ECVT (EarthCARE CalVal Team)

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1st ESA EarthCARE Cal/Val Workshop, 13-15 June 2018, Bonn

Outline

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1) Introduction

- ESA Earth Observation Missions: geophysical validation and external calibration are to be performed by independent scientists.
- Contributions are solicited through an Announcement of Opportunity (AO).
- Commissioning phase for EarthCARE will last 6 Months. Long-term validation is to be performed for the remaining mission duration (Phase E2) together with complementary QC.
- EarthCARE embarks 3 ESA instruments and 1 JAXA/NICT instrument. ESA generates level 1 products for the 3 ESA instruments, JAXA generates level 1 products for the CPR. For the level 2 products, both ESA and JAXA independently generate products for all instruments.
- The ESA AO addresses the validation of the ESA products (including the ESA CPR-based products).
- JAXA is coordinating the validation of the Japanese products (including the JAXA products based on ATLID, BBR, and MSI) through their own Research Announcements (refer to the presentation by T. Kubota-san)
- Whilst observing this split of responsibilities, ESA and JAXA have been collaborating on EarthCARE validation: until now at inter-agency level only, and subsequently also at Cal/Val Teams level.

2) EarthCARE Cal/Val Workshop Objectives

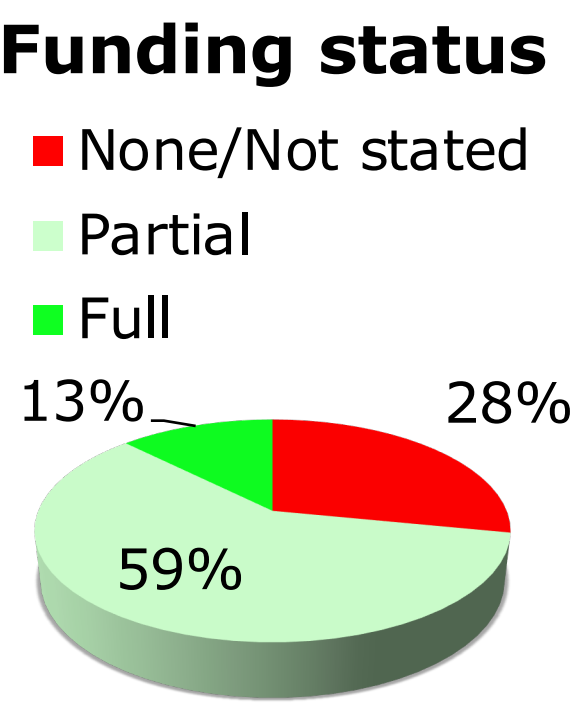
- (ESA) **To inform** the PIs on
  - Mission status, algorithms and products (day 1 of the Science Workshop, not repeated orally today but still available in the poster session)
  - Results of the Announcement of Opportunity
  - Tools, Communications, Data Exchange
  - Next steps
- (All) **To familiarise**
  - with contributions of the 32 proposals
- (All) **To identify**
  - collaboration opportunities (especially in the area of campaigns)
  - any overlapping activities
  - common methodologies, protocols, etc.
- (All) **To assess**
  - the completeness of proposed contributions with respect to the validation requirements
- (All) **To build** the EarthCARE Cal/Val Team

3) The ESA Announcement of Opportunity (AO) for EarthCARE Calibration/Validation

- Opened on 15 July and closed on 31 October 2017
- Full AO documentation suite still online at http://earth.esa.int/aos/EarthCARECalVal
- 32 proposals have been received in response to the AO
- Evaluation kicked off on 14 November 2017, and closed on 31 January 2018
- External Evaluation performed by the European & Canadian EarthCARE Mission Advisory Group (E-MAG). An internal evaluation was performed by ESA experts.
- Initial evaluation outcome has been that 7 proposals were accepted, and 25 accepted conditionally to satisfactory clarifications.
- Evaluation feedback was sent to prospective Principal Investigators on 8 March 2018
- Clarifications received on 30 April 2018
- **All clarifications are satisfactory: -> ALL PROPOSALS ARE ACCEPTED**
- A formal notification of acceptance will be sent (and a letter of support towards your funding sources if needed)

