

# IDEAS-QA4EO

## Cal/Val WS#2 Introduction and Meeting Objectives

Fabrizio Niro and Gabriele Brizzi

*2 December 2020*  
*Virtual meeting*

# Background

- **IDEAS-QA4EO** is the IDEAS+ **follow-on** contract started in **Nov 2019**; it shares the same principles and objectives of IDEAS+ with reinforced focus on R&D and Metrology
- Task-2 is the place where **innovative** solutions are promoted, prototyped and tested with the long-term goal to improve quality of ESA EO data and advance in Cal/Val methods
- Task-2 teams gathered in **periodic WS** and new collaborations have started thanks to that
- It is now the WS #9, 2<sup>nd</sup> of QA4EO, new teams joined the group and methods have evolved, yet, **objectives** of such WSs remain the same: share ideas, foster **synergies**, discuss on evolution, collect **recommendations**

#4



#5



#6



#7



#8



# Framework & Vision

**Task 1 – Quality Control/Reprocessing**  
(Kajal Haria, Sabrina Pinori)

Facilities and Tools  
(Massimo Cardaci)

**Task 2 – Cal/Val**  
(Fabrizio Niro)

**Task 3 – Web**  
(Cristiano De Vincenti)

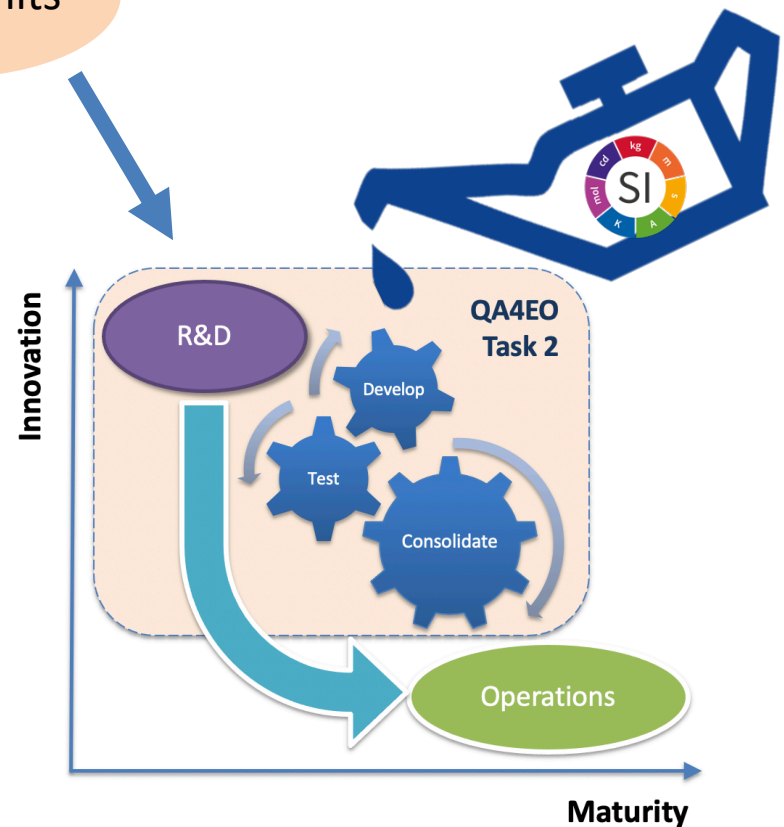
**Task 4 – On-site support**  
(John Swinton)

QA4EO Service Manager  
(John Swinton)

