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TAKING THE PULSE OF OUR PLANET FROM SPACE

FLEX Product Validation and Campaigns: Status and Plans

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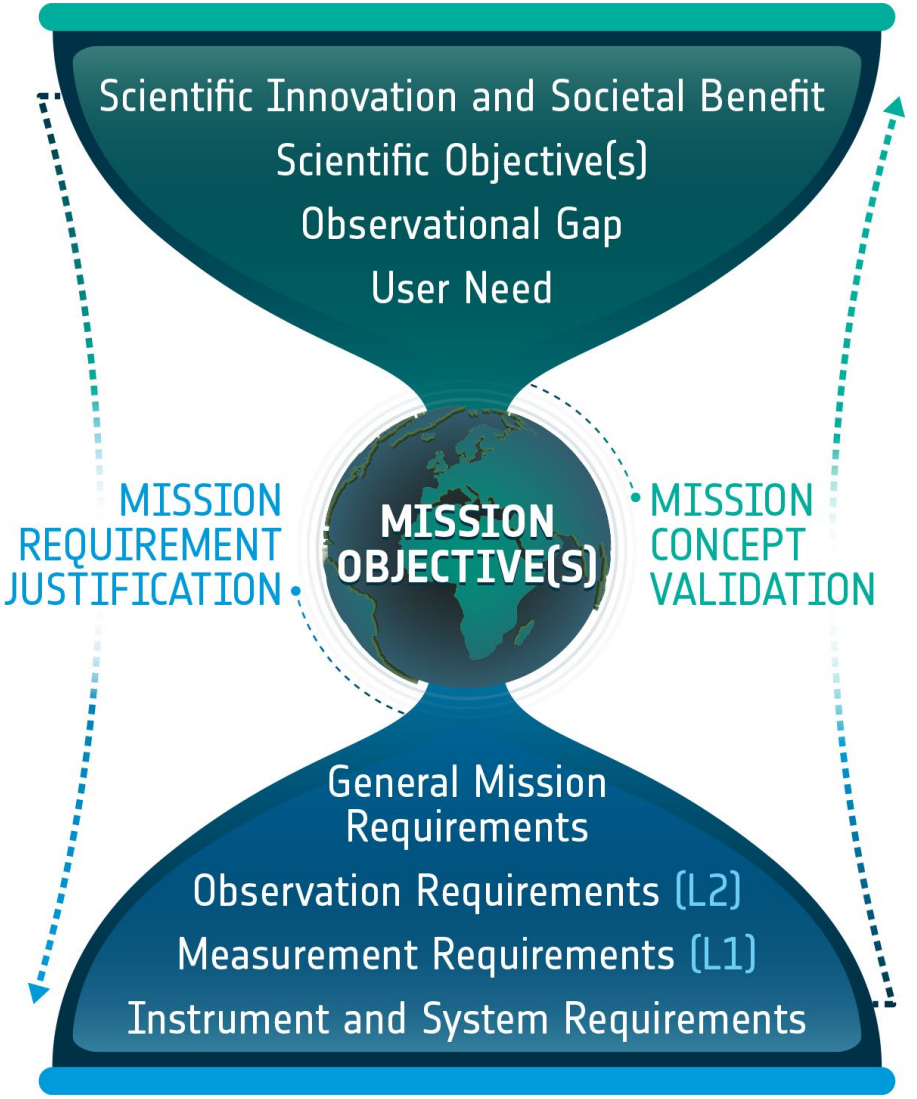
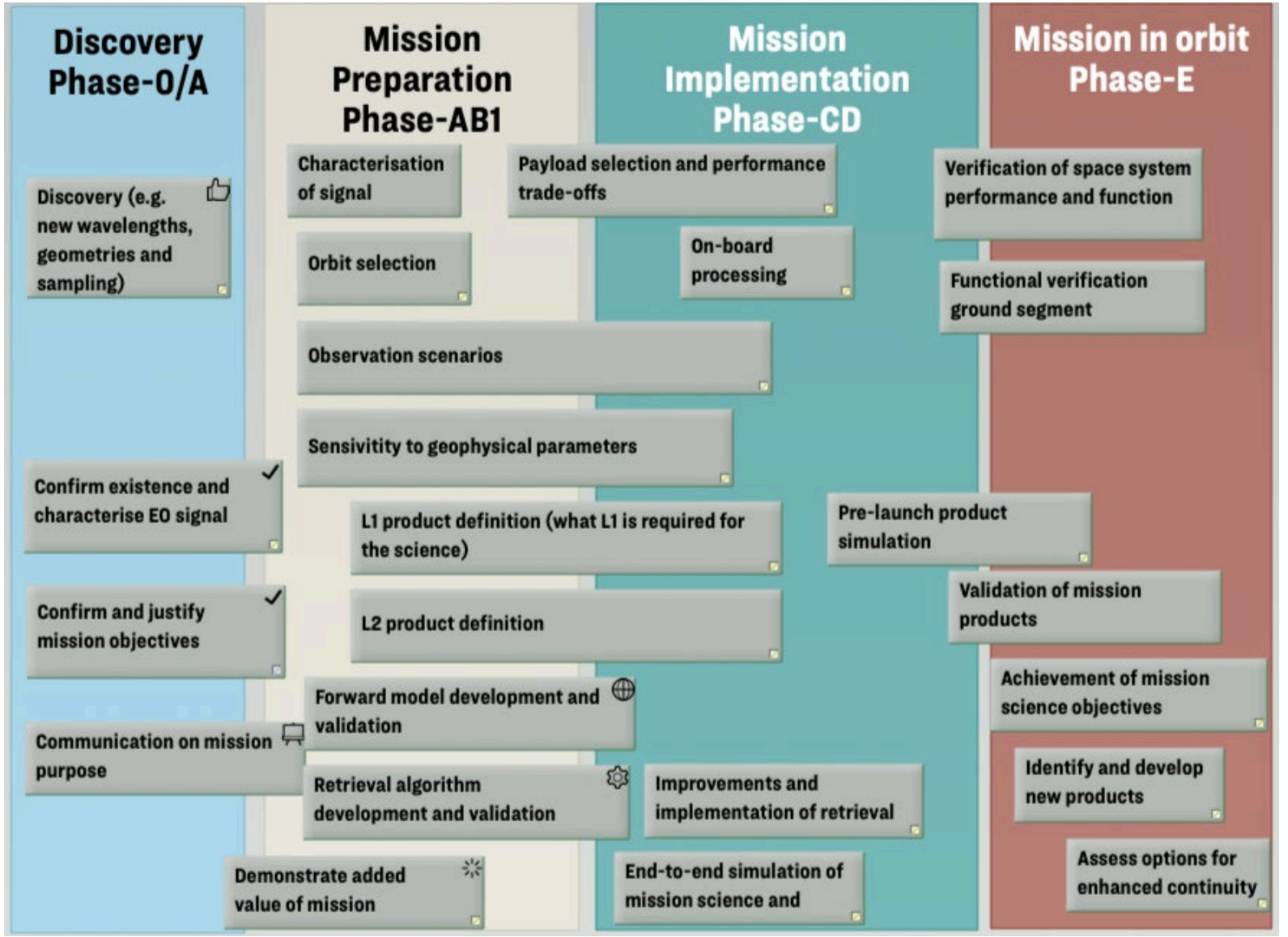
Mission Development & Validation

