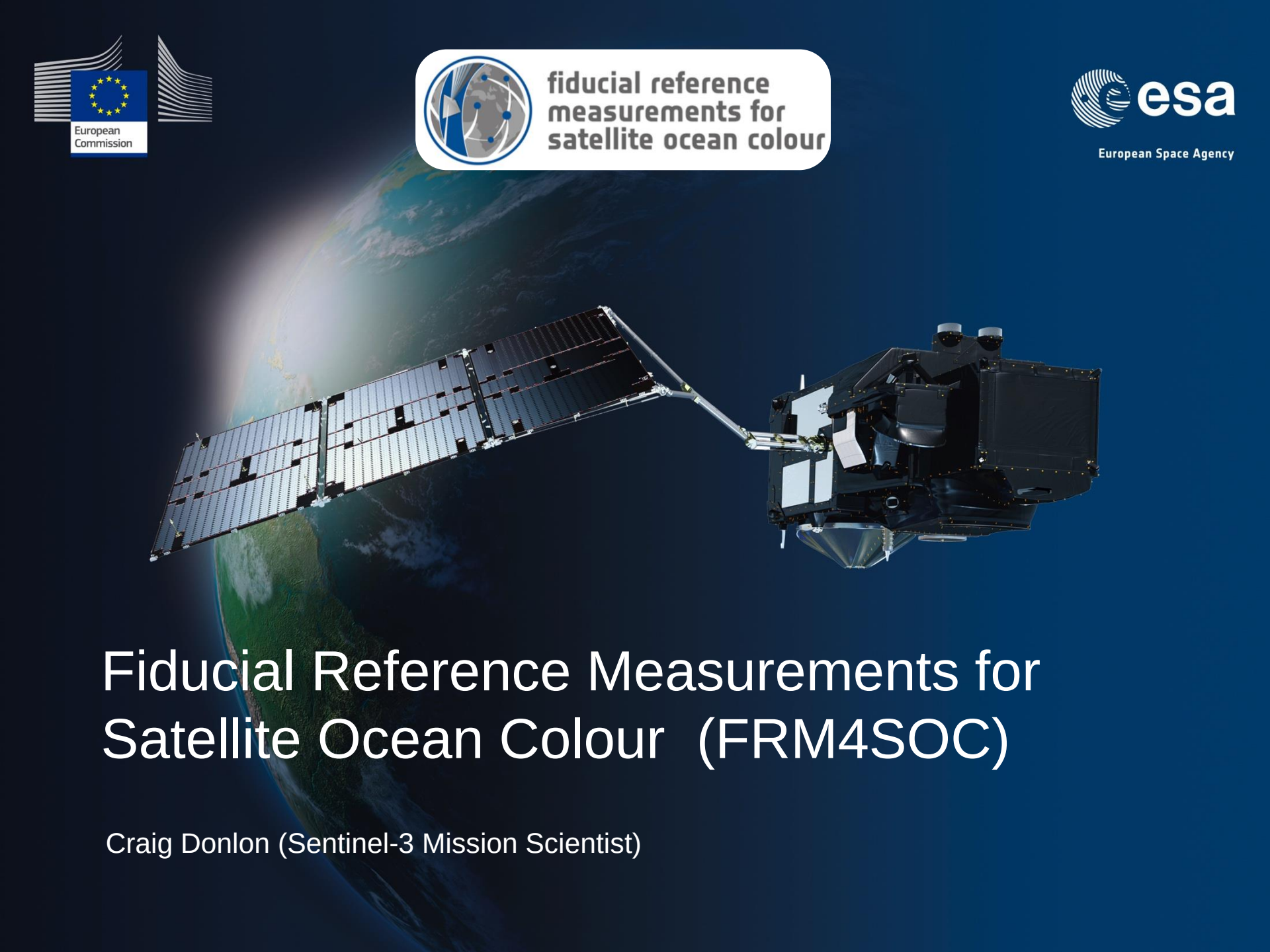


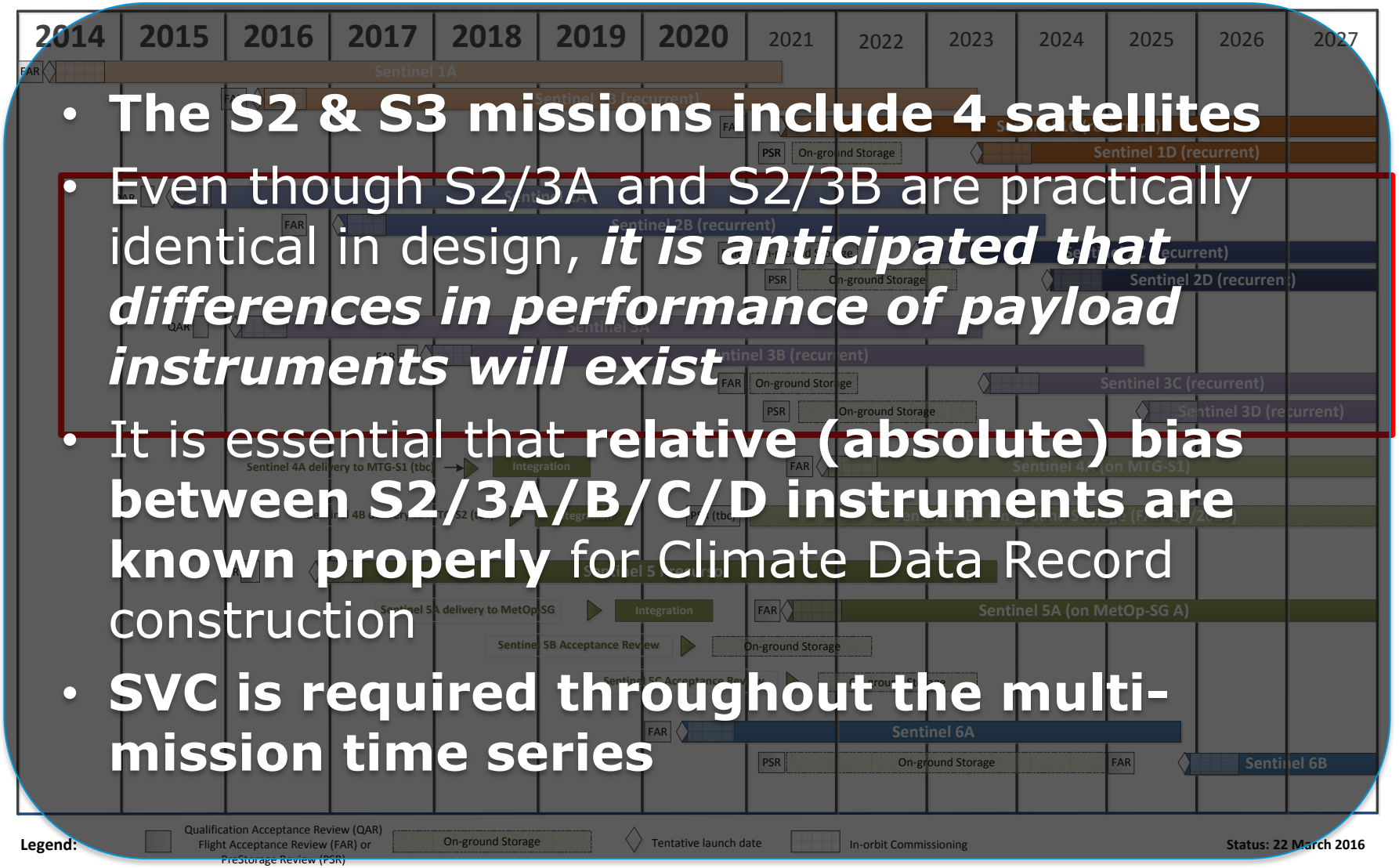
Fiducial Reference Measurements for Satellite Ocean Colour (FRM4SOC)

Craig Donlon (Sentinel-3 Mission Scientist)