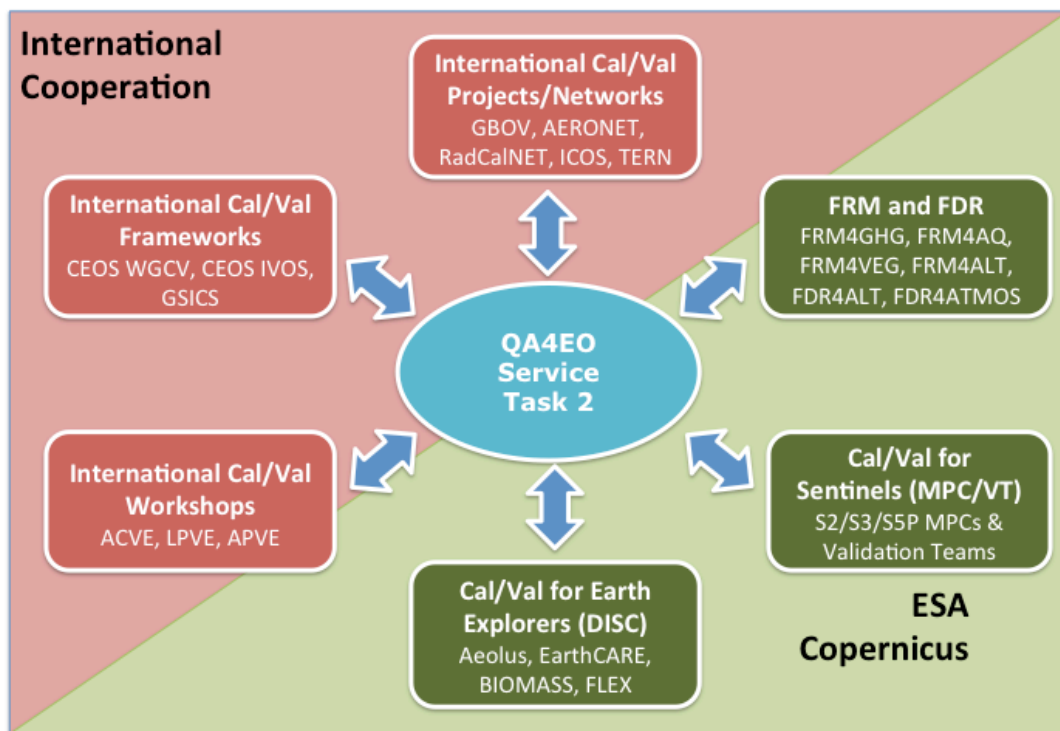
R&D activities of today are operations of tomorrow

Gaps/Limits

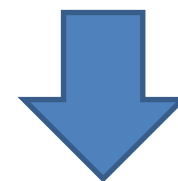
Reinforced **metrological** focus



# Area of influence



Innovative methods fostering the progress of Algorithms, Cal/Val protocols, instrument design, adoption of metrological practices



**Recommendations** used for driving and shaping the ESA Cal/Val strategy, to be pursued leveraging on **existing Cal/Val frameworks** and international cooperation

# Our Domains

## IDEAS-QA4EO Cal/Val Domains

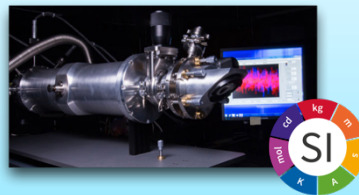
Land



Marine



Metrology



Ice/Snow



Atmosphere



# Our Team

serco



GRASP



solvo  
Par Bleu  
technologies

NPL  
National Physical Laboratory



Spectral Earth

EOsense



pmo wrc

Université  
de Lille  
1 SCIENCES  
ET TECHNOLOGIES



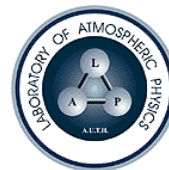
University of  
Zurich<sup>UZH</sup>



FINNISH  
METEOROLOGICAL  
INSTITUTE



GEO-K



SAPIENZA  
UNIVERSITÀ DI ROMA

BROCKMANN  
CONSULT

IDEAS-QA4EO

# Our Team... is growing



**CCN-3 activities:** agreed by ESA, formally started on 1<sup>st</sup> Nov 2020, they are currently in preparation, **not yet presented** during this WS