- Scientific Readiness Levels (SRL) give overall guidance throughout Mission Phases
- Science Plan as the basis for actual Development from Phase B1 onwards
- Campaigns and Studies performed based on Scientific Objectives & Mission/User Needs
- The according output forms the basis for mission development and the validation plan for phase E1 onwards



The role of EO campaigns – a visual guide

- Role and contribution of campaigns through all phases of EO missions (Earth Explorer, Copernicus and Met. missions)
- Different project phases require different inputs (from discovery to verification)
- Campaigns embed **end-to-end simulation** aspects of EO missions, e.g.
  - Level-0 data collection
  - Processing to Level-1 (engineering units)
  - Processing to Level-2 (geophysical units)



Overview of Previous FLEX Campaigns

DEFLOX:

- Ground-based proximal Sensing
- Drone-based proximal Sensing
- Instrument Calibration
- Retrieval Development

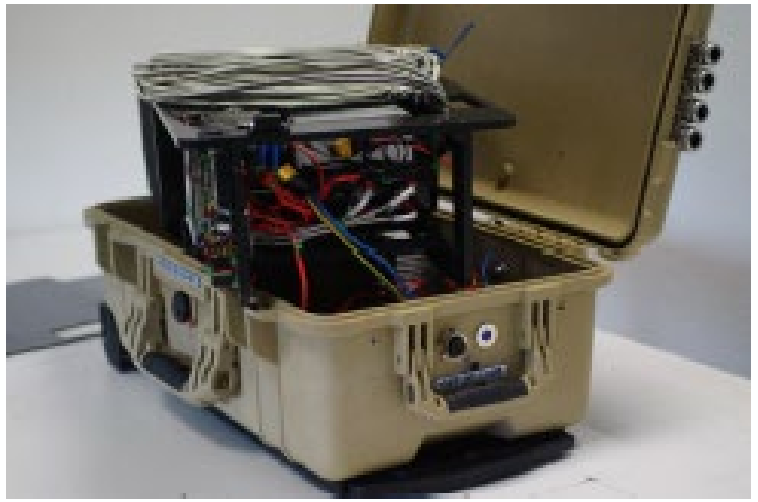
AtmoFLEX:

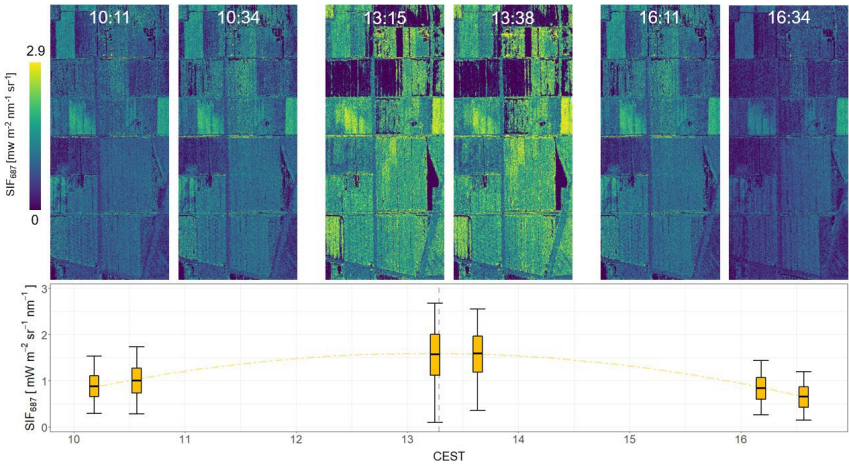
- Short-term & long-term deployment of ground-based systems
- Fluorescence in combination with atmospheric and surface measurements

All data freely available for further analyses

FlexSense:

- Airborne systems flown during several years over various targets
- Acquisitions performed in combination with S3 tandem phase (2018) & different science objectives





Ongoing & Planned FLEX Campaigns

Current Main Objective:

Quantitative comparison of the different existing methods accounting for atmospheric effects in the retrieval of fluorescence in the O2 bands.

By means of:

1.) Coordinated analyses for existing measurements gathered during the ATMOFLEX campaign at the OHP site in France

2.) Data acquisition in Italy focussing on D-Flox measurements from different heights in combination with reference targets on ground

3.) Data acquisition in the Netherlands focussing on D-Flox measurements in an agricultural area in combination with other correlative measurements

4.) Coordinated analyses for the campaigns in Italy and the Netherlands

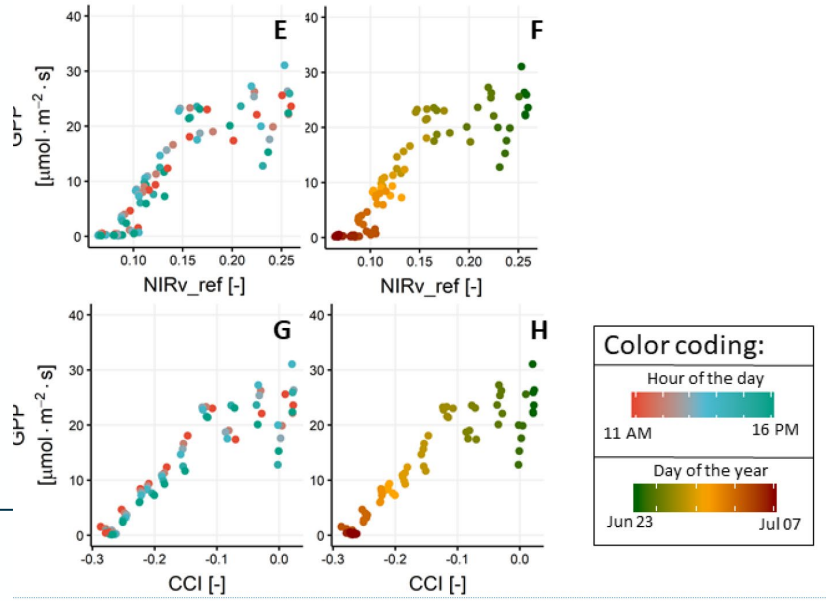
5.) Preparation of a measurement protocol for FLOX boxes in proximal settings including recommendations for a validation plan for the future FLEX mission