Welcome and Overview

- Welcome to ESRIN
- Background
- Quick status on S3B and S2B
- FRM4SOC
- Aim and Objectives for this workshop

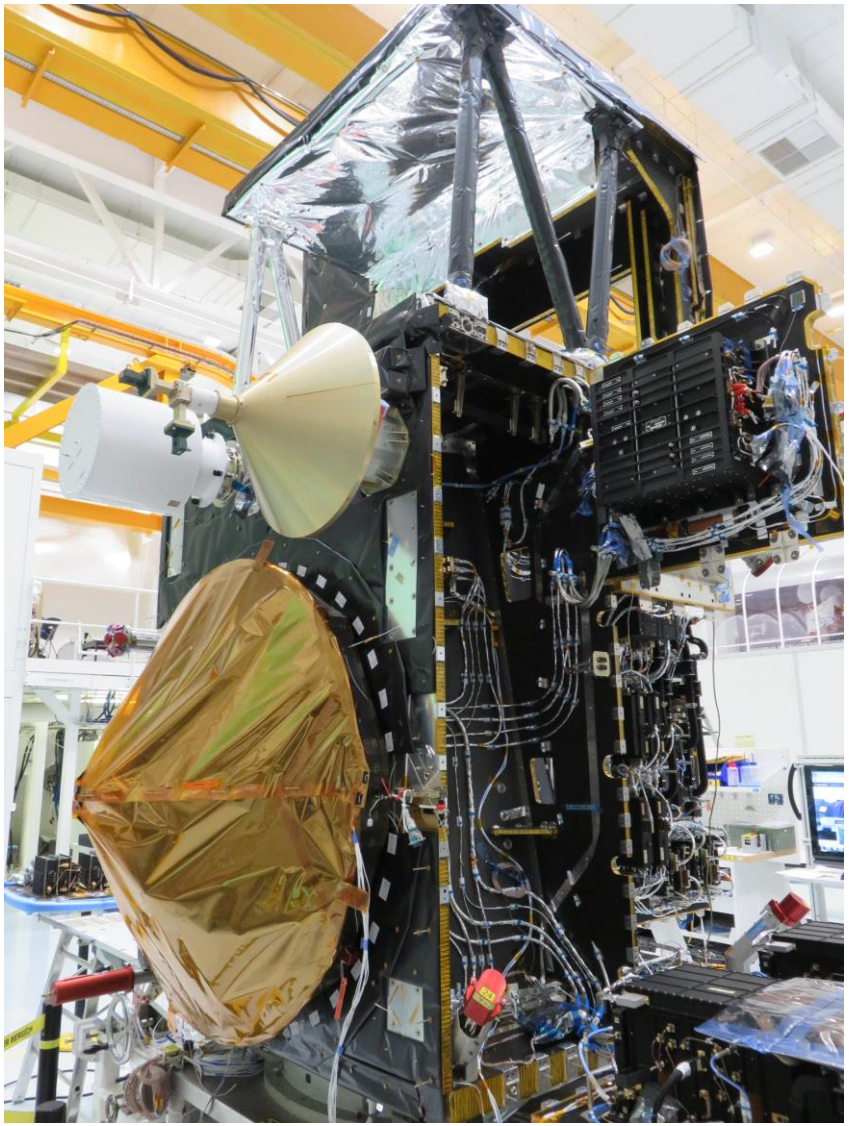
The Copernicus Sentinel Deployment Schedule



- **The S2 & S3 missions include 4 satellites**
- Even though S2/3A and S2/3B are practically identical in design, ***it is anticipated that differences in performance of payload instruments will exist***
- It is essential that **relative (absolute) bias between S2/3A/B/C/D instruments are known properly** for Climate Data Record construction
- **SVC is required throughout the multi-mission time series**

Sentinel-3B: status

- Sentinel-3B FAR planned for Sept-Oct 2017, still compatible with a launch before end 2017
- OLCI-B model suffered major anomaly (repeat of anomaly which affected the A instrument) during Instrument TVAC in July 2016 - Decision to refurbish all 5 cameras, with new gluing process.
- Delivery of OLCI-B for S/C integration by mid June 2017
- Flight Acceptance Review – October 2017
- **Launch on Rockot from Plesetsk in late 2017.**



