

# Aeolus CAL/VAL preparation status February 2018



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Mission Advisory Group

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## Members:

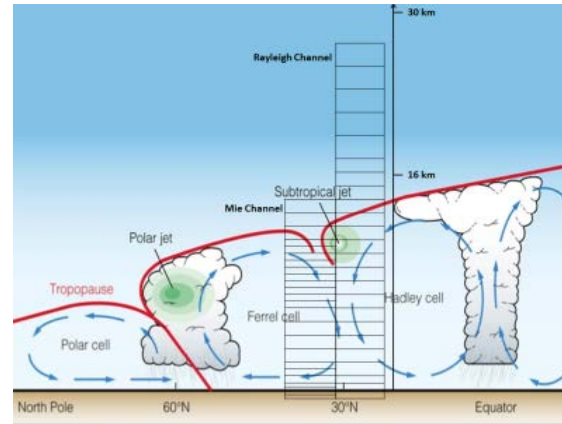
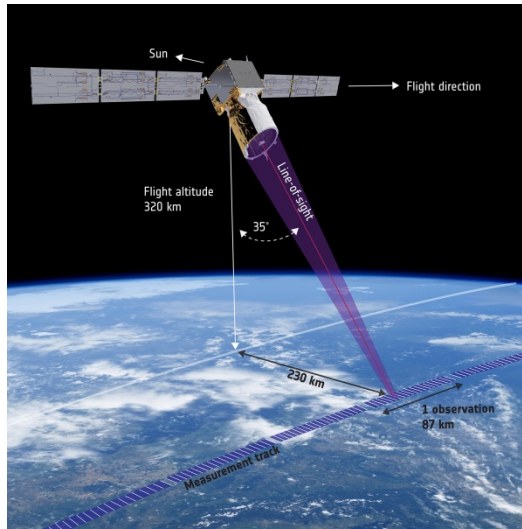
- Angela Benedetti / ECMWF
- Alain Dabas / MétéoFrance
- Pierre Flamant / IPSL
- Mary Forsythe / MetOffice
- Erland Källén / MISU (Chair)
- Heiner Körnich / SMHI
- Harald Schyberg / met.no
- Ad Stoffelen / KNMI
- Oliver Reitebuch / DLR
- Michael Vaughan / Lidar & Optics Associates

## Observers:

Régis Borde (EUMETSAT), Mike Hardesty (NOAA/University of Colorado), Ramesh Kakar (NASA), Lars Peter Riishojgaard (WMO)

1. Aeolus sampling and products
2. Aeolus in orbit satellite, instrument and product verification and validation in phase E
3. Aeolus CAL/VAL requirements and organization
4. Aeolus CAL/VAL teams: status, coverage, gaps
5. Aeolus CAL/VAL schedule
6. ESA supported campaigns