CCN-3



# Task 2 CCN-3 activities (1/2)

- Towards a new FRM4DOAS compliant site
  - Fill data gap in availability of DOAS measurements in the Po Valley, support S5P Cal/Val
- Night-time lunar aerosol and trace gases columnar observations
  - Advance retrieval methods of aerosol and trace gases based on Prede-POM and Pandora lunar observations and support Cal/Val of various EO missions (S5-P, S3, EarthCARE...)
- Extend GRASP to trace gases
  - Extend GRASP to allow retrieval of trace gases for application to spectrometer, e.g., S5P
- PGN uncertainty
  - Further advancing in improving uncertainty characterization for PGN products, with metrological guidance from NPL



# Task 2 CCN-3 activities (2/2)

- PICS-Moon Harmonization
  - Harmonize PICS and Moon calibration, moving towards traceable methodology, for improved radiometric assessment of S2, S3, Proba-V,...
- Proba-V, OLCI non-linearity and SNR
  - Follow up activity on statistically-based assessment of optical sensor on-orbit performances application to Proba-V, OLCI
- Prototype Cal/Val platform
  - Starting from Survey (Jul/Aug 2020), build requirements and develop a use-case for a cloud platform dedicated to Cal/Val
- Polar/coastal altimetry
  - Improve sea-ice thickness and snow depth estimation from different altimetry mode (LRM, SAR) and support the Cryosat-2/IceSat-2 tandem phase

