



Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

L2A+

L2A+

Enhanced Aeolus L2A for depolarizing targets and impact on aerosol research and NWP

Progress Report 03 – PR03
[03/2023-04/2023]

(Version 1.0)

Submitted to: Christian Retscher (ESA)

	Name	Function	Date
Prepared by:	E. Proestakis	WP1000 – NOA	04/2023
	H. Baars	WP2000 – CoPI – TROPOS	04/2023
	A. Floutsi	WP2000 – TROPOS	04/2023
	A. Gkikas	WP3000 – NOA	04/2023
	K. Rizos	WP3000 – NOA	04/2023
	A. Georgiou	WP4000 – NOA	04/2023
	A. Kampouri	WP4000/5000 – NOA	04/2023
	E. Drakaki	WP4000/5000 – NOA	04/2023
	A. Benedetti	WP6000 – CoPI – ECMWF	04/2023
Approved by:	V. Amiridis	PI	04/2023

*National Observatory of Athens (NOA)
Institute for Astronomy, Astrophysics, Space Applications & Remote Sensing
(IAASARS)*

Vas. Pavlou & I. Metaxa, 15236 Penteli, Greece

&

Leibniz Institute for Tropospheric Research (TROPOS), Leipzig, Germany

&

European Centre for Medium-Range Weather Forecasts

[ECMWF]

Reading, United Kingdom

ESA-L2A+ Progress Report 03 [PR03]



L2A+

Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

Executive Summary - Progress Report 03 (PR03)

This is the Progress Report 03 (PR02) documentation file of the European Space Agency (ESA) project entitled L2A+ [Enhanced Aeolus L2A for depolarizing targets and impact on aerosol research and NWP]. PR03 reports on the activities performed during the period from between March 2023 and April 2023 (KO+5 - KO+6 months).

Work Package Status

WP1000	Management, reporting and promotion.
	<p>Status: Ongoing. Schedule: KO – KO+24 months. Started on: November 2022. Objectives: Monitoring of the L2A+ project, ensuring the timely and efficient accomplishment of the planned activities and administrative tasks and promotion of the project to the scientific community. Furthermore, consolidating the scientific requirements for L2A+ study.</p>
Status	<p>Ongoing.</p> <p>Activities related to WP1000 included the general management of the L2A+ project as well as the communication among all partners and with the Agency. Meetings were organised to ensure a smooth execution of all scientific and technical tasks. Moreover, activities related to WP1000 included addressing the comments raised by the ESA-L2A+ officers on Deliverable Item 01 (DIO1) – “Requirement Baseline Document” (RBD).</p> <p>Towards enhancing communication of the ESA L2A+ activity and outputs, the following L2A+ abstracts have been submitted:</p> <p><i>“Aeolus Science Conference 2023” - 22 and 26 of May 2023 - Rhodes Island</i>:</p> <ol style="list-style-type: none"> Rizos, K., Gkikas, A., Proestakis, E., Georgiou, T., Amiridis, V., Marinou, E., Donovan, D., Benas, N., Stengel, M., Retscher, C., Baars, H., and Floutsi., A. A.: “Development and validation of an enhanced aerosol product for Aeolus”, poster, Aeolus Science Conference 2023, 22-26/03/2023, Rhodes Island. Georgiou, T., Proestakis, E., Gkikas, A., Rizos, K., Drakaki, E., Kampouri, A., Tsikerdekis, A., H. Baars, A. A. Floutsi, E. Marinou, A. Benedetti, W. McLean, C. Retscher, and V. Amiridis.: “Improvements in Numerical Weather Prediction and Dust Transport modelling through AEOLUS L2A assimilation”, poster, Aeolus Science Conference 2023, 22-26/03/2023, Rhodes Island. Gkikas, A., Proestakis, E., Dabas, A., Benedetti, A., McLean, W., Flament, T., Marinou, E, Tsikoudi, I., Baars, H., Floutsi, A., A., Amiridis, V., Borde, R.: “Upgrading Aeolus aerosol observational capabilities towards improving air quality and NWP models”, Oral, Aeolus Science Conference 2023, 22-26/03/2023, Rhodes Island. Proestakis, E., Gkikas, A., Georgiou, A., Rizos, K., Paschou, P., Benedetti, A., McLean, W., and V. Amiridis, V.: “Aeolus aerosol observational capability based on CALIPSO”, poster, Aeolus Science Conference 2023, 22-26/03/2023, Rhodes Island. <p><i>“EGU 2023 2023, 22-28/04/2023, Vienna, Austria”</i>: T. Georgiou, E. Proestakis, A. Gkikas, K. Rizos, E. Drakaki, A. Kampouri, A. Tsikerdekis, H. Baars, A. A. Floutsi, A. Benedetti, and V. Amiridis.: “Enhancing Aeolus L2A for depolarizing targets and impact on aerosol research and NWP”, Poster, EGU 2023, 22-28/04/2023, Vienna, Austria.</p>