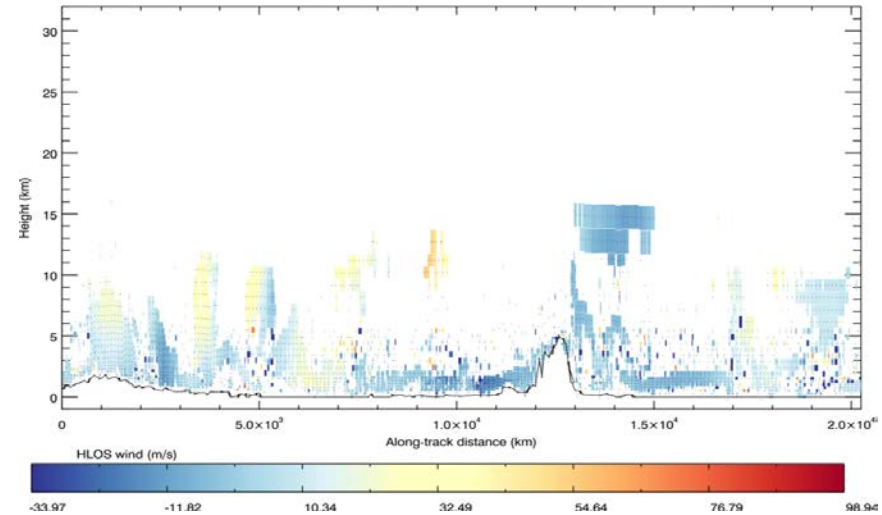
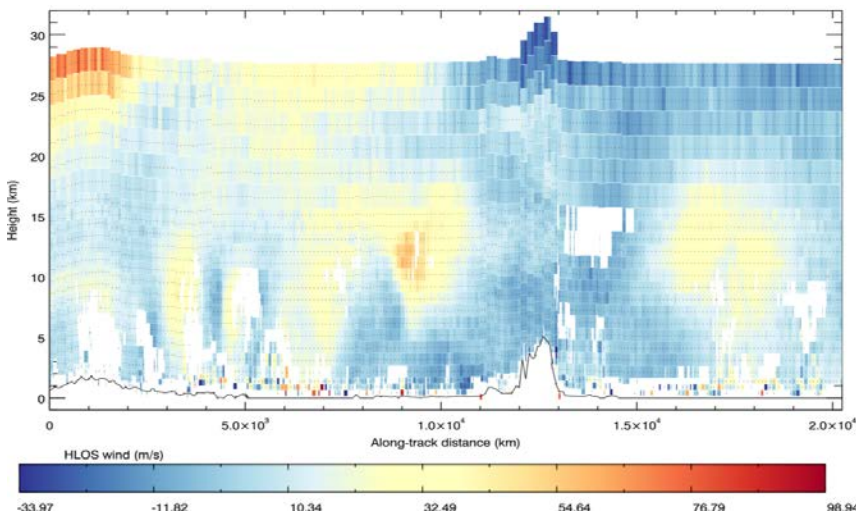
# Aeolus DWL sampling, molecular and particle backscatter at 355 nm (HSRL)



Flexible vertical sampling, 24 height bins per channel

Molecular winds

Particle backsc. winds



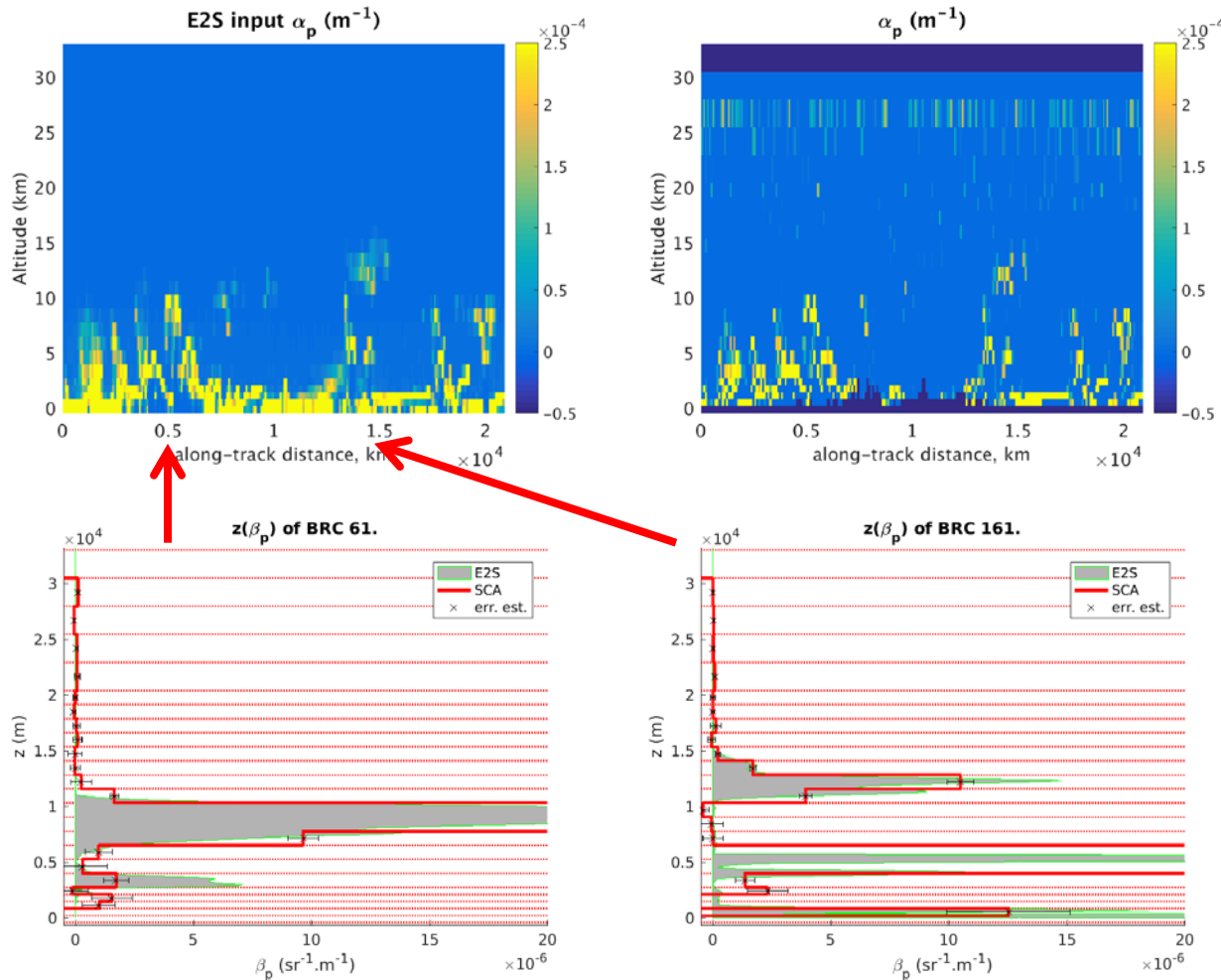
Working group on space-based Lidar winds | 08/02/2018 |