4)Results of the Announcement of Opportunity (1/9)

Country	# proposals with PI from that Country	Country	#PI from C
Belgium	1	Italy	1
Brazil	1	Japan	1
Canada	1	Netherlands	3
Czech Rep.	1	Norway	1
China	1	Spain	1
France	7	Sweden	1
Finland	1	UK	2
Germany	1	USA	7
Greece	1		



4)Results of the Announcement of Opportunity (2/9)

Target:	ATLID	BBR	CPR	MSI
# proposals	28	8	15	14

Source:	Satellite	Surface (Routine)	Surface (Campaign)	Airborne	Model
# prop.	10	20	17	13	4

4)Results of the Announcement of Opportunity (3/9)

Relations between proposals (black),

and

use of same instrumentation (grey)

PI	Acronym/short-hand description	ID	37730	38018	38188	38623	38644	38709	38757	38768	38809	38810	38811	38813	38816	38834	38836	38839	38841	38909	38935	39067	39147	39173	39183	39184	39186	39205	39211	39214	39217	39266	39821	39873
Clerbaux	BBR/L1L2	37730	■					▒																										
Marenco	FAAM+NWP	38018		■																														
Wandinger	GIVE	38188			■																													
Genthon	SPACECARE	38623				■									▒																			
Apituley	AECARE	38644					■			▒						■	■	■				▒			■		■		■						
Loeb	Val w CERES	38709	▒					■																										
Landulfo	LALINET	38757							■																									
Moisseev	HiLAT&Arctic	38768					▒			■																								
Renard	BAIVEC	38809									■												▒											
Delanoe	MORECALVAL	38810										■																						
Liberti	ItaVal	38811											■																					
Tesche	BAKLAVA	38813												■								▒												
Ancellet	VECARE	38816				▒									■						■											▒		
Apituley	CECARE	38834					■									■																		
Golouh	ACTRIS-France	38836					■										■																	
Devasthale	SweVal	38839					■											■										▒				▒		
Welton	MPLNET	38841																	■															
Gausa	ALIVO	38909																		■														
Josset	Innoy Retrieval	38935													■						■												▒	
Hu	China Val	39067					▒							▒								■												
Chandrasekar	CPR vs Weather Radar	39147								▒													■											
Nishizawa	East Asia Val	39173																						■										
Amiridis	ACROSS	39183					■																		■									
Chepfer	Statist. ATLID val	39184																								■								
Donovan	Cabauw Val	39186					■																				■							
Tanelli	Air&Sat Radar Val	39205																■										■						
Perez-Ramirez	ACTRIS - Spain	39211					■																						■					
Markonis	Rain gauge vs AM-CAP	39214																												■				
Scott	MMP	39217																													■			
Winker	ATLID vs CALIPSO	39266													▒			▒														■		
Barker	Canadian Arctic airborne	39821																															■	
Hostetler	ATLID vs HSRL	39873																			▒													■

4) Airborne platforms and instrumentation

FAAM	CTH/Aerosol LIDAR, MARSS radiometer, various in-situ
HALO	WALES LIDAR, Cloud radar, imager, various in-situ, Cloud radar, MWR, solar radiation,
DLR Falcon	in-situ cloud probes , hygrometer, dropsondes, etc.
LOAC Voltaire	Light Optical Particle Counter
Strateole	BeCOOL lidar, backscatter tethered sonde, etc.
ATR42	RASTA and BASTA radars, LNG Lidar (355nm), ALIAS LIDAR (355nm) Radiometers etc.
STRATOBUS	BASTA
Polar 6	in-situ probes, MIRAC RADAR (95), AMALI LIDAR (355nm)
Vulcanair (TBC)	Nd-YAG system at 532 (TBC)
TBC	355 lidar (CNES – Russia collaboration) (TBC)
Norwegian Aircraft	Nezerov probe (LWC, TWC)
NASA LaRC Aircraft	HSR Lidar
NASA JPL Aircraft	Precipitation and Cloud Radar
EUFAR (TBC)	Various Lidars (TBC)
Canadian Convair	94GHz cloud radar, (355nm) backscatter Lidar
various UAVs	Various instruments , including WALI Lidar, etc.