L2A+

Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

	<p><i>“International Conference on Meteorology Climatology and Atmospheric Physics 2023 - COMECAP 23 - 25-29/09/2023, Athens, Greece”:</i></p> <ol style="list-style-type: none"> 1. K. Rizos, A. Gkikas, E. Proestakis, T. Georgiou, V. Amiridis, E. Marinou, D. Donovan, N. Benas, M. Stengel, C. Retscher, H. Baars, and A. A. Floutsi.: “Development and validation of an enhanced aerosol product for Aeolus (L2A+)”, poster/oral: to-be-announced, COMECAP23 - 25-29/09/2023, Athens, Greece. 2. T. Georgiou, E. Proestakis, A. Gkikas, K. Rizos, E. Drakaki, A. Kampouri, A. Tsikerdekis, H. Baars, A. A. Floutsi, E. Marinou, A. Benedetti, W. McLean, C. Retscher, and V. Amiridis.: “Utilising AEOLUS to improve dust transport modelling”, poster/oral: to-be-announced, COMECAP23 - 25-29/09/2023, Athens, Greece. <p>With respect to L2A+ Progress Meeting 03 (PM03), the day of Tuesday 16/05/2023 and the time-window between 12:00-14:00 CET, is decided.</p>
WP2000	<p>ASKOS ground-based datasets in support of L2A+.</p> <p>Status: Ongoing. Schedule: KO – KO+16 months. Started on: November 2022. Objectives: To provide ASKOS ground-based datasets for L2A+ product validation and model evaluation studies.</p>
Status	<p>Ongoing.</p> <p>Activities conducted between KO+5 and KO+6 months include the finalization of the Quality-Assurance (QA) procedures applied to the observational datasets acquired in the framework of ESA-ASKOS/JATAC campaign at Cabo Verde. Internal QA procedures ensure the high quality of the products that are part of the data pool (D2, D4 and D5), which will in-turn be used as input in several WPs.</p> <p>During KO+5 and KO+6 months the preparation and submission of the D2 was conducted. With respect to D2, we have provided the following data:</p> <ul style="list-style-type: none"> • PollyXT-derived aerosol optical properties and target classification (September 2021). • Cloudnet target classification (September 2021). • 2-step POLIPHON results, including among others the dust-only vertical profiles of the extinction and backscatter coefficient, the dust mass concentration, etc. (September 2021). • HETEAC-Flex typing results for the four Aeolus overpasses during September 2021 (03, 10, 17, 24), which include the relative volume contributions of four aerosol components, the volume and number concentration (per component). • Radiosonde profiles obtained at Sal. <p>The novel combined feature mask over Mindelo (September 2021) is still work-in-progress and will be based on the PollyXT-derived aerosol optical properties and target classification (September 2021) and Cloudnet target classification (September 2021) delivered within D2. In addition, the first version (V1) of height-resolved dust-only profiles above Mindelo, which is the deliverable (D5) planned for KO+12 m, was already provided.</p>