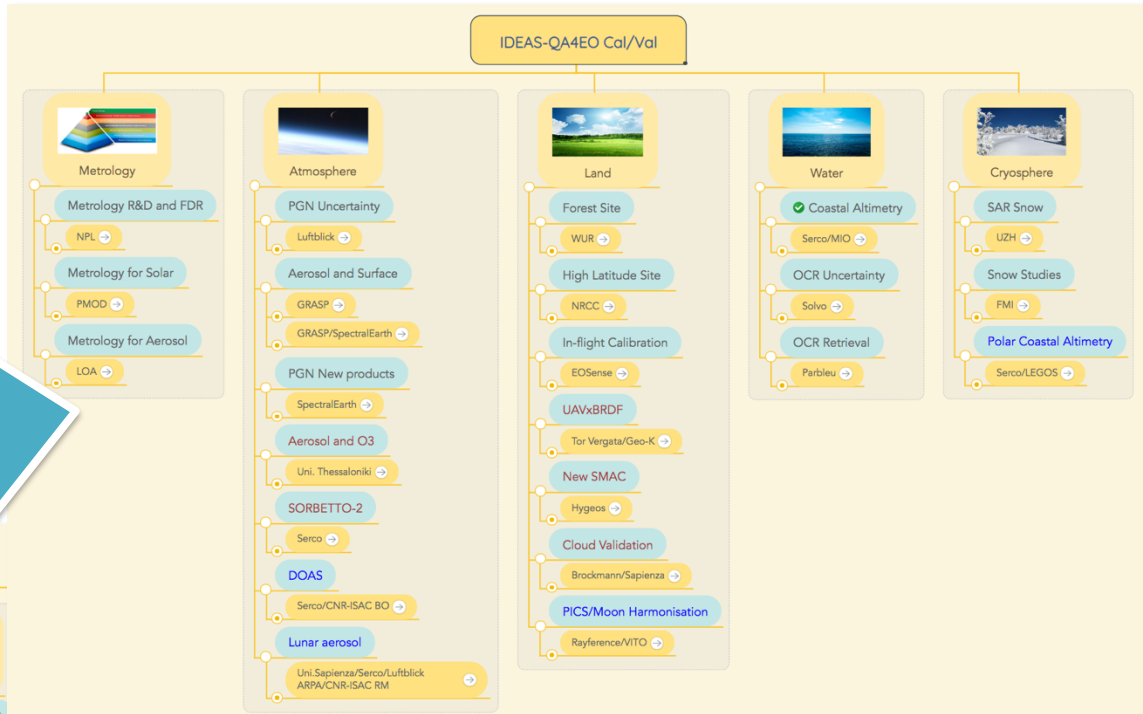


# Our Projects ... are growing

36 WPs

23 WPs

18 WPs



**CCN3**  
(Nov 2020)

**CCN2**  
(May 2020)

**Baseline (Nov 2019)**

# Where we are?



- We **completed the 1<sup>st</sup> year** of IDEAS-QA4EO contract; we have 1.5 year ahead, as part of Phase 1; at the end of this phase, contract will be reviewed for Phase 2 extension (+2.5 years)
- A significant amount of **new activities** have been added to the baseline proposal, another important CCN is scheduled for 2021
- The current **year** has been extremely **challenging**, as you all know, notably for Cal/Val field campaigns; resulting **delays** in the schedule were transparently communicated and accepted by ESA
- Some campaigns have successfully **restarted** during last summer and we are progressively **catching up** with the original plan
- Despite all difficulties, we **start** to see the distinct IDEAS-QA4EO pathway to Cal/Val, namely, the reinforced focus on **metrology** to facilitate inter-operability of in-situ and satellite EO data

# Task 2 Highlights (so far)

## Metrology



AERONET moving towards traceability to SI at global scale

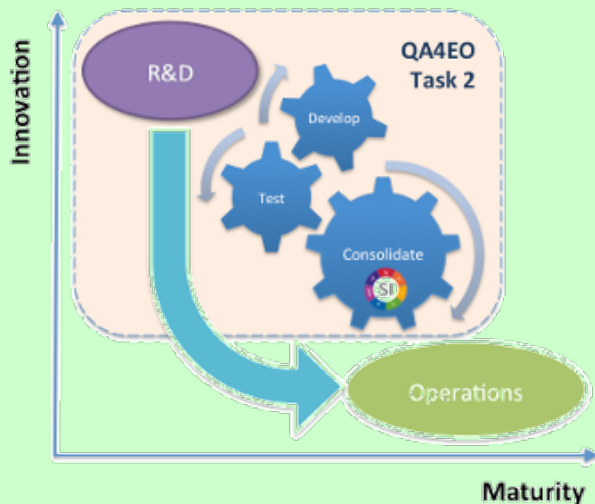


Enhancing maturity (uncertainty estimate) of PGN products

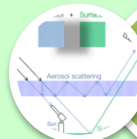


NPL ensuring metrological guidance across EO domains (PGN, FRM4SM)

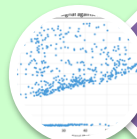
## R&D



WUR and FMI low-cost network for validation of LAI, SCE







GRASP new synergistic algorithm for aerosol/surface retrieval





EOSense new approach for SNR, being validated for S2/S3/PV

# Cal/Val WS#1 Recs. 1/2

Rec#	Owner	Actions	Status
 <b>REC-1</b>	QA4EO	Strengthen the focus on metrology with more active involvement of NPL within Task 2 coordination.	<b>Implemented</b> – NPL delivered FDR Webinar, preparing E-learning, actively involved in PGN uncertainty estimate and future FRM4SM
 <b>REC-2</b>	QA4EO	Further review the need and interest for Cloud base platform devoted to Cal/Val applications and the potential use of DIAS platforms for the purpose of Cal/Val	<b>Implemented</b> – Cal/Val Platform Survey allows to gather valuable needs requirements for the platform, pilot study proposed
 <b>REC-3</b>	ESA/VITO	Follow up the issues observed in Proba-V SWIR band, the observed non-linearity effects will be compared with the VITO results	<b>Implemented</b> – Interaction EOSense-VITO initiated, to be continued with another TC and involvement in re-calibration and Cubesat
<b>REC-4</b>	QA4EO	Provide input to the CEOS Cal/Val portal, such as campaigns data, documents, and protocols.	<b>On-going</b> – In the frame of ACIX-II and CMIX, NPL contributing in the vocabulary, WUR with Cal/Val data
 <b>REC-5</b>	ESA/MPC	Investigate the interest of Cal/Val data collected within the FIREX-AQ field campaign for validation of S3 operational L2 products, mainly FRP and AOD.	<b>Implemented</b> – Interaction LOA-ESA- <b>NOAA</b> facilitated, availability of AOD and FRP products will be considered for S3VT activities, mainly S3-FRP

