

2nd Workshop on International Cooperation in Spaceborne Imaging Spectroscopy

19-21 October 2022, Frascati, Italy

The Copernicus Hyperspectral Imaging Mission For The Environment (CHIME): Status And Next Steps

Marco Celesti, Jens Nieke



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European Space Agency

Tim Lemmens, Peter Strobl, Cristina Ananasso***
European Commission

Andrew Skidmore, Heike Bach, Eyal Ben-Dor, Sabine Chabrillat, Cindy Ong, Claudia Giardino, Giovanni Rum, Jean-Baptiste Feret, Luis Guanter, Martin Schlerf, Martin Schodlok, Matthew Williams, Michael Schaepman, Robert O. Green, Roberto Colombo, Stuart Marsh, Tobias Storch
Members of the CHIME MAG

CHIME
Copernicus Hyperspectral Imaging
Mission for the Environment

* now at ISSI Bern

** now at University of Zurich

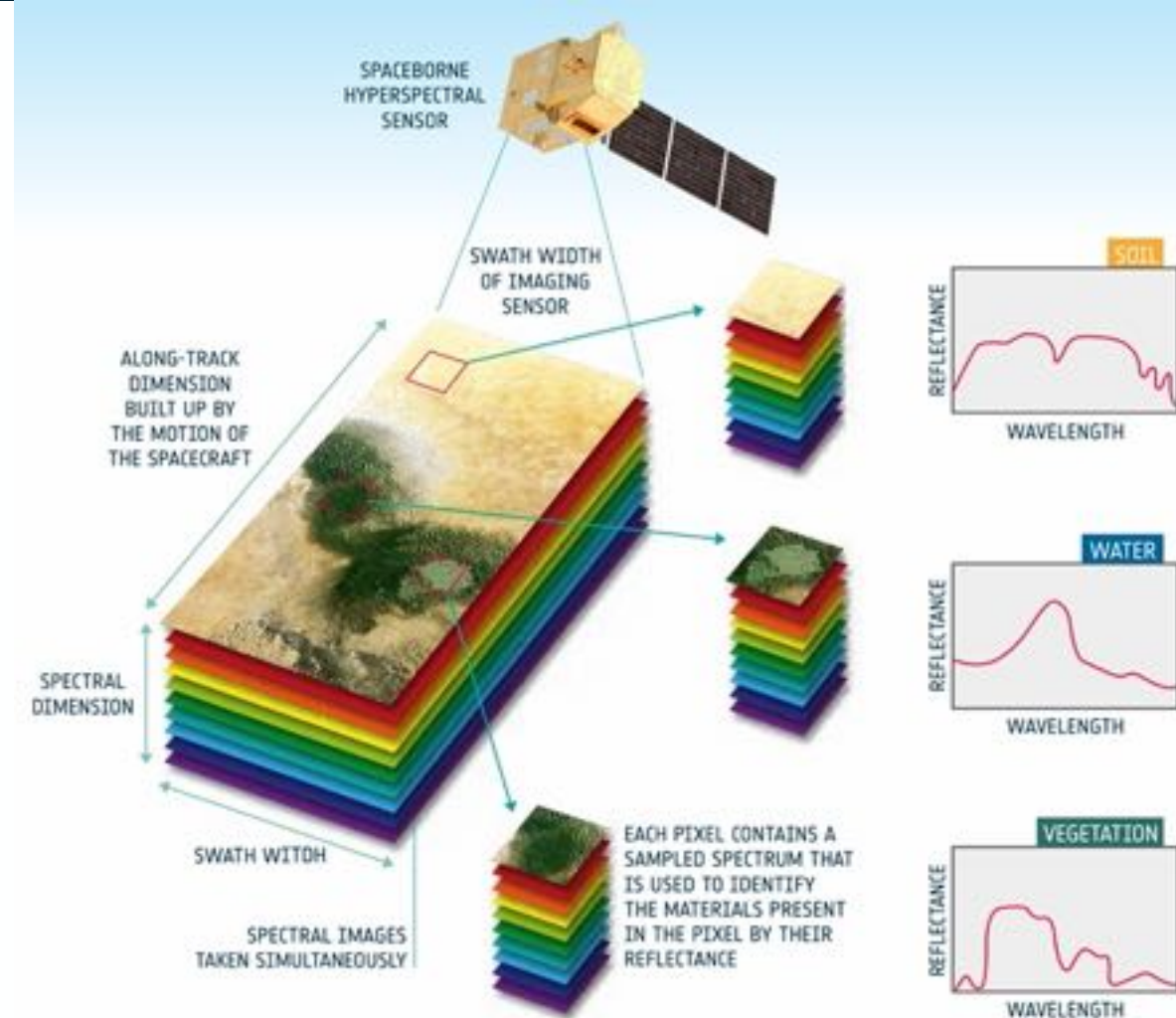
*** now at ECMWF

CHIME Key Specifications

- Operational hyperspectral observations of land and coastal areas (current mask: up to 370 km offshore)
- Spectral range: 400 – 2500 nm
- FWHM and SSI $\leq 10\text{nm}$
- Ground Resolution: 30 m
- Swath: $\sim 130\text{ km}$
- Revisit 11 days (2 satellites)
- High radiometric accuracy, low spectral/spatial mis-registration
- High SNR




Core data products:

- L1-B Top-of-atmosphere (TOA) radiance
- L1-C Ortho-rectified TOA reflectance
- **L2-A Ortho-rectified bottom-of-atmosphere (surface) reflectance**



More @13:40 from Antonio Gabriele

CHIME High Priority Prototype Products

DOMAIN	THEMATIC AREA	VARIABLES CHPPP	CHIME Candidate Algorithms
