

Deliverable D7.1: Deliverable AERONET Europe Calibration Centre

Intermediate Report on Access to AERONET-EUROPE Calibration Centre

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Comments	Overview of the IR activity (access unit provided), Scientific Highlights, Publications

Description of publicity

Permanent on line call is open at the ACTRIS/AERONET-Europe website. Advertising for AERONET-Europe Calibration facility is permanently published on the AERONET-USA website thus providing wide distribution since the website frequently accessed on a global scale.

Moreover, presentations, communications and posters presenting the infrastructure are made during workshops, conference (ESA workshops, etc. for example), during ACTRIS General Assemblies (Italy, 2016) and several other conferences. NASA (Dr. Brent Holben) also redirects potential new users (in Europe at least) to AERONET-Europe facility. Websites of the three AERONET-Europe components advertise TNA offer. Link to ACTRIS website, brochure and poster are functional (<http://loaphotons.univ-lille1.fr/ACTRIS/>; <http://www.aemet.izana.org/>; <http://goa.uva.es/>).

Selection Procedure

After reception of submitted TNA proposals, proposals are sent by LOA by email to the selection panel for evaluation and approval. As some of the members of the selection panel are located in the USA, Canada, Switzerland, Spain and France, the selection procedure is therefore remotely performed. The selection of the proposal is based on four criteria 1) originality/scientific quality; 2) interest to the scientific community; 3) favourable geographical location of user site; and 4) available complementary instrumentation at the atmospheric station. Priority is also given to « new » users. In case of approval of the proposal, the user is informed by email and further information on user obligations and shipping instructions are given. The choice of the relevant calibration facility (AE-LOA or AE-GOA) is made internally, depending on (i) the distance between the calibration centre and the user site, (ii) the instrument type, and (iii) weather conditions. Distinction must be made between first time and recurrent user. The calibration of reference instruments is provided at the Izaña platform (AE-IZA). The provision of access is made depending on the available capacity of the installations.

Selection panel: The members of the AERONET-Europe USP comprise the following international external experts: Stelios Kazadzis (WRC-Switzerland, PFR Network), Brent Holben (AERONET, USA/GSFC); Norman O'Neill (AERONET, Canada (AEROCAN)); Zhengqiang Li (IRSA/ CAS-China, SNET Network), and internal experts: Carlos Toledano (AERONET, UVA/GOA-Spain), Philippe Goloub (AERONET, LOA/CNRS-France). This list has been approved during the first meeting of the General Assembly.

Description of TNA

AERONET-Europe is supporting, mostly in Europe, long-term aerosol observation and monitoring efforts from a ground-based automatic sun/moon-*photometer* network. In particular, one of our objectives is that almost all relevant European AERONET sites will be covered by the facility. The activity is strongly contributing, at the European level, to several relevant integration/synergetic activities between LIDAR, photometer and in situ observation and with satellites and modelling. The main objectives are to provide calibration support to academic and private sectors. Most of the associated data being expected to contribute to AERONET network and to ACTRIS Data centre. To maximize the data

quantity and quality, AERONET-Europe (WP7) is organizing to provide remote and physical trainings. Additional regular newsletters will be good communication vectors to disseminate information towards users. The calibration facility, partly supported through ACTRIS-2, is shaped/designed to support SMEs needs. CIMEL SME, as others, is benefiting from our infrastructure, expertise for network management, for instrument monitoring, for users training, feedback from the instrumentation in the field. Thanks to partnerships developed between academic research and industry within ACTRIS, a lunar photometer is expected to develop much more in the future and offer night-time observation capability. Additionally, our infrastructure aims at supporting the production of high quality AOD and radiances data requested by innovative software's solving inverse problems and being developed by CNRS and GRASP-SAS. The French and Spanish components of AERONET-Europe (WP7) are involved in several programs and projects (ESA, EUMETSAT) to secure the upgrade of the instrumentation and calibration facility, additionally to the dedicated national supports.