4)Results of the Announcement of Opportunity (5/9) Airborne Campaign Areas

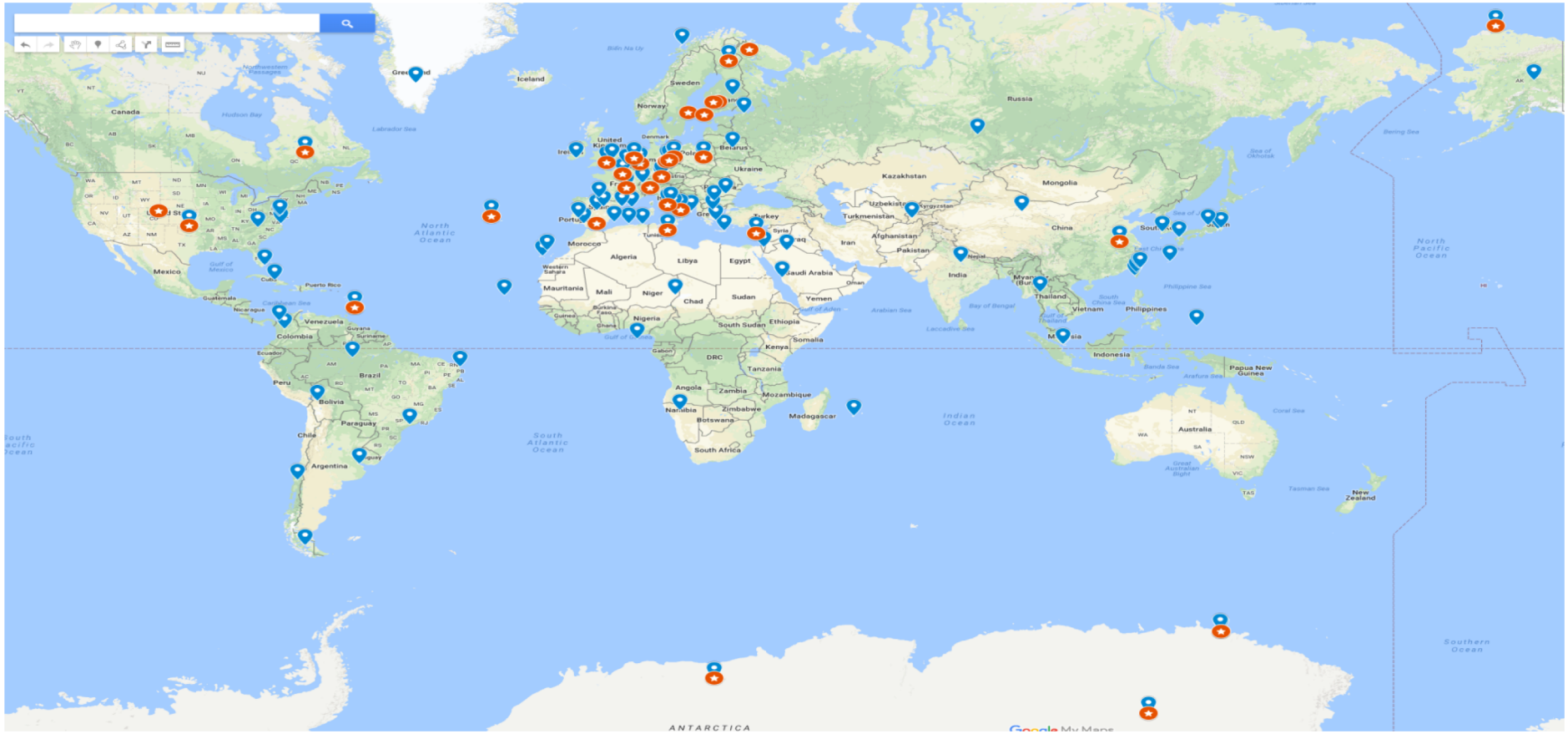
Alaska	Aire sur l'Adoure (F) (launch location for balloons)	Norway
Indonesia	Kiruna (S) (launch location)	North America
Sweden	Timmins (CND) (launch location)	NASA JPL areas TBD
Iberian Peninsula	Equatorial site (40 balloons)	NASA LaRC areas TBD
North Atlantic	Barbados	EUFAR (TBC) areas TBD
Arctic (3 campaigns)	Siberia	