L2A+

Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

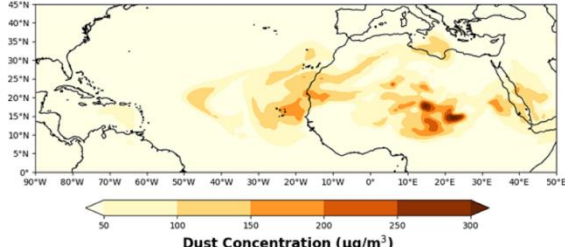
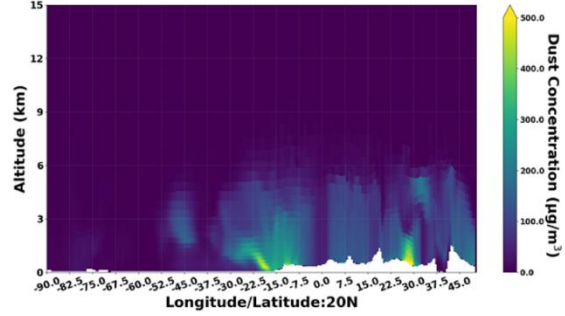
WP3000	Development of the L2A+ aerosol product. Schedule: KO+4 – KO+21 months. Started on: February 2023.
Status	<p>Ongoing.</p> <p>Overarching technical Objective of L2A+ WP3000 consists the development of a refined Aeolus aerosol optical product (L2A+) over the North Atlantic Ocean, based on AEL-FM/AEL-PRO algorithms, AOD products, CAMS, and new AOD retrievals from the Aeolus itself, with focus on non-spherical atmospheric particles (i.e., dust). Towards realisation of the L2A+ product, the work-in-progress conducted between KO+05 months and KO+06 months, includes, among others,the:</p> <p>implementation of the AEL-FM Feature Mask product, towards the removal of atmospheric features classified as clouds and the establishment of a high quality L2A+ pure-aerosol product. The challenge is related to minimisation of the risk L2A+ WP3000 output of aerosol profiles - contaminated by clouds - to be implemented in WP4000 as input to the foreseen assimilation experiments. The development analysis is focused on indicative Aeolus-Cabo Verde overpasses, identified in the framework of L2A+ WP2000 and the ESA-ASKOS experiment, and more specifically on the 10th, 17th, and 24th of September 2021, to be expanded to cover the entire L2A+ RoI in next steps of WP3000, following validated activities against quality-assured measurements from the ASKOS/JATAC experiment in Cape Verde (WP2000). An indicative study case is provided in the figure-below, for the test case on 17th September 2021 (orbit id: 017790).</p> <div> </div> <p>Figure: Aeolus overpass on 17th of September 2021 (top panel), L2A SCA backscatter coefficient (left panel) profiles, AEL-FM Feature Mask product (middle panel), and Cloud-Filtered SCA backscatter coefficient profiles (right panel), for the Aeolus overpass of orbit id: 017790.</p> <p>Initial steps on processing of CAMS reanalysis dataset for 09/2021 have been undertaken. Implementation of CAMS reanalysis dust outputs is to be applied towards addressing L2A underestimation in terms of backscatter due to ALADIN instrument providing only the co-polar part of the atmospheric backscattered return of the circularly polarised emitted beam. CAMS-identification of atmospheric dust cases will be used in the following WP3000 steps, towards accounting for the missing/non-detected cross polar component in the case of strongly depolarizing targets (i.e., dust particles). An indicative study case is provided in the figure-below, for the test case on 17th September 2021 (orbit id: 017790).</p>



