouds
Villa Glori
River Aniene
Villa Ada

Land Surface Temperature (°C)

Madrid, 16 August 2021, 8:36 am (UTC)

Campo del Moro
Parque de El Retiro
City Centre

Switzerland & France, 17 August 2021, 12:43 pm (UTC)

Annemasse Train Station
Lac Léman
Geneva
River Arve

N.B.: different scale.
Land Surface Temperature (°C)

South outskirts of Modena, 13 August 2021, 2:17pm (UTC)

Forest
Water bodies
Water Sufficient
Water Stressed

Evapotranspiration (Wm⁻²)

European ECOSTRESS Hub (EEH)
https://www.nasa.gov/mission_pages/ecostress
https://foodsecurity-tep.net/ecostress-hub

Need for High Resolution Thermal EO

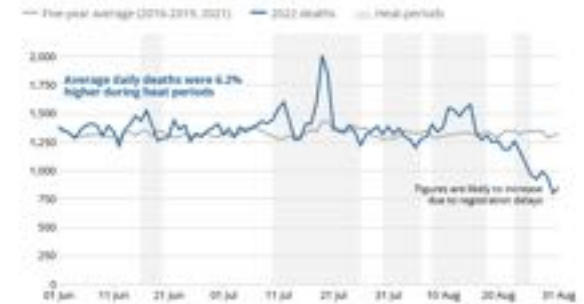**High resolution and frequent thermal EO capabilities will be critical for adaptation and preparedness to heat waves & droughts**
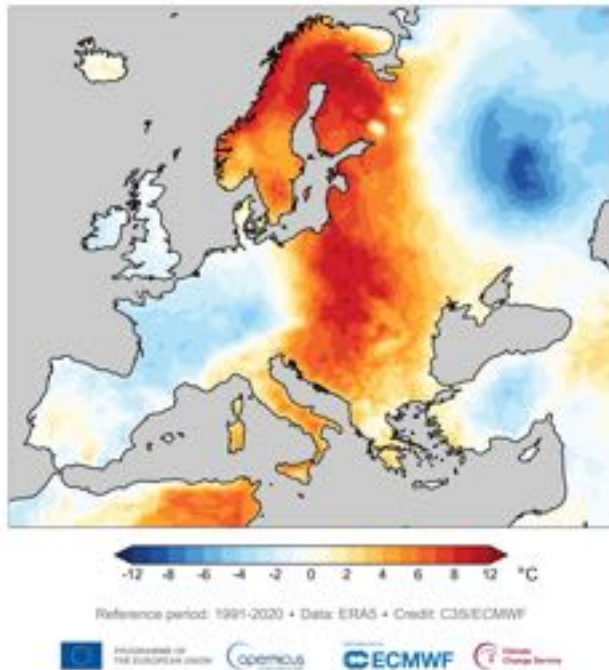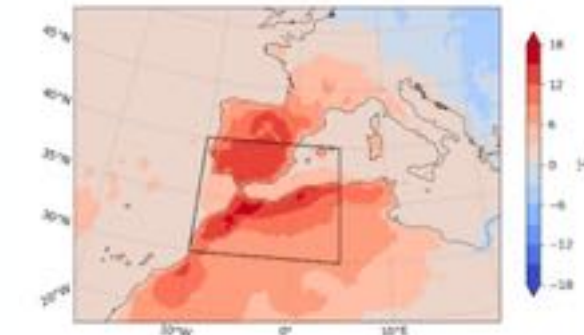
One of the various factors impacting biodiversity loss

Global warming and biodiversity loss 1970 – 2018

WWF

- Strengthen **international cooperation and coordination** in the space and ground segments, for calibration and validation activities, for products definition & harmonization.

- Share **updates on the state-of-the-art activities and projects** in relevant science and application areas, **stimulating exchanges** across research groups for the use of the upcoming missions.

- Formulate **recommendations** and identify high-priorities **topics for future R&D activities** supporting the preparation of HR thermal EO data exploitation. (e.g., ESA EOP FutureEO Block-4 roadmap: Science, Applications, Industry, Digital Innovation, Disruptive Technologies, Sentinel User Preparation).

→ THE EUROPEAN SPACE AGENCY

Sentinel User Preparation (SUP) ESA EOP Initiative

Activity in collaborative synergy with the EC

CRISTAL

LSTM

ROSE-L

WHAT
SUP is a preparatory program for the use of Copernicus Expansion/NG data. Strong support by MS and EARSC.
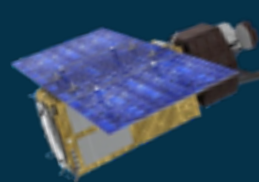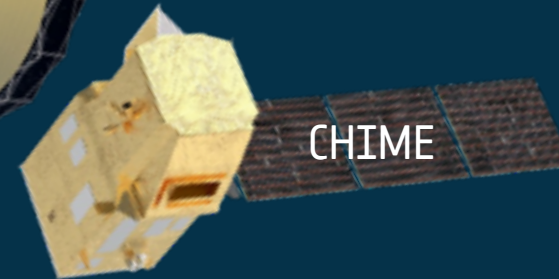With a **multi-mission approach**.