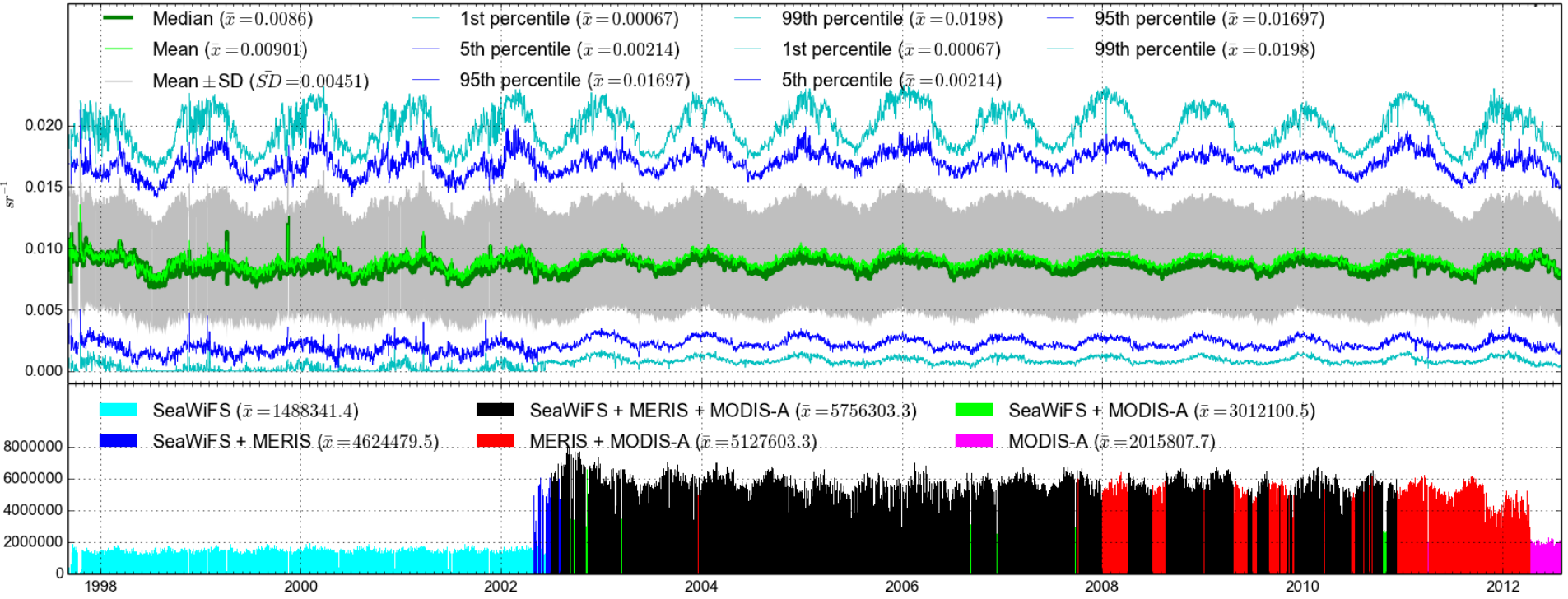
Sentinel-2B launch preparations

Band Set of OLCI&MSI in the Visible and the Near Infra-Red

(Credit: OC_cci, S. Sathyendranath)

- Higher spectral resolution than all previous sensors: Important for atmospheric correction, complex coastal waters, phytoplankton types
- Consistency with MERIS: facilitates merging (no need to do band-shifting to establish inter-sensor biases)

OCR Time Series: Daily coverage: gaps in daily coverage with single sensor



(Credit: OC_cci, S. Sathyendranath)

- Need two to three sensors to minimise gaps in daily coverage, and to reduce noise
- Promise of Sentinel: at least two sensors in constellation mode when Sentinel 3A and 3B are in orbit
- Current status: OC-CCI time series reliant solely on old sensor MODIS-A. VIIRS under evaluation.