L2A+

Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

	<p style="text-align: center;">10 Sep 2021 (18:00 UTC)</p> <p style="text-align: center;">Pressure Level: 710 hPa</p>   <p style="text-align: center;"><i>Figure: CAMS dust mass concentration over L2A+ RoI for the 10th of September 2021 at 18:00 h UTC at 710hPa (top panel) and vertical cross-section of dust mass concentration at 20° Latitude (lower panel).</i></p>
WP4000	Assimilation of L2A/L2A+ and application of WRF-L experiments.
	Status: Not started. Schedule: KO+6 – KO+24 months. Objectives: Assimilation of L2A and L2A+ dust products on WRF-L and pertinent simulations.
Status	-
WP5000	Impact Studies.
	Status: Not started. Schedule: KO+12 – KO+24 months. Objectives: Scientific Analysis and Impact Assessment.
Status	-
WP6000	Recommendations.
	Status: Not started. Schedule: KO+12 – KO+24 months. Objectives: Summary of the main scientific outcomes of the project and recommendations for expanding the performed research activities.
Status	-



L2A+

Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

Status of Deliverable Items

<i>Code</i>	<i>Deliverable Item</i>	<i>Type</i>	<i>Delivery Date</i>	<i>Status</i>
MoM	Minutes of Meeting – Kick-Off Meeting	Documentation	KO	Completed.
PR01	Progress Report 1	Documentation	KO+2 Months	Completed.
Do1 – V1	Requirement Baseline Document (RB)	Documentation	KO+3 Months	Completed.
Do7 – V1	L2A+ project website (WEB)	Webpage	KO+3 Months	Completed.
MoM-PM01	Minutes of Meeting – Progress Meeting 1	Documentation	KO+3 Months	Completed.
PR02	Progress Report 2	Documentation	KO+4 Months	Completed.
Do1 – V2	Requirement Baseline Document (RB)	Documentation	KO+6 Months	Submitted.
Do2	Data Pool (DP)	Dataset	KO+6 Months	Submitted.
PR3	Progress Report 3	Documentation	KO+6 Months	Submitted.
MoM-PM02	Minutes of Meeting – Progress Meeting 2	Documentation	KO+6 Months	To be submitted following PM02.
PR04	Progress Report 4	Documentation	KO+8 Months	Pending.
MoM-PM03	Minutes of Meeting – Progress Meeting 3	Documentation	KO+9 Months	Pending.
Do3	Description of the Algorithm Developments (ALGO)	Documentation	KO+9 Months	Pending.
PR05	Progress Report 5	Documentation	KO+10 Months	Pending.
Do5	Output data product (OP)	Dataset	KO+12 Months	Pending.
Do8	Multi-media material (MM)	Documentation	KO+12 Months	Pending.
PR06	Progress Report 6	Documentation	KO+12 Months	Pending.
MoM-MTR	Minutes of Meeting – Mid Term Review Meeting	Documentation	KO+12 Months	Pending.
PR07	Progress Report 7	Documentation	KO+14 Months	Pending.
Do2	Data Pool (DP)	Dataset	KO+15 Months	Pending.
Do3	Description of the Algorithm Developments (ALGO)	Documentation	KO+15 Months	Pending.
Do4	Analysis of the Validation Activities carried out (VAL)	Documentation	KO+15 Months	Pending.
MoM - PM04	Minutes of Meeting – Progress Meeting 4	Documentation	KO+15 Months	Pending.
PR08	Progress Report 8	Documentation	KO+16 Months	Pending.
Do5	Output data product (OP)	Documentation	KO+18 Months	Pending.
Do7 – V2	L2A+ project website (WEB)	Webpage	KO+18 Months	Pending.
PR9	Progress Report 9	Documentation	KO+18 Months	Pending.
MoM - PM05	Minutes of Meeting – Progress Meeting 5	Documentation	KO+18 Months	Pending.
PR10	Progress Report 10	Documentation	KO+20 Months	Pending.
Do2	Data Pool (DP)	Dataset	KO+21 Months	Pending.
Do3	Description of the Algorithm Developments (ALGO)	Documentation	KO+21 Months	Pending.
Do4	Analysis of the Validation Activities carried out (VAL)	Documentation	KO+21 Months	Pending.
Do6	Scientific Analysis, Impact Assessment and	Documentation	KO+21 Months	Pending.