AERONET-Europe TNA activities (WP7)

AERONET-Europe has accepted a total of 177 TNA projects since the beginning of the project for a total quantity of 197 CAL provided, with the following breakdown for the intermediate period after the first reporting period:

- AE-LOA: 83 eligible projects, 94 CAL provided
- AE-GOA: 54 eligible projects, 56 CAL provided
- AE-IZA: 40 eligible projects, 47 CAL provided

Scientific output

During the last 6 months, the activity of this infrastructure was good and yields, after 24 months, a slightly larger users number than the expected value. In term of access units, we provided 187 ua. Most of the users are recurrent users. However, there were few new users applying for calibration. As mentioned previously, the infrastructure is now offering additional lunar-calibration facility. The calibration methodologies and organization of this calibration at a network scale is a quite positive result for the company that produces and markets this instruments, since all new users/customers have now a solution for calibration and processing. The new CIMEL photometer, particularly with its new lunar capability is currently involved in various field campaigns, as for example, INTERACT II comparing various Lidar technologies and among them Raman LiDAR mostly used during night. Mid-2016, close to 200 calitoo handheld sunphotometers have been manufactured, sold and distributed in and out of Europe. Innovation around GRASP activities that include both satellite and ground-based data processing and applications yields to creation of GRASP-SAS start up (<http://www.grasp-open.com>), in France.

All publications referring to AERONET-Europe are part of Open air database.

The overview of TNA projects.

Acronym Project	Title	Reporting period	Qty of access	Objectives	Description of work
AEIZA_FR_LIL8-16	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_FR_LIL9-16	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_FR_LIL10-16	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_SP_VAL9-16	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_SP_VAL1-17	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_SP_VAL2-17	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_FR_LIL1-	Absolute	RP2	1	calibration of reference	Absolute

17	Calibration of Sunphotometer			instrument for GOA operation in AERONET-EUROPE	calibration
AEIZA_FR_LIL2-17	Absolute Calibration of Sunphotometer	RP2	1	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
AEIZA_FR_LIL3-17	Absolute Calibration of Sunphotometer	RP2	2	calibration of reference instrument for GOA operation in AERONET-EUROPE	Absolute calibration
Total Access 10					

LOA Access 20					
Acronym Project	Title	Reporting Period	Amount of access (CAL)	Objectives	Description of work
AELOA_UK_CAM1-16	Met Office aerosol network	RP2	1,5	The eruption of Eyjafjallajökull in 2010 has triggered the rapid development of volcanic ash remote sensing activities at the Met Office. As a response, a Lidar – Sunphotometer network for near real time monitoring of volcanic ash will be set-up across the United Kingdom. The networks will consist of 9 fixed sites with a Lidar and Sunphotometer, as well as a mobile platform across the UK to ensure a spatial coverage. The station at Camborne will be one of them. Additional calibration units and spares will help to ensure the operational service. The network will form	Intercalibration

				<p>an integral part of a wider volcanic ash response strategy, which will incorporate additional observations as well as dispersion models. One aim is a better characterisation of aerosol types using the combination of aerosol backscatter/extinction coefficient and depolarization ratio from Lidar as well as Aerosol Optical Depth (AOD) and further products from the Sunphotometer. Furthermore events such as Sahara dust episodes, air quality or influence from sea salt aerosols will be monitored, as well as compared to models. Different parameters derived by AERONET inversions such as particle size distribution, refractive index or phase function will be used to characterize such events.</p>	
AELOA_RO_MAG1-16	<p>Characterization of aerosol optical and microphysical properties above Magurele-Bucharest, Romania</p>	RP2	1	<p>Regular calibration within 12-month period as requested by AERONET. In the context of regional climate change and air quality, the project goal is to study aerosol loading, its variability and trends over a sub-urban region of Bucharest, Romania. Aerosol products by AERONET sun-sky radiometer measurements combined with air-mass back trajectories are going to be analysed in order to identify source regions and pathways of air masses carrying aerosols to south-east Romania, and to determine the dependence of aerosol mean optical properties on advection patterns. Aerosol Raman lidar observations of particle extinction and backscatter coefficients at 532nm are going to be used in combination with Sun photometer observations of the particle optical depth at eight wavelengths from 340-1020nm to fully</p>	Intercalibration

				characterize column-integrated microphysical properties of boundary-layer aerosol such as volume and surface concentrations, effective radius, refractive index, and single scattering albedo.	
AELOA_DE_LIN1-16	Aeronet Station "MetObs_Lindenberg" of the meteorological observatory from DWD "MOL-RAO" in Lindenberg, Germany	RP2	1	Research in aerosol and atmospheric radiation. Synergy with other radiation and ground remote-sensing instruments (spectrometers, BSRN station, Lidars, All-Sky instruments).	Intercalibration