AGRICULTURE / FOOD SECURITY	 <p>Assessment of biophysical and biochemical variables related to the crops and of agronomic interest</p>	Leaf/Canopy Pigment Content	<p>Semi-empirical modelling based on narrow-band vegetation indices; Hybrid methods based on ANN/LUT or other machine learning algorithms applied to vegetation canopy radiative transfer models outputs (e.g. PROSAIL).</p> <p>Narrow-band vegetation indices; Hybrid methods based on ANN/LUT or other machine learning algorithms e.g. GPR methods applied to vegetation canopy reflectance models (e.g. PROSAIL).</p>
		Leaf/Canopy Nitrogen Content	
		LAI	
		Canopy Water Content	
		Leaf/Canopy Pigment Content	
	Leaf Mass/Area		
	 <p>Topsoil properties</p>	Soil organic carbon content	<p>Chemometrics modelling (e.g. PLSR); Spectral analysis; Spectral indices; Machine learning (e.g. Random Forest)</p>
		Soil texture (clay, silt, sand)	
GEOLOGY & MINERALS	 <p>Raw material detection</p>	Mineral identification / classification (Kaolinite, Smectite, Jarosite, Dolomite)	<p>Sub-pixel linear unmixing Tetracorder type (EnGeoMap/PRISM)</p>
		Hematite – Goethite distribution	
		Ferric oxide content	
		Kaolin Crystallinity	

CHIME “Hypersense” Campaigns

2018 – Ground / Airborne

2020 – Ground / ~~Airborne~~ / Spaceborne

2021 – Ground / Airborne / Spaceborne

More @9:44 tomorrow
from Andy Hueni

- 17 fully successful sites (+1) across Europe
- Exceptional coordination between all teams (including PRISMA and DESIS)
- Concurrent Ground / Airborne / Spaceborne acquisitions over 8 sites
- Open data policy fostering community exploitation



AVIRIS-NG Surface Reflectance (RGB)
22nd June 2021 - Jolanda di Savoia (IT)