NOTA BENE: the above campaigns were mentioned in the AO, but many of them will have finished before the present launch date.

4)Results of the Announcement of Opportunity (6/9) Ground-based instrumentation

instrument	instrumen	instrument
(Multiwavelength) Raman-(polarisation) Lidar	(Profiling) Cloud radar	(Microwave)/(visible) radiometer
Backscatter Lidar	Ceilometer	radiosonde
Doppler Lidar	(micro) rain radar (profiler)	Pyrometer
(multi channel) (multi-wavelength) RMR Lidar	Precipitation radar	Pyranometers and Pyrgeometers
Aerosol Lidar	Radar wind profiler	Optical distrometer
Micro-Pulse Lidar	Weather radar	Sun sky radiometer
Nephelometer	Aethalometer	Sun photometer
(Pandora)(Precision) spectrometer		(Optical) Particle (Counter)/(Sampler)

Results of the Announcement of Opportunity (7/9)
Ground-based sites (higlighting lidars and radars)

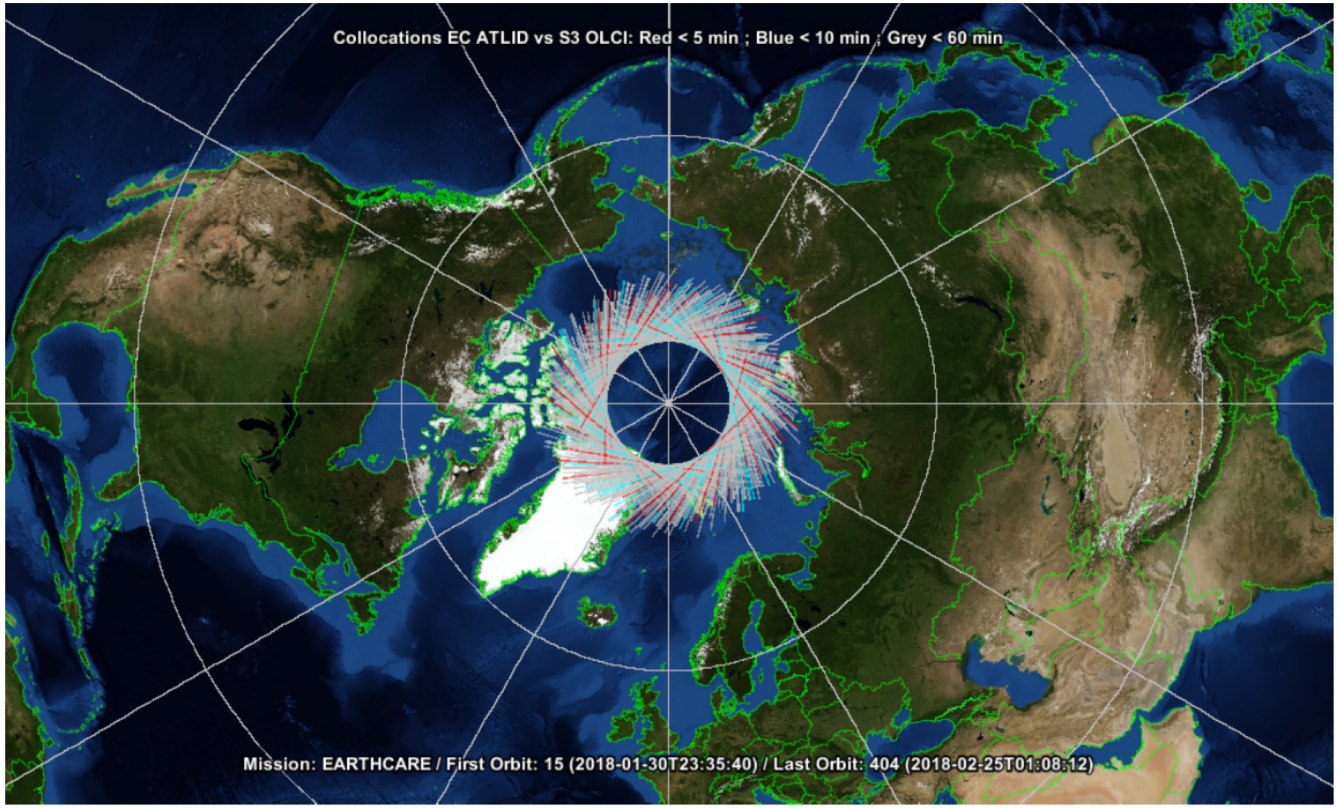


4) Results of the Announcement of Opportunity (8/9) Satellite intercomparisons

AVHRR	GERB
CALIPSO (*)	GPM/DPR
CATS	SCARAB
CERES	SEVERI
CLARREO	Sentinel 3 (OLCI+SLSTR)
MODIS	VIIRS

(*) = several proposals will use CALIPSO even in case there would be no Mission overlap in time. In that case they will use the CALIPSO Dataset in a statistical manner

Caveat: for some satellites – few collocations



For satellite-to-satellite collocations see presentation Monserrat Pinol Sole

Results of the Announcement of Opportunity (9/9) Validation using Models

Model name	Parameters
Met Office NWP	4D-Var Cloud&Aerosol
EURAD-IM	4D-Var Aerosol
ICON-LEM (DKRZ HD(CP)2)	Cloud