WHY
Supporting the integration of new Copernicus Expansion/NG datasets towards future operational working practices and promote European leadership for space systems where competitors are already active and boost digital commercialisation (ref. **EARSC workshop** 2021 with D-EOP).
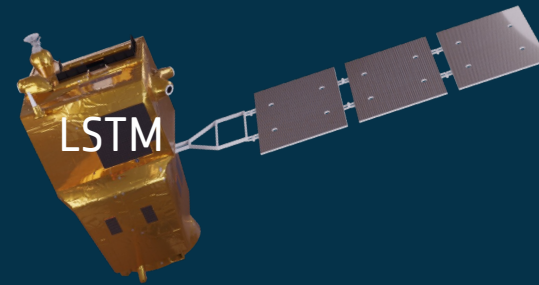
HOW
- Build the **necessary expertise in the various science and application domains** and sectors (academia, value adding companies) to prepare future downstream services.
- Ensure **awareness for rapid uptake** by users and stakeholders of derived information products.

CIMR

CHIME

CO2M

EFFECTS
- **Readiness** of science/applications/downstream analytics to address societal/environmental challenges.
- Act as 'de-risking' factor and incentive for growth to **maximise return-on-investment**.

Enabling actions

➔ **Enabling actions** on:

     1) **[SUP-1] Applications preparedness with stakeholder and end-users**

     2) **[SUP-3] Fundamental research and algorithm/products developments/validation**

     3) **[SUP-4/5] New processing methods for Sentinel Expansion class datasets**

➔ **Cross-cutting** components :

     1) **[SUP-2] SUP Sharing and Collaboration Environment**

     2) **[SUP-6] Training, toolboxes and education**

➔ **Multi-mission** approach.

➔ **Representative dataset consolidation** (e.g., in terms of revisit time, resolution, and spectrally/technique) over specific areas of interest, with stakeholder engagement as necessary, through: proxy-data from non-ESA missions (national, international partners, commercial), simulated/ synthetic data from models, and in-situ/validation/campaign data. Leveraging and complementing existing infrastructure/datasets and planned campaign data.

- **Multi-missions** Applications topics :

  - **Agriculture** (crop and vegetation indices, operations monitoring, yield estimation, water productivity with soil moisture/irrigation/evapotranspiration)

  - **Ecosystem and biodiversity monitoring** (ecosystem structural and functional traits, habitat mapping)

  - **Soil management** capacities (e.g., composition, organic carbon, degradation)

  - Enhanced **Methane Point Sources** capacities

  - **Forest management** (classification, biomass/carbon, disturbances, fire risks)

  - **Resilient Cities**

  - **Critical Infrastructures**

  - **Mining and extractives**

Date: Wednesday, 10/May/2023

8:45am - 9:30am	Registration
9:30am - 11:00am	Opening Location: Chair: An Chair: Mi
11:00am - 11:15am	Discuss
11:15am - 11:45am	Coffee
11:45am - 1:00pm	1.2 Harm Location: Chair: Bi Chair: Sir
1:00pm - 1:15pm	Discussion and Recommendations
1:15pm - 2:30pm	Lunch
2:30pm - 3:50pm	1.3 New Space for Thermal EO Location: Big Hall, Building 14 Chair: Ferran Gascon, ESA Chair: Zhuoting Wu, USGS
3:50pm - 4:00pm	Discussion and Recommendations
4:00pm - 4:20pm	Coffee Break
4:20pm - 5:50pm	1.4 Algorithm development Location: Big Hall, Building 14 Chair: Itziar Barat, ESA Chair: Jean-Louis Roujean, CESBIO
5:50pm - 6:00pm	Discussion and Recommendations
6:00pm - 7:30pm	POSTER SESSION AND WELCOME DRINK Location: Big Hall, Building 14

Date: Thursday, 11/May/2023

9:30am	2.1 Agriculture - irrigation, evapotranspiration
- 1:20pm	
1:20pm - 2:30pm	Lunch
2:30pm - 4:00pm	2.3 Ecosystem & Coastal Location: Big Hall, Building 14 Chair: Emmanuelle AUTRET, IFREMER Chair: Gilles Boulet, IRD
4:00pm - 4:10pm	Discussion and Recommendations
4:10pm - 4:40pm	Coffee Break
4:40pm - 6:10pm	2.4 Urban Heat & Cryosphere Location: Big Hall, Building 14 Chair: Glynn Hulley, NASA Jet Propulsion Laboratory Chair: Jose A. Sobrino, University of Valencia
6:10pm - 6:20pm	Discussion and Recommendations
6:20pm - 7:20pm	POSTER SESSION Location: Big Hall, Building 14

Date: Friday, 12/May/2023

9:00am	3.1 Calibration & Algorithms
	nologia
12:50pm - 1:15pm	Closing Session Location: Big Hall, Building 14 Chairs: Giuseppe Ottavianelli ESA, Benjamin Koetz ESA, Simon Hook NASA/JPL, Philippe Gamet CNES, Sara Venafra ASI, Bimal Bhattacharya ISRO

Discussions & Recommendations sessions fundamental for the definition of the future roadmap

A very rich 2.5-day programme!

ESA Conference support team (e.g., taxi, shuttle to Frascati on Friday).

Lunch in the Canteen at 1h30.

Group Photo.

15

→ THE EUROPEAN SPACE AGENCY

Thanks to the full team
…the organizing committee,
…the scientific committee,
…the session chairs,
…the onsite team!

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