Expected Output: Protocols and Procedures for ground-based FLEX validation (PPFV)

Application Oriented FLEX Campaigns

PhotoProxy:

- Determine the scale-dependence (temporal and spatial) of the correlation between SIF and other optical metric and photosynthesis or GPP.
- Determine the factors that confound the interpretation of fluorescence- and reflectance-based signals, and the conditions under which these occur.
- Determine the degree by which physiological regulation and structural adjustments influence each signal.



Land Carbon Constellation (LCC):

- Synergistic exploitation of satellite observations from active and passive microwave sensors together with **optical** data for an improved understanding of the terrestrial carbon and water cycles.
- Adapting a numerical land surface model for its application in a data assimilation framework,
- Acquisition and analysis of campaign data sets at Sodankylä (Finland) and Majadas de Tietar (Spain)

Current FLEX Validation Status

Status for ground-based & airborne Measurements

- Sensor development, maintenance and quality control established
- Sensor calibration development started, overall calibration strategy needs to be established
- Criteria for validation site selection established, sampling design to be refined
- Ground-based Retrievals schemes identified, corrections where needed under development
- Airborne retrieval schemes tested and uncertainty estimates available

Next important Step:

- **Finalize FLEX Validation Plan** based on **Protocols and Procedures** for **ground-based measurements** (starting soon) and **airborne measurements** (planning started)
- Set up the Mission Algorithm and Analysis Platform (MAAP)

The regular EO user point of view

"Where do I find in-situ data to validate my results?"

"Am I using the latest version of the dataset?"

"My computation takes too much time!"

"I have a god idea to improve the official dataset."

"I don't have sufficient data storage capacity."

"How can I share my results (few GB of data) with interested scientists?"

"The provided toolboxes do not allow me to do all I want."

Mission Algorithm and Analysis Platform (MAAP)

→ *It's a Virtual open and collaborative environment that…*

Enables researchers to easily discover, process, visualize, and analyze large volumes of data.

Provides tools adapted for Cal/Val and algorithm development but also tools and infrastructures to bring data into the same coordinate reference frame to enable comparison, analysis, data evaluation, and data generation.

Provides a version-controlled science algorithm development environment that supports tools, co-located data, validation data and processing resources.

Addresses intellectual property and sharing issues related to collaborative algorithm development and sharing of data and algorithms.

Why a MAAP for FLEX?

- Expected data size → better to bring the user to the data than vice versa
- Development/validation of new (or modified) algorithms, so the needed computation time could be reasonable
- Execution of regional algorithms, i.e. a long time series on a small geographic area. Regional algorithm could be set up to run automatically, e.g. every day, to have a regional product
- Execution of new (or modified) global algorithm, that has been already validated. In this case this could enter the "mission reprocessing" area.

A MAAP for FLEX will be developed and implemented in the ground segment prior the launch

Overall Conclusions for FLEX Validation

- FLEX Science Plan forms the basis for all FLEX Campaigns
- Successful execution of key activities related to science advancements and validation, also demonstrated by growing community and growing number of publications
- Protocols and Procedures for FLEX Validation to be in place soon with the main objective to guide future FLEX validation
- MAAP planning started to process and analyse FLEX Satellite Data

LPS2022 FLEX products user survey

URL:
https://forms.gle/yQd4vGT1pxYS64ww7

QR code:

Thanks?

Thanks!