fiducial reference measurements for satellite ocean colour

esa

Aim ***To establish and maintain SI traceability of Fiducial Reference Measurements (FRM) for satellite ocean colour radiometry (OCR).***

- Laboratory and field radiometer characterization experiments
- Laboratory comparison of radiance and irradiance sources
- Laboratory round-robin performance assessment of field OCR used for satellite validation
- Workshop to establish requirements for European OCR vicarious adjustment infrastructure

https://frm4soc.org/

PML | Plymouth Marine Laboratory

TARTU OBSERVATORY space research centre

museum

NPL National Physical Laboratory

fiducial reference measurements for satellite ocean colour

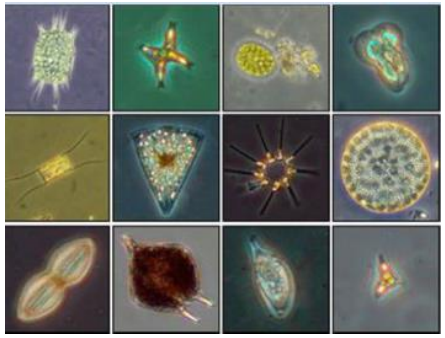
ACRI ST

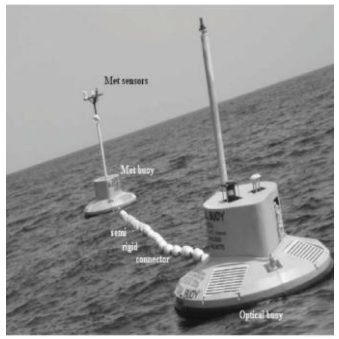
Workshop Aim and Objectives (1/2)

By the end of this workshop we should have:

Evaluated options for future European satellite OCR vicarious adjustment infrastructure (including approaches and value for money) for the Sentinel-3 OLCI and Sentinel-2 MSI A/B/C and D instruments.





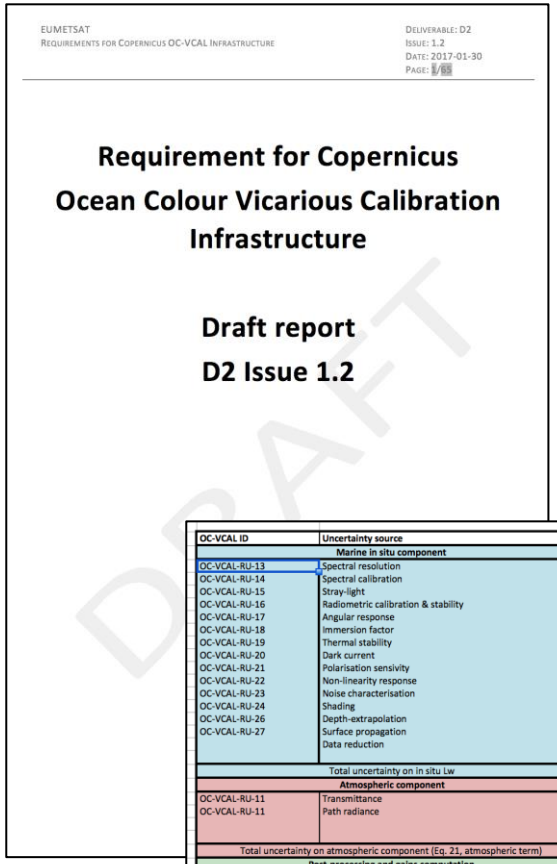


Workshop Aim and Objectives (2/2)