Simulated Aeolus L2B winds, courtesy M. Rennie (ECMWF)

European Space Agency

# Simulated Aeolus L2A observations

Y. Benounna *et al.* MétéoFrance



Simulated backscatter and extinction observations (87 km horizontal averages) from 1/2 orbit CALIPSO data, 1/1/2007

Simulated backscatter coefficient profiles for observations (87 km horizontal average) at (a) ~ 5000 km and (b) ~ 15000 km in the figure above

## 1. Level 1B:

- a. preliminary HLOS winds, not p and T corrected and not scene classified
- b. Input to Level 2B processor (no direct scientific use in its own)

## 2. Level 2B:

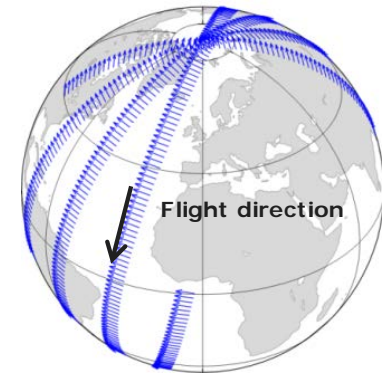
- a. horizontally projected line-of-sight wind (NRT)
- b. PBL: 2 m/s, FT: 2-3 m/s, Stratosphere: 3-5 m/s
- c. NRT, ESA EE format, perhaps also in BUFR (BUFR convertor available)

## 3. Level 2C:

- a. assimilated winds from ECMWF model at location of Aeolus Level 2B observations

## 4. Level 2A:

- a. atmospheric backscatter and extinction coefficient profiles (NRT)
- b. no polarization measurements
- c. Paralell polar backscatter of circularly polarized emitted light



Dusk/dawn orbit

Courtesy  
N. Žagar



## 1. Level 1B:

- a. preliminary HLOS winds, not p and T corrected and not scene classified
- b. Input to Level 2B processor (no direct scientific use in its own)

## 2. Level 2B:

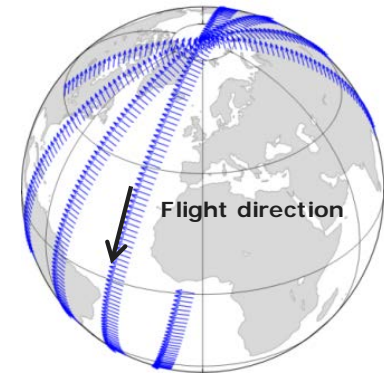
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- c. NRT, ESA EE format, perhaps also in BUFR (BUFR convertor available)

## 3. Level 2C:

- a. assimilated winds from ECMWF model at location of Aeolus Level 2B observations

## 4. Level 2A:

**L1B, L2A and L2B data are available NRT from ESA  
L2B data will be made available in BUFR format  
on the GTS and EUMETCAST by ECMWF and EUMETSAT**