# Cal/Val WS#1 Recs. 2/2

Rec#	Owner	Actions	Status
REC-6	QA4EO	Actively support the adoption of a common terminology for uncertainty following metrological guidelines.	<b>On-going</b> – A discussion is on-going with NPL to be continued in CEOS framework
REC-7	ESA	Facilitate the evolution of MBASSS Cal/Val capabilities with CIMEL and LST	<b>On-going</b> – Interaction with Uni. Leicester and LOA initiated
 REC-8	ESA/QA4EO	Review the increasing trend in using network of low-cost sensors for Cal/Val applications and consider them in the overall Cal/Val strategy	<b>Implemented</b> – Taken into account as part of WUR activities of low-cost LAI sensors and FMI activities on webcam network for snow products Cal/Val
REC-9	ESA/QA4EO	Prepare the ground for future ACIX-III; sustaining international efforts in gathering advanced ground-based measurements for SR.	<b>On-going</b> – Currently on-going as part of ACIX-II evolution activities and in support to WaterHypernet
 REC-10	ESA	Sustain the effort in building a global network for cloud mask validation	<b>Implemented</b> – This is included as part of CCN2 activities in collaboration with BAQ/NASA/Brockmann
REC-11	ESA/QA4EO	Exploit synergies between QA4EO and SnowPex exercise working towards common validation practices	<b>On-going</b> – Discussion on going synergies with SnowPex being explored

# REC#2 → Cal/Val platform

## Cal/Val User Needs

### Architecture Design

- ✓ **Centralized** Archive
- ✓ **Accessing/storing/exploiting** data archive of **large size**, saving time for data download

### Working Environment

- ✓ **Virtual Environment** with a set of procedures for quick solution of common Cal/Val request
- ✓ **Match-up extraction** of satellite over Cal/Val sites
- ✓ Python, R languages
- ✓ Usability and Reliability

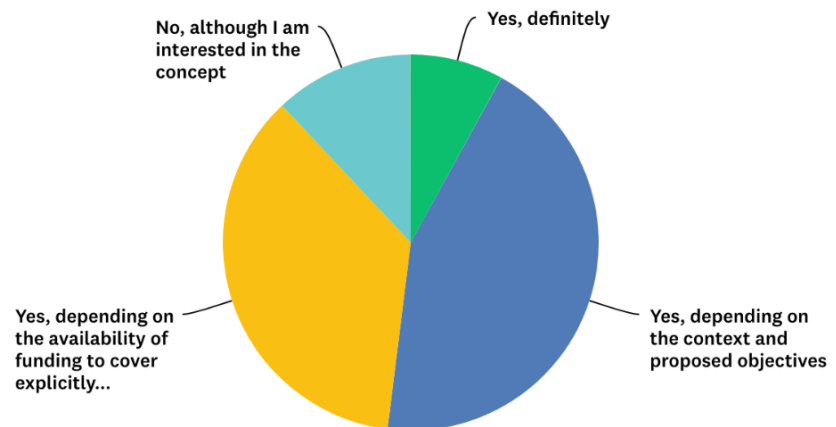
### Data Archive

- ✓ Copernicus Sentinels data
- ✓ Ground based measurements
- ✓ Cal/Val networks for atmosphere
- ✓ Ancillary and Meteo data
- ✓ Most recent data collection

## Survey on QA4EO Cal/Val Infrastructure

Would you be optionally available in participating in a pilot project?