- Foster an **open-forum, wide-ranging debate** with the international ocean colour community;
- **Review** of historical and contemporary **approaches to vicarious adjustment;**
- Document **Lessons Learned** from international teams;
- Review the **strengths and weakness** of alternative methods and approaches to OCR satellite vicarious adjustment;
- **Consider an optimum European location for OCR vicarious adjustment infrastructure** based on spatial and temporal distributions of Chl, atmospheric aerosol loading and cloud cover (and other geophysical quantities if deemed appropriate);
- **Conclude with a consensus on the way forward** to deliver the best scientific outcomes to support long-term Copernicus operations using European infrastructure S3 and S2 OCR vicarious adjustment infrastructure;
- **Review the costs to implement, operate and maintain** a European satellite OCR vicarious adjustment infrastructure for S3 and S2 missions;
- **Write a workshop report:** "*Requirements and recommendations for infrastructure required for the long-term vicarious adjustment of the Sentinel-3 OLCI and Sentinel-2 MSI A/B/C and D instruments"* building on the workshop and any other source that is relevant to the definition of an optimal European infrastructure.
- **Review and define justified and traceable requirements** for vicarious adjustment measurements (ie. instruments) to be made in support of satellite OCR;

EUMETSAT Companion activity
September 2016 to July 2017

- Parallel study by EUMETSAT: "***Requirements for Copernicus Ocean Colour Vicarious Calibration Infrastructure***".
- Detailed requirements for Ocean Colour Vicarious Calibration Infrastructure for the European Commission's Copernicus Programme
- A review process for the requirements document.
- The objective is to generate a complete scientific, technical and operational requirements document that will be a deliverable to the European Commission's Copernicus Programme
- Can be used as a traceable reference for all steps and aspects of vicarious calibration infrastructure design, development and operations.


EUMETSAT
REQUIREMENTS FOR COPERNICUS OC-VCAL INFRASTRUCTURE

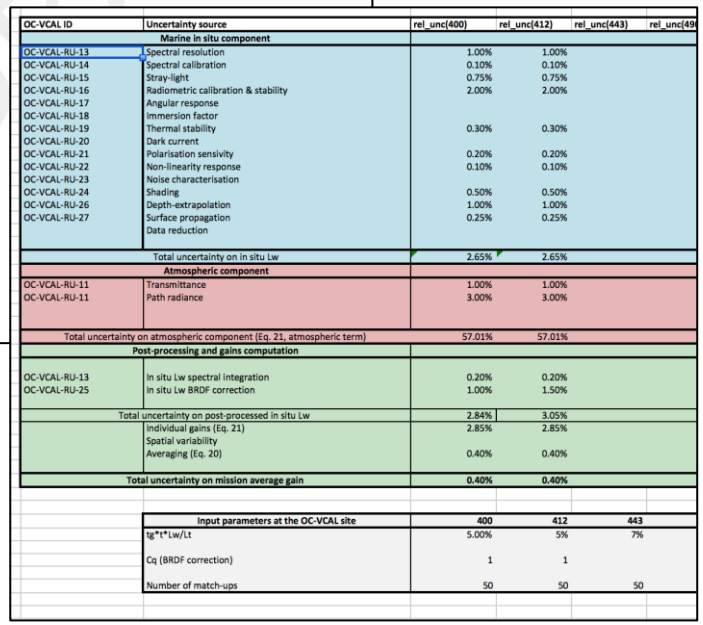
DELIVERABLE: D2
ISSUE: 1.2
DATE: 2017-01-30
PAGE: 1/65