Dusk/dawn orbit

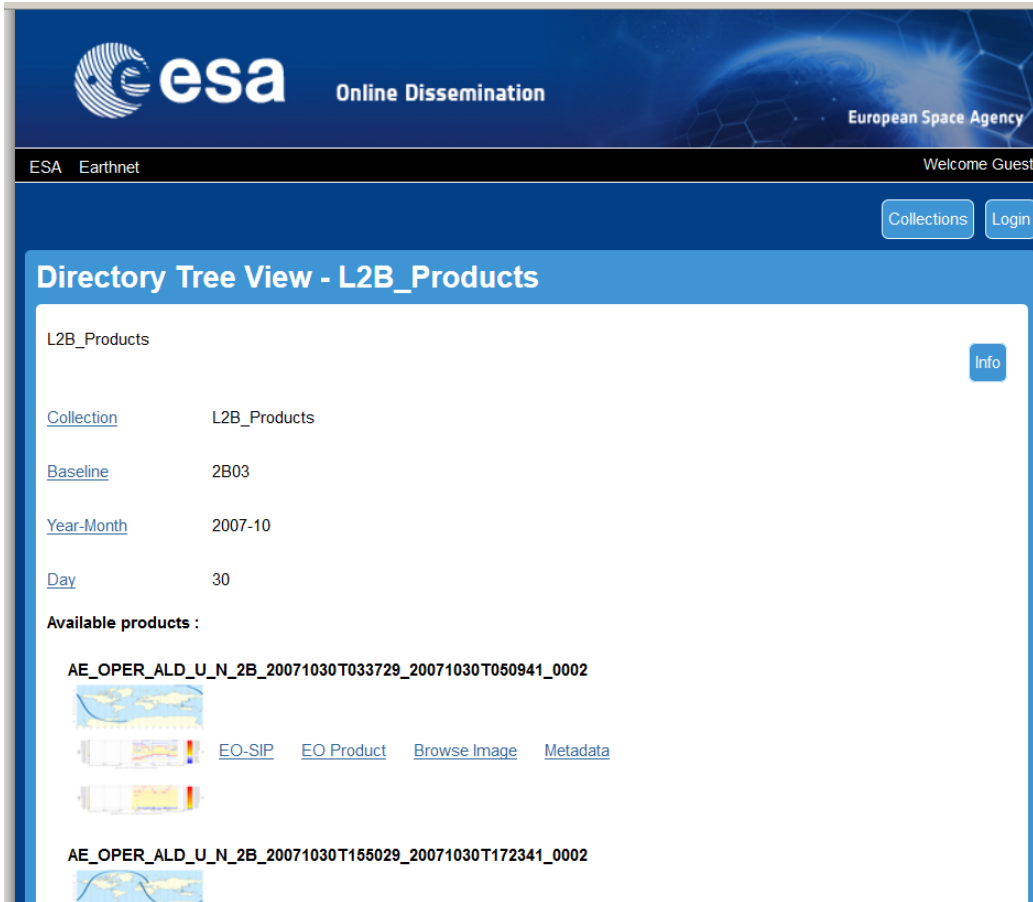
Courtesy  
N. Žagar

# ESA study Invitations to Tender being launched soon






1. Small feasibility studies to look into new Aeolus spin-off products and applications
  - a. Ocean and earth surface backscatter
  - b. Atmospheric backscatter
  - c. ...
  
2. Larger study for extraction of aerosol information from the Aeolus L2A optical properties product
  - a. Possibly in synergy with other observations and/or models





The screenshot shows the ESA Online Dissemination portal. The header includes the ESA logo, 'Online Dissemination', and 'European Space Agency'. Below the header, there are links for 'ESA Earthnet' and 'Welcome Guest'. A navigation bar contains 'Collections' and 'Login' buttons. The main content area is titled 'Directory Tree View - L2B\_Products'. It displays a table with the following details:

Collection	L2B_Products
Baseline	2B03
Year-Month	2007-10
Day	30
<b>Available products :</b>	
AE_OPER_ALD_U_N_2B_20071030T033729_20071030T050941_0002	
	<a href="#">EO-SIP</a> <a href="#">EO Product</a> <a href="#">Browse Image</a> <a href="#">Metadata</a>
	