4A/OP	Brightness Temperatures (for MSI)

5) Documentation

- The Cal/Val AO document suite (incl Validation Requirements, public)
- Your proposal with Clarifications (private)
- Cal/Val Workshop report (public)
- Letters of Acceptance / support (private)
- EVDC Protocol (public document, to be signed individually)
- Individual agreements (private, formulated after funding confirmation)
- Validation Plan 1.0 / 2.0 (public, 1.0 is based on AO, 2.0 is after funding conf)
- CalVal portal (ECVT only)
- Rehearsal Review Report (ECVT only)
- Technical:
  - ATBOs (public)
  - ATBDs (case by case)
  - PDDs (public)
  - Instrument news (ECVT only)
  - Commissioning Plans (ECVT only)

6) Tools/Services

- **Tools/service for overpass prediction**: ESA provides several tools for this to PIs that have special planning needs. PIs operating at fixed sites do not need to install such tools: it is sufficient to provide their site coordinates to ESA (if different from those already reported in the **Geophysical Parameters.xls** file submitted with their AO proposal). (see presentation and demo by Montserrat Pinol Sole. For Airborne Campaigns coordination see presentation by Dirk Schüttemeyer)

- **Tools for data decoding, data analysis, and data intercomparison:** Whilst EarthCARE data are self-descriptive and can be read with many standard tools, the Atmospheric toolbox suite comprised of CODA(read)/HARP(analyse/intercompare)/VISAN(visualise) is planned to be adapted to EarthCARE to facilitate intercomparison (see presentation and demo by Sander Niemijer)