- **CHIME Level-2 Study >> processors development and cal / val**

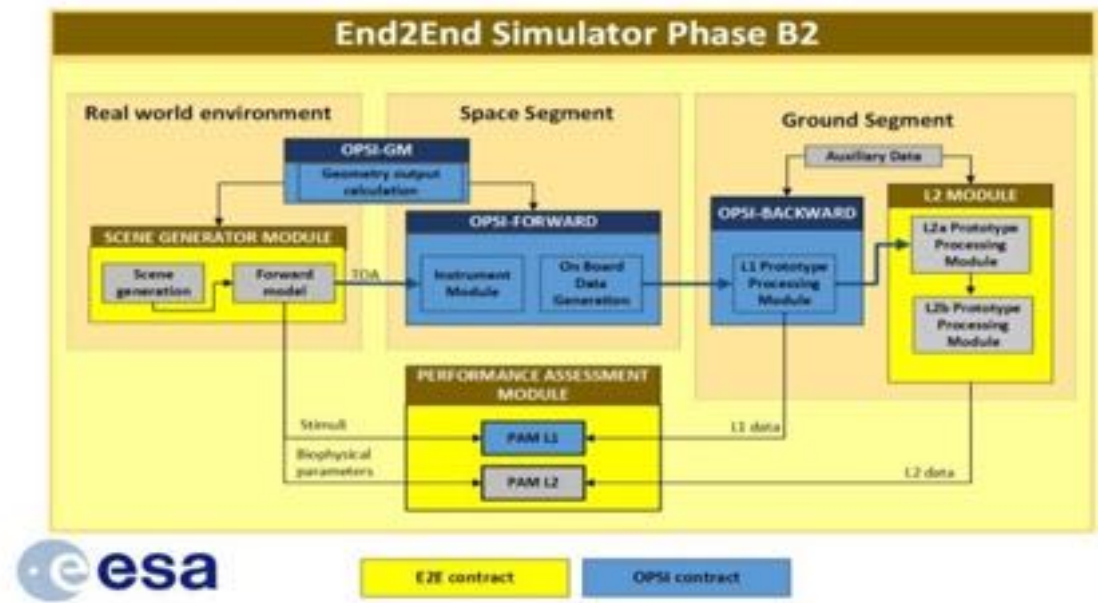
- ITT planned for: Q4 2022
- Intended Start Date: Q1 2023
- Estimated Duration: 6 years

- **CHIME Phase B2CDE E2E simulator**

- Consortium: GMV (ES/PL) prime + GFZ (DE), ISPRA (IT), University of Valencia (ES) as subcontractors
- KO 1 April
- E2E v1 expected by Dec 22

- **Additional campaign activities**

- **Sentinel User Preparation activities**



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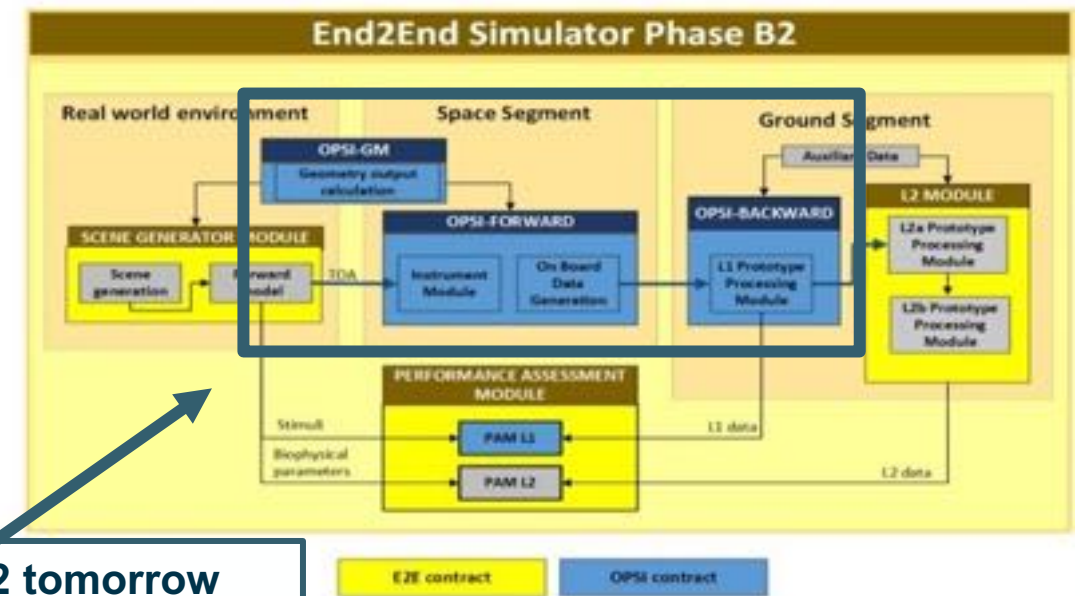
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More @9:02 tomorrow
from Nicolas Lamquin

More @18:16 from Roberto Camarero and Shima Ghasemi on on-board processing

Schedule

- PDR Board 15-Jul-2022
- Instrument HSI PDR Board 31-Oct-2022
- Start of Phase C/D expected in Q4 2022
- CDR Board Q2 2025
- QAR of PFM Q3 2028