AE_OPER_ALD_U_N_2B_20071030T155029_20071030T172341_0002	
	

<http://aeolus-ds.eo.esa.int/oads/access/>

- Open to experts and CAL/VAL PIs in commissioning phase and first months of phase E2
- Opened to general public via single sign-on as soon as data product is confirmed to be of good quality
  - no restrictions other than registration

1. Satellite and Instrument verification by industry (Comm. Phase, 3 months)
2. Verification of ESA data processing and operation by (CP and beyond)
  - a. Flight Operation teams
  - b. Payload Data Ground Segment teams
  - c. Algorithm core team with L1 and L2 data processing experts at DLR, MétéoFrance, KNMI and ECMWF
  - d. L2 processing centre at ECMWF including NWP monitoring
3. Product verification with international CAL/VAL teams (from L+ 2 months)
  - a. Collocated observations
  - b. Modelling
  - c. Science

# ADM-Aeolus Observational Requirements Winds only!



		PBL	Troposphere	Stratosphere
Vertical domain	[km]	0-2	2-16	16-20 (30)*
Vertical resolution	[km]	0.5	1.0	2.0
Horizontal domain		Global		
Number of profiles	[hour <sup>-1</sup> ]	>100		
Horizontal track data availability		> 95%		
Temporal sampling	[hour]	12		
Horizontal resolution / integration	[km]	15 (goal) – 100 (threshold)		
Horizontal sub-sample length	[km]	3 km		
Random error (HLOS Component)	[m/s]	1	2.5	3 (3-5)**
Systematic error (HLOS component)	[m/s]	0.7	0.7	0.7
Dynamic Range, HLOS	[m/s]	±100 (150)*		
Error Correlation over 100 km		< 0.1		
Probability of Gross Error	[%]	< 5		
Timeliness	[hour]	3		
Length of Observation Dataset	[yr]	3		

1. Describes mission and mission objectives
2. Product CAL/VAL requirements to be addressed by ESA and science teams
- 3. Goal: Assure verification of Mission Requirements (L2)**
4. Recommendations for CAL/VAL techniques to be applied
5. Guideline for CAL/VAL proposal review process
6. Guideline for CAL/VAL Implementation Plan

# Aeolus CAL/VAL Implementation Plan document

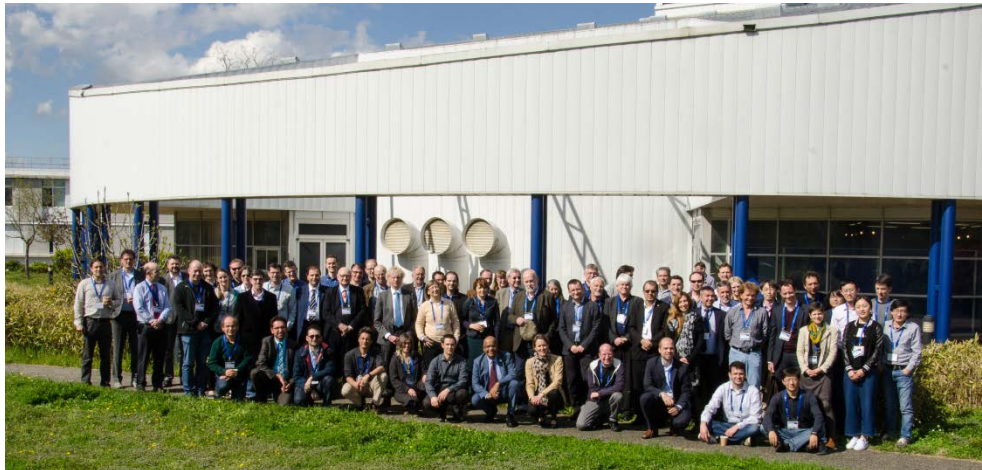


1. Describes mission, mission objectives
2. Describes the products, requirements, information content
3. Lists CAL/VAL requirements from requirements document
4. Describes relevant ESA and industry activities (e.g. algorithm core team, campaigns, industry commissioning activities, ...)
5. Lists CAL/VAL proposals
6. Map ESA, industry and CAL/VAL proposal activities to requirements
7. Gap analysis
8. Describes the CAL/VAL coordination and planning
9. Describes data access, ESA tools, team communication, ...
10. Links to other missions