L2A+

Ref: ESA AO/1-11041/22/I-NS

Progress Report 03 – PR03

	Scientific Roadmap (SIR)			
MoM - PM06	Minutes of Meeting – Progress Meeting 6	Documentation	KO+21 Months	Pending.
PR11	Progress Report 11	Documentation	KO+22 Months	Pending.
Do4	Analysis of the Validation Activities carried out (VAL)	Documentation	KO+24 Months	Pending.
Do5	Output data product (OP)	Documentation	KO+24 Months	Pending.
Do6	Scientific Analysis, Impact Assessment and Scientific Roadmap (SIR)	Documentation	KO+24 Months	Pending.
Do8	Multi-media material (MM)	Documentation	KO+24 Months	Pending.
Do9	Final Report and Executive Summary Report (FR)	Documentation	KO+24 Months	Pending.
MoM -FR	Minutes of Meeting – Final Review Meeting	Documentation	KO+24 Months	Pending.

L2A+ Gantt Chart

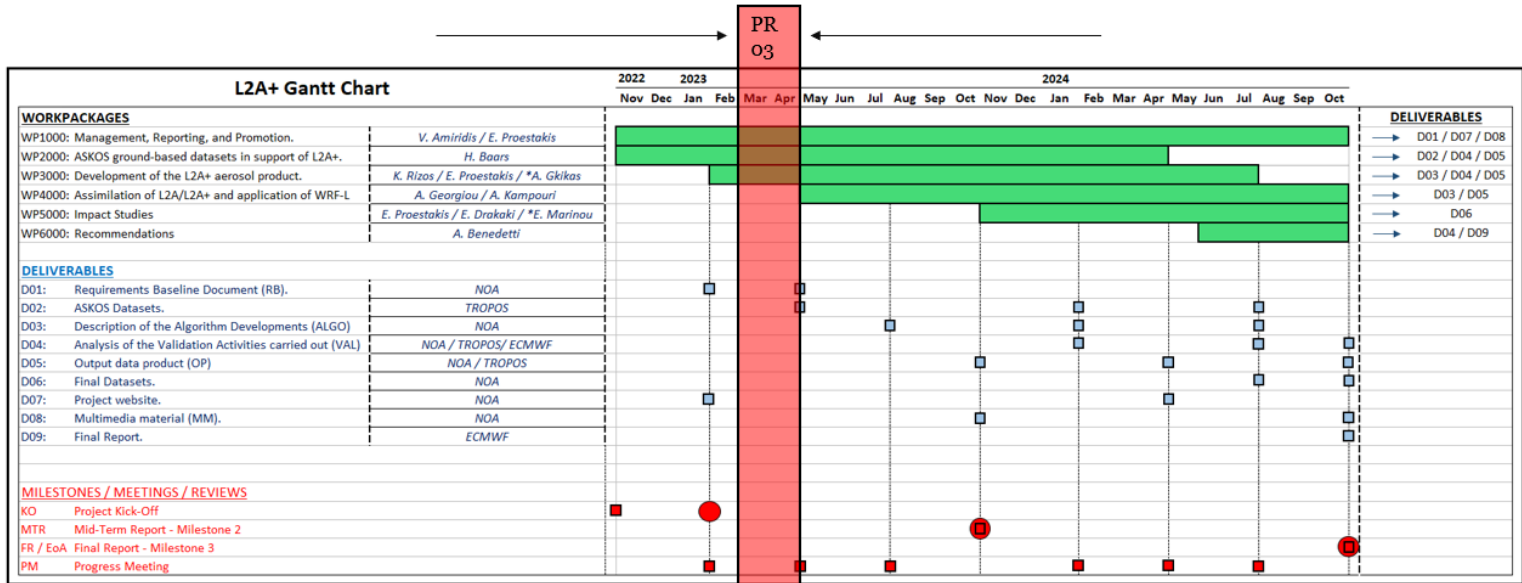


Figure: L2+ Gantt Chart and current PR03 temporal period.