Requirement for Copernicus Ocean Colour Vicarious Calibration Infrastructure

Draft report

D2 Issue 1.2

DRAFT

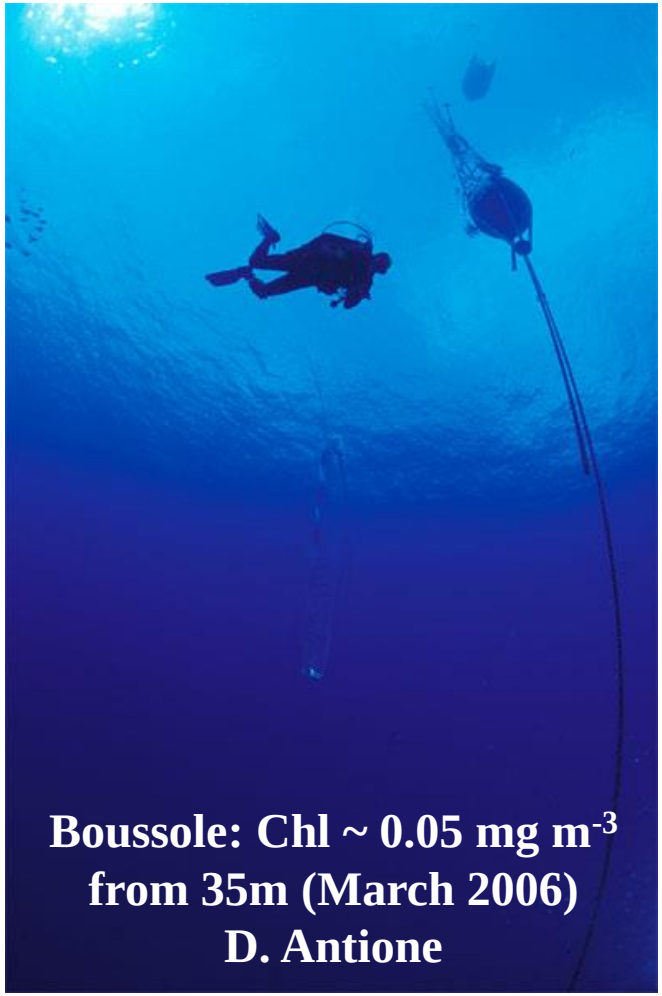


OC-VCAL ID	Uncertainty source	rel_unc(400)	rel_unc(412)	rel_unc(443)	rel_unc(49
	Marine in situ component				
OC-VCAL-RU-13	Spectral resolution	1.00%	1.00%		
OC-VCAL-RU-14	Spectral calibration	0.10%	0.10%		
OC-VCAL-RU-15	Stray-light	0.75%	0.75%		
OC-VCAL-RU-16	Radiometric calibration & stability	2.00%	2.00%		
OC-VCAL-RU-17	Angular response				
OC-VCAL-RU-18	Immersion factor				
OC-VCAL-RU-19	Thermal stability	0.30%	0.30%		
OC-VCAL-RU-20	Dark current				
OC-VCAL-RU-21	Polarisation sensivity	0.20%	0.20%		
OC-VCAL-RU-22	Non-linearity response	0.10%	0.10%		
OC-VCAL-RU-23	Noise characterisation				
OC-VCAL-RU-24	Shading	0.50%	0.50%		
OC-VCAL-RU-26	Depth-extrapolation	1.00%	1.00%		
OC-VCAL-RU-27	Surface propagation	0.25%	0.25%		
	Data reduction				
	Total uncertainty on in situ Lw	2.65%	2.65%		
	Atmospheric component				
OC-VCAL-RU-11	Transmittance	1.00%	1.00%		
OC-VCAL-RU-11	Path radiance	3.00%	3.00%		
	Total uncertainty on atmospheric component (Eq. 21, atmospheric term)	57.01%	57.01%		
	Post-processing and gains computation				
OC-VCAL-RU-13	In situ Lw spectral integration	0.20%	0.20%		
OC-VCAL-RU-25	In situ Lw BRDF correction	1.00%	1.50%		
	Total uncertainty on post-processed in situ Lw	2.84%	3.05%		
	Individual gains (Eq. 21)	2.85%	2.85%		
	Spatial variability				
	Averaging (Eq. 20)	0.40%	0.40%		
	Total uncertainty on mission average gain	**0.40%**	**0.40%**		

Input parameters at the OC-VCAL site	400	412	443
tg*t*Lw/Lt	5.00%	5%	7%
Cq (BRDF correction)	1	1	
Number of match-ups	50	50	50

Conclusions

- Please use the time together in the best way possible
- Please don't see this workshop as a means to confuse existing activities
- This is not a competition!
- We are trying to establish a rationale for investment into OCR
- We need your help to articulate the requirements in a justified and meaningful manner with respect to the Copernicus Sentinels
- It's a great opportunity to develop the international consensus
- Thanks to Christophe and FRM4SOC team
- Thanks for your help and for your time.




Thank You –
any Questions
Contact: Craig.Donlon@esa.int