# Aeolus CAL/VAL Rehearsal Workshop 2017



1. MétéoFrance, 28-30 March 2017, Toulouse, France
2. 100 participants - CAL/VAL PIs, industry, national entities and ESA
  - a. Wind and aerosol in-situ, remote sensing, modelling groups
  - b. Met services, universities, national space agencies ... in Europe, US and Canada, China, Japan
3. Rehearsal: Simulated products made available for download and testing of reading tools



# CAL/VAL proposal status July 2017



Proposal ID	PI name and institute location	Products	CAL/VAL techniques	Pre-Launch	Phase 1	Phase E2	Remarks
5156	Dabas, Alain, FR	W, A	RO, AC, GC	Green	Green	Green	
5166	Apituley Arnoud, NL	W, A, C	GC	Yellow	Yellow	Yellow	
5177	Hardesty Robert Michael, USA	W, A, C	RO, AC, GC, M, S	Yellow	Yellow	Yellow	
5188	Apituley Arnoud, NL	W, A, C	RO, GC	Yellow	Yellow	Yellow	
5190	Stoffelen Ad, NL	W, AL2	M	Yellow	Yellow	Yellow	
5192	Schyberg Harald, NO	W, A, C	RO, M	Yellow	Yellow	Yellow	
26989	Gausa Michael, NO	W, A, C	AC, GC	Red	Red	Red	
27329	Reitebuch Oliver, DE	W, A	AC, GC	Yellow	Yellow	Yellow	
27389	Stebel Kerstin, NO	W, A	RO, GC, S	Red	Red	Red	
27409	Amiridis Vassilis, GR	A, C	RO, GC	Yellow	Yellow	Yellow	
27411	Wu Songhua, CHI	W, A, C	GC	Green	Yellow	Yellow	
27449	Zagar Nedjeljka, SLO	W	M	Green	Red	Red	
27529	Forsythe Mary, UK	W, A	AC, M, S	Green	Green	Green	
27589	Ishii Shoken, JA	W	GC	Green	Green	Green	
27590	Joe Paul, CA	W, A, C	RO, GC, M, S	Yellow	Yellow	Yellow	
28295	Kushner Paul, CA	W	M, S	Yellow	Green	Green	

**W = Wind**  
**A = Aerosol**  
**C = Clouds**

**RO = Routine Operations**  
**AC = Airborne Campaigns**  
**GC = Ground Based Campaigns**  
**M = Model Studies**  
**S – Other satellite obs**  
**AL2 – Alternative L2 products**