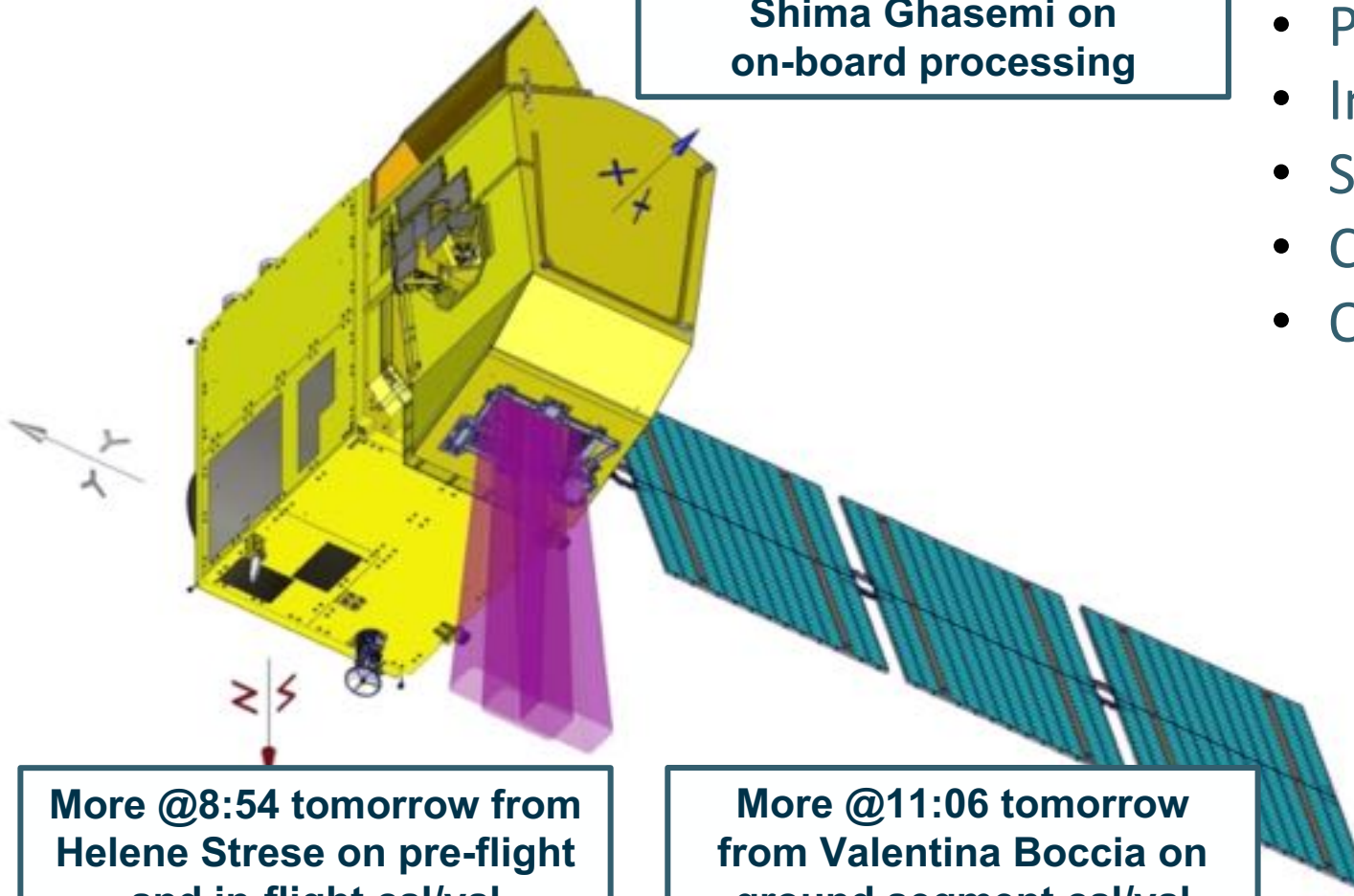
The Industrial Core Team consists of Thales Alenia Space (FR) Consortium Prime



OHB (DE) Instrument Prime with AMOS (BE) and Leonardo (IT)

More @8:54 tomorrow from Helene Strese on pre-flight and in-flight cal/val

More @11:06 tomorrow from Valentina Boccia on ground segment cal/val





Thank you for your attention!

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CHIME

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