- **EarthCARE Simulator:** ESA intends to provide a limited amount of simulated data to help familiarisation and also for the rehearsal. The tool used to generate these data is subject of a demonstration at this workshop. (poster #8 and demo by Dulce Lajas)

- **EVDC data conversion tools:** Correlative data are to be shared using GEOMs metadata and common templates. Conversion tools are available but may need to be adapted (see presentation and poster #85 by Ann Mari Fjæraa)

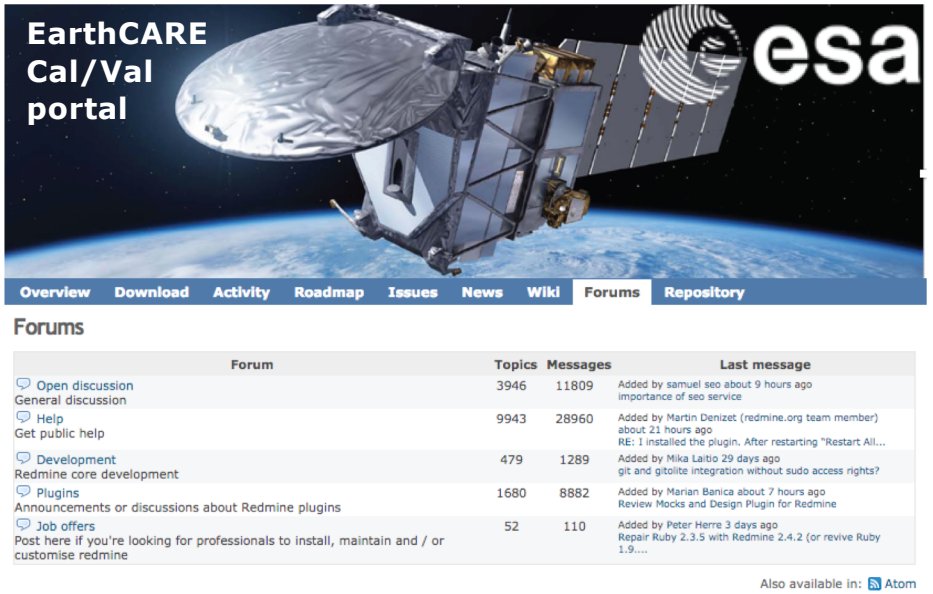
7) Communications (1/3)

- Mailing list: **ecvt@earthcare.esa.int** already operational
- Will be used by ESA to communicate towards the whole EarthCARE Cal/Val team
    - Mission news
    - Meeting logistics
    - Cal/Val document updates
    - Rehearsal plans and logistics
- Does not accept incoming mails yet. It will soon be configured to distribute incoming mail to ESA colleagues, which will resolve your query (if needed through internal consultation) and get back to you. This solution should allow continuity during holidays, missions etc.).