 funding secured  
 funding partly secured  
 no secured funding  
 unknown

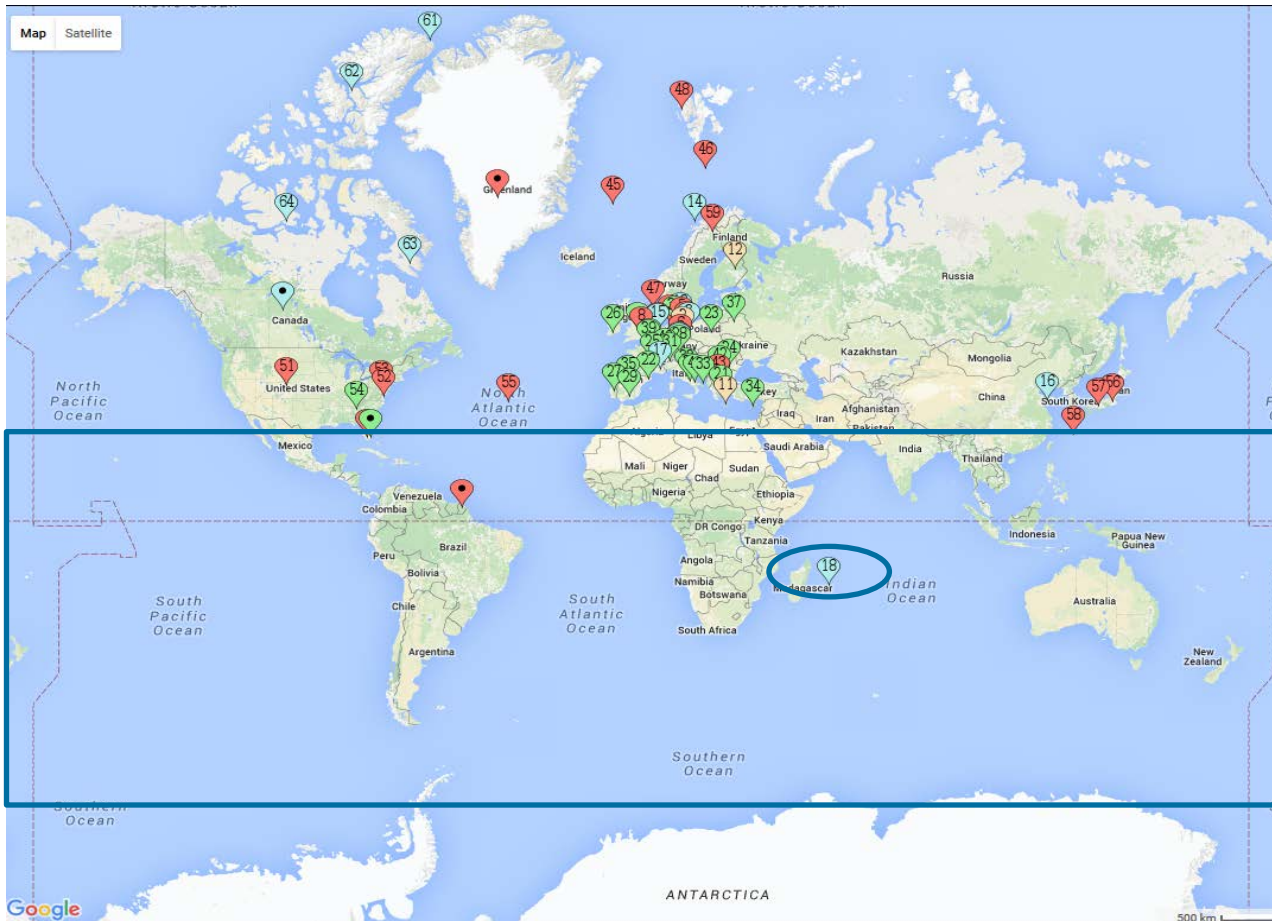


# New CAL/VAL proposals expected from



1. Ground-based Doppler wind lidar (Xuejin *et al.*, Nanjing, China)
2. Ground-based Doppler wind and backscatter lidars (Fochesatto *et al.*, Fairbanks, Alaska (application to NSF on-going))
3. Ground-based aerosol lidars (Khalessifrad *et al.*, Iran)
4. Ground-based aerosol lidars (Müller *et al.*, Korea and UK)
5. LALINET aerosol lidars (Landulfo *et al.*, Latin America)
6. Comparison of Aeolus extinction product with OSIRIS in the UTLS (Bourassa *et al.*, University of Saskatchewan, Canada)
7. Validation of Aeolus with ground-based wind profilers in Kiruna Sweden and India (Körnich *et al.*)
8. Discussions with BOM and CSIRO on possible CAL/VAL with Doppler wind radars and aerosol remote sensing instruments in Australia