Answered: 25 Skipped: 0



A dedicated WP was activated within CCN3 with support from Progressive (former GPOD team), we are looking for **volunteers** for pilot projects!

# Outreach initiatives

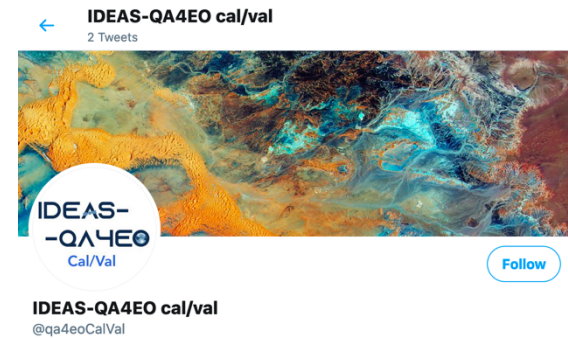
“Science is not finished until it is communicated”

Web presence:

- requested by ESA
- to provide insight into Cal/Val activities
- to promote newsworthy results
- to reach a broader audience

Strategy:

News articles on ESA EO Gateway regularly published with team's support (expected contributions with short text and figures) bounced via Twitter



<https://twitter.com/qa4eoCalVal>



ResearchGate

IDEAS-QA4EO CalVal project

# Summary and Objectives

- This year was very difficult, especially for who was dealing with instrument procurement, field campaigns, workshops, ... yet, we all overcame the hardships and demonstrated **resiliency** in adapting to a new way of working
- First **outstanding results** were demonstrated as part of IDEAS-QA4EO Cal/Val tasks and many **new activities** were proposed with the objective of filling existing Cal/Val data gap, advancing in algorithms and methods
- The reinforced focus on **metrology** is also becoming evident in a number of existing and planned activities
- This IDEAS-QA4EO virtual Cal/Val WS will allow you to **showcase** your achievements and discuss on the way forward as well as to provide recommendations for future evolutions