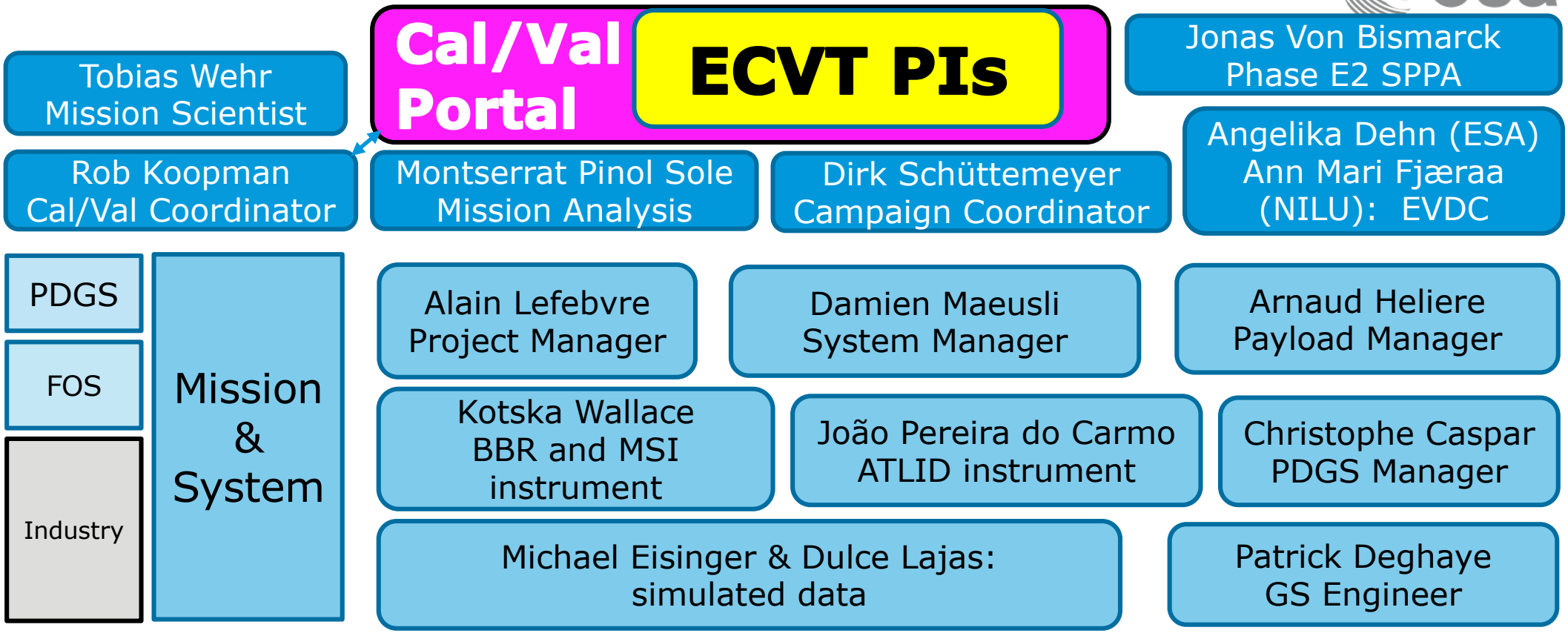
7) Communications (2/3)

In preparation: ESA EarthCARE CalVal Portal, accessible only to ECVT, with:

- **Interactive group collaboration mechanism for Questions & Answers, exchange of results and documents**
- Latest overpass tables
- Latest instrument status
- Latest timeline (calibration interruptions etc)
- Latest news on anomalies affecting product quality
- Latest information on data processing / availability
- Archive of communications and discussions, Q&A
- Repository of documents



7) Communications (3/3):ESA Team (Phase D/E1)



- E2 SPPA= Exploitation Phase - Sensor Performance and Product Assessment
- GS = Ground Segment
- PDGS = Payload Data Ground Segment FOS=Flight Operations Segment

8) Data exchange

From ESA to EarthCARE CalVal Team

- **Limited simulated data (prior to launch)**
- **Preliminary data (during commissioning phase, and in some cases after introduction of new algorithms or instrument settings in phase E2)**
- Operational data (after commissioning)
- Reprocessed data (after operational algorithm updates)

Sharing of correlative data within ECVT via ESA Atmospheric Cal/Val Data Centre

- Independent data coincident with EarthCARE
- GEOMS format: harmonised file format and metadata for Atmospheric Cal/Val
- Metadata templates: data from similar instruments organised along similar lines
- Helpdesk support with conversion (your "**Geophysical Parameters.xls**")

Refer to presentation and poster #85 by Ann Mari Fjaeraa

9) Validation Rehearsal

Objectives:

- Test observation planning (using simulated overpass tables)
- Test EarthCARE data download to PDGS (using simulated data)
- Test PI correlative data upload to EVDC (using real or simulated data)
- Test download of correlative data from other teams
- Test analysis and intercomparison chain
- Share simulated analysis results within ECVT for discussion

Pre-requisites:

- Familiarisation with EarthCARE products and mission
- Adaptation of PI tools to handle EarthCARE data
- Verification with EVDC of GEOMS metadata compatibility and support to EVDC expansion of GEOMS metadata definition where needed
- Adaptation of PI tools to convert data to GEOMS format, where needed using subroutines available at EVDC.