# Geographical coverage CAL/VAL proposals

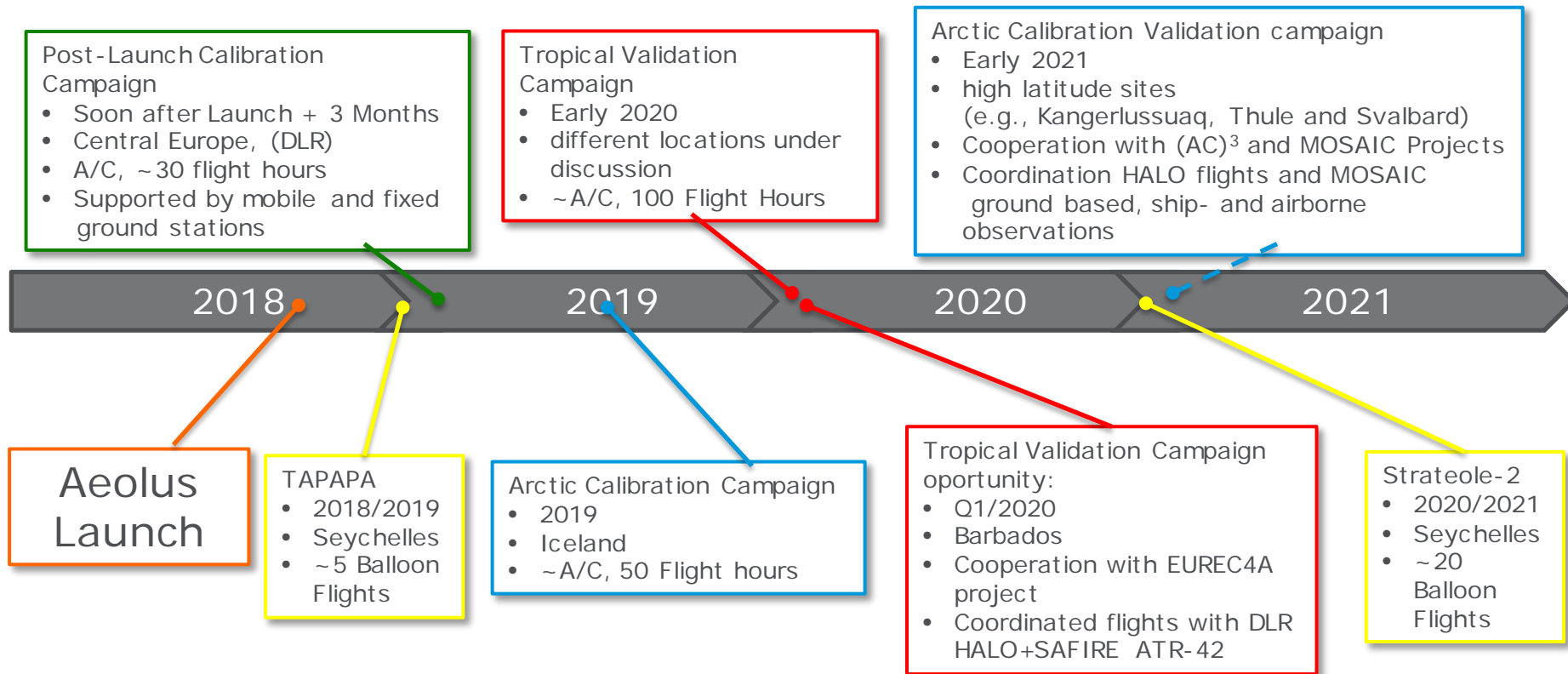


- Data calibration and validation will be performed by teams world wide using:
  - Correlative ground-based (remote sensing) wind and aerosol observations
  - Airborne observations
  - Comparison to models
- Gaps:
  - Tropics and SH

1. Re-opening of Aeolus CAL/VAL portal: 1 March 2018
2. Cal/Val Team organization and preparations: Spring 2018
3. Workshop EUMETSAT 29 May: data assimilation European NWP community
4. 1<sup>st</sup> European Lidar Conference: 3-5 July 2018
5. Communication on mission status, instrument performance and CAL/VAL coordination via email and Aeolus wiki page:
  - From [Launch – 3 months] onwards
6. Mission launch: expected September 2018
7. Algorithm core team support to industry commissioning:
  - September – December 2018
8. First CAL/VAL activities: L+2 months on-wards
9. First post-launch Aeolus CAL/VAL and Science Workshop:
  - March 2019, ESA-ESTEC
  - Yearly workshops (Mission lifetime: 3 years)
10. Campaigns: next slide

# Phase E2 Airborne Campaigns – Options

## T. Fehr (Aeolus campaigns manager)



1. Aeolus CAL/VAL preparations are picking up speed
2. Most CAL/VAL teams have secured funding for CAL/VAL activities, although some gaps remain (e.g. PhD student funding)
3. ESA will launch on-line lecture series on:
  - a. The instrument, calibration, data processing, product monitoring and validation
    - Training of new people joining CAL/VAL teams soon
  - b. Aeolus science applications
4. Aeolus CAL/VAL Announcement of Opportunity website reopens 1 March
5. 1<sup>st</sup> post-launch Aeolus science and CAL/VAL workshop at ESA-ESTEC, March 2019

[http://www.esa.int/Our\\_Activities/Observing\\_the\\_Earth/Aeolus](http://www.esa.int/Our_Activities/Observing_the_Earth/Aeolus)



<https://aeolusweb.wordpress.com/>