# Agenda

START of Meeting: 9:00

Introduction and Metrology

Coffee break – 10:30 – 11:00

Atmosphere Cal/Val

Cryosphere Cal/Val

LUNCH – 13:00 – 14:00

Land Cal/Val

Water Cal/Val

Coffee break – 16:00 – 16:30

Discussion and Wrap-up

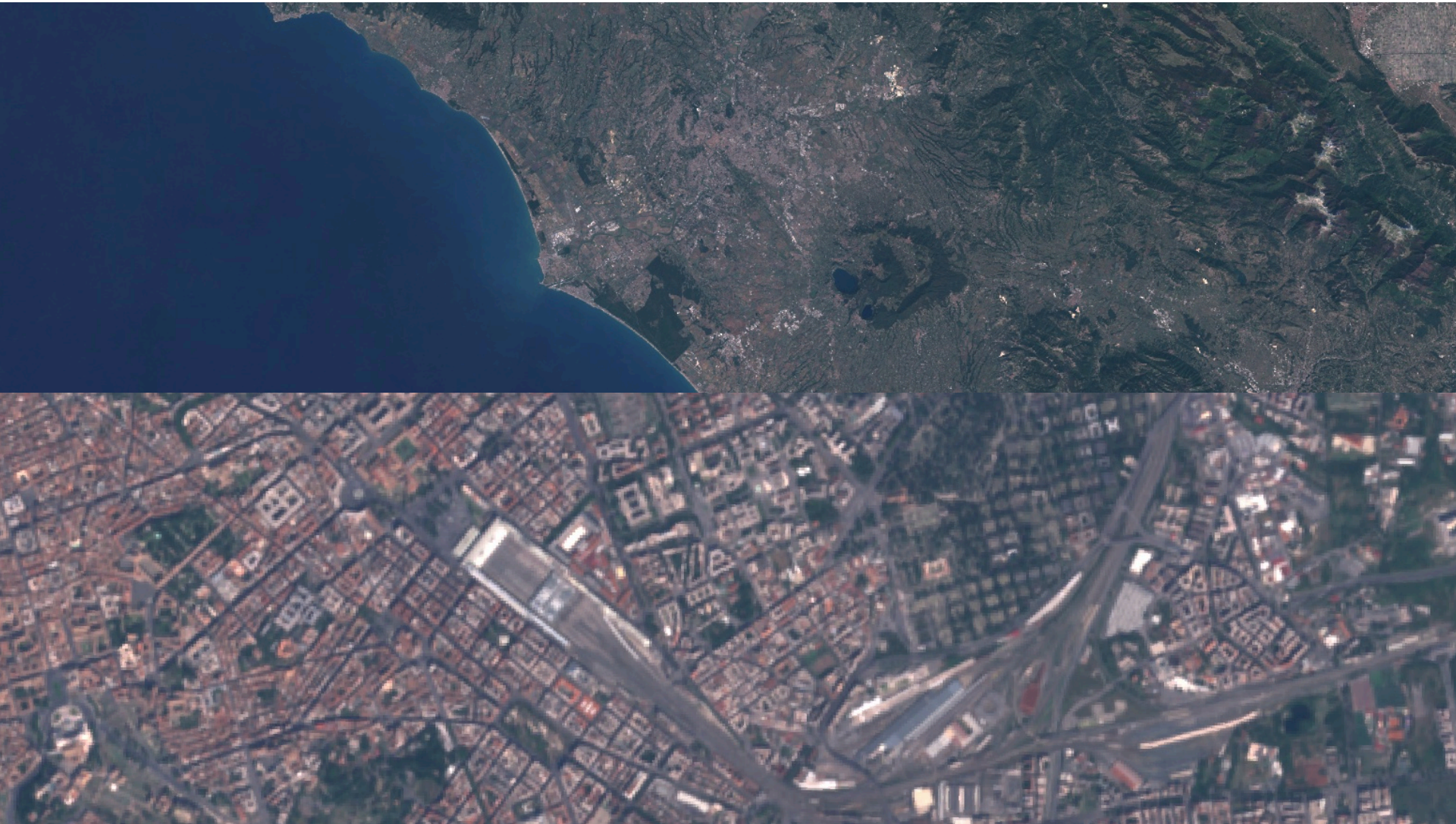
END of Meeting: 18:00

**10 minutes** each WP  
on progresses and highlights

+

Discussion time

# Q&A



# Food for thoughts

## Cal/Val data and methods

- How QA4EO can further contribute in addressing current and future needs/gaps for EO Cal/Val:
  - Which is the most urgent need in terms of spatio/temporal/thematic coverage for Cal/Val? How we can fulfill this need? Which are the risks of losing Cal/Val capacity in the future?
  - How we can use a cloud-based platform dedicated to Cal/Val to address current challenges and needs?
  - How we can further improve robustness and reliability of new technological solutions (low-cost sensors, UAV)? How we can best integrate these devices into the overall Cal/Val strategy?
  - How we can promote adoption of metrological practices within the community moving towards FRM concept?
  - Are Cal/Val protocols/methods mature and what is still required to enhance their maturity level?

# Food for thoughts

## EO algorithms and products

- How QA4EO can contribute in further advancing EO algorithms for the benefit of operational mission:
  - Which is the most urgent need/gap in terms of ESA EO operational products availability?
  - Are the algorithms mature and what is still required in terms of science and R&D? How we can progress in this domain?
  - Is synergy of current and future ESA EO missions exploited and what we can do to advance in this respect?
  - What is still required to enhance readiness for exploitation of future EE/HPCM missions (EarthCARE, Flex, ...)?
  - How mature are the methodologies for uncertainty estimation and which theoretical advance is still required?