Discussion/Reporting: at Validation Rehearsal Review where also very latest information on the mission status will be provided

10) EarthCARE Data Release (1/2)

Data level	Target date release to EarthCARE Cal/Val Team	Target date public release
Level 1	3 months after launch	6 months after launch
Level 2a and Level 2b two-sensor products	6 months after launch	9 months after launch
Level 2b three-sensor and four-sensor synergy products	9 months after launch	18 months after launch

10) Data Release (2/2)

The target date for release to Cal/Val team is a conservative estimate: Preliminary data products will be made available to the Cal/Val Team as soon as they become available (after successful initial quality check)

The target dates for data release do not mark the beginning of your correlative measurement activity:

Your correlative measurements can start as soon as the EarthCARE instrument settings have been finalised and the EarthCARE instruments are in measurement mode. This is referred to as 'blind validation'.

This timing will be strongly instrument dependent

11) Timeline/Next Steps

- Workshop report — Q3 2018
- Notification of acceptance/letter of support — Q3 2018
- Validation plan (1.0) — Q4 2018
- Funding confirmation (may involve proposals to national or international calls) — 2018 &'19
- Intention to host a Validation Methods workshop (TBC) — Q3 2019
- (ESA and PI) to describe which of the activities proposed in the AO are confirmed — 2019 &'20
- ESA-JAXA validation workshop — October 2020
- Validation Plan (2.0) — Q4 2020
- Validation Rehearsal — Q1 2021
- Validation Rehearsal Review / Validation Readiness — Q2 2021
- Launch — June 2021
- Preliminary Validation Results Review — Launch + 6M
- Long-term Validation Phase — Launch+6 months until End of Mission

12) Logistics (1/3): Demonstrations (in the Foyer)

Time	Title	Presenter
Wednesday		
17:30	EarthCARE Cal/Val Observation Planning Support	Montserrat Pinol Sole
17:50	EarthCARE End-to-End	Dulce Lajas
18:10-18:30	ESA Atmospheric Toolbox	Sander Niemeijer
Thursday		
10:05	EarthCARE Cal/Val Observation Planning Support	Montserrat Pinol Sole
10:35	EarthCARE End-to-End	Dulce Lajas
11:05-11:35	ESA Atmospheric Toolbox	Sander Niemeijer

12) Logistics (2/3): Posters (on the 1st floor)

Number	Scope
[2-10]	Mission and System, Ground segment, data production model, simulators
[11-31]	EarthCARE data product algorithms
37	Fiducial Reference Measurement (FRM) Radar Network
85	The ESA Atmospheric Cal/Val Data Centre (EVDC)

Workshop Organisation

- Organised in sessions with (very short) talks followed by discussion
- Last session will be an overall gap analysis/coverage assessment session
- Each day a 90 minute break for poster viewing and demos
- Lunch provided on-site: extra chance to view posters

12) Logistics (3/3): Workshop session summary

Day	Time	Session
WED	13:30	ESA introduction
	15:05	General approaches and multi-task country contributions
THU	09:00	Specific instrument, product and algorithm validation
	14:25	Dedicated campaigns and regional efforts
	17:15	Global coverage and long-term global mission support by observational networks and stations (continues on Friday)
FRI	11:05	Validation against other satellites
	12:10	Validation using models
	12:30	Analysis of coverage with respect to validation requirements

Welcome to the ECVT