AELOA_RO_TIM1-16	Romanian Atmospheric research 3D Observatory (RADO) of Timisoara	RP2	1	<p>Starting with 2011, March, the Timisoara sun photometry station is part of the AERONET network and is located at the Politecnica University www.upt.ro, in the location of the Faculty for Mechanical Engineering (Bv M Viteazu 1, Timisoara), on the roof. Of the tallest building (45.74N; 21.22E). The Instrument type is CE 318N EB S9. The sun photometer number in the network AERONET is 645. The measurements from sun photometer were used in research and educational activities. Until now, many valuable articles published in prestigious journals (e.g. Atmospheric Research, Energy Conversion and Management, etc.) have been written, a PhD thesis was fulfilled and other two are ongoing Students from license cycle (Mechanical and Electric and Chemical engineers, but not only) and master level of Renewable Resources Engineering have access to the sun photometer data and currently use the data base for reporting and exercising or student projects. The instrument is also a member of the Romanian Atmospheric Research 3D Observatory (RADO) is a state-of-the-art facility at national level (and so far unique in SE Europe), dedicated to research and monitoring of atmospheric processes and compounds in the Planetary Boundary Layer and Free Troposphere. Also, we have an accredited laboratory in accordance with standard ISO CEI 17025:2005, and it is fully equipped with the infrastructure required for air quality measurements, as well as highly qualified personnel. The mobile laboratory ensures the monitoring of CO,</p>	Intercalibration
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				<p>NO, NO2, O3, PM, THC, NMHC, CH4 and SO2 concentration, values required for a correct interpretation of pollution episodes (e.g. a project with the Timisoara City Hall, main industrial entities from the western part of Romania such as Smithfield, TRW, Continental, CONTITECH, etc.). The data offered by the sun photometer is completing / enlarging our research and measurement possibility in this field for sure, and open for sure new correlation possibilities for the local, but not only, state of the air quality and possibility to use the solar energy, despite the polluting episodes occurring. The photometer is included also in the ERRIS platform of research structures - http://erris.gov.ro/main/index.php?- available and ready to join projects and cooperation offers. As domain we indicate: Earth Sciences & Environment.</p>	
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AELOA_FR_LIL4_16	Calibration of CIMEL CE318, CE318T, sun/sky/polar photometer	RP2	1	<p>Since 25 years, Cimel has developed several instruments dedicated to atmosphere sciences that are used by leading scientific organisations in the world. In particular, Cimel's photometer CE318 equips the worldwide AERONET federation and has become the reference instrument for aerosol monitoring networks. All instruments are designed according to Cimel's philosophy resulting in high quality measurements with field proven reliability and very low maintenance requirements. Cimel provides direct support for installation, training and maintenance. CIMEL request access to AERONET-EUROPE calibration facility to provide high quality measurements and data to its customers.</p>	Intercalibration
AELOA_BE_UST1-16	Monitoring Atmospheric Composition at the Belgian Antarctic station Princess Elisabeth(BELATMOS) 2012	RP2	1	<p>The objective of the BELATMOS project planned by the Royal Meteorological Institute of Belgium, the Belgian Institute for Space Aeronomy and University of Ghent is, to contribute to the long-term monitoring of the chemical and particle composition of the Antarctic atmosphere. The project aims to characterize comprehensively the physical and optical properties of the ambient aerosol at the Princess Elisabeth station Antarctica. From the measurements, the radiative impact of the aerosol will be derived, in particular by studying the evolution of the aerosol optical depth and the single scattering albedo. Pertinent relationships will be established, e.g., between absorbing and scattering properties, wavelength, and size of the aerosol. By combining the Belatmos observations with meteorological parameters and the calculation of air</p>	Intercalibration

				<p>mass back trajectories, we will improve the understanding of the long-range transport of aerosol particles towards Antarctica and of the relative impact of rather continental or marine sources. With the build-up of a long time series, trends concerning the Antarctic aerosol can be established. In addition, the aerosol measurements will be combined with simultaneous measurements of cloud and precipitation properties in order to study relationships between aerosol, cloud, and precipitation characteristics. Furthermore, the evolution of the total ozone column is monitored and a precise UV and total irradiation climatology at Utsteinen will be established.</p>	
AELOA_UK_BIS1-16	Met Office aerosol network	RP2	1,5	<p>The eruption of Eyjafjallajökull in 2010 has triggered the rapid development of volcanic ash remote sensing activities at the Met Office. As a response, a Lidar – Sunphotometer network for near real time monitoring of volcanic ash will be set-up across the United Kingdom. The networks will consist of 9 fixed sites with a Lidar and Sunphotometer, as well as a mobile platform across the UK to ensure a spatial coverage. The station at Glasgow Bishopton will be one of them. Additional calibration units and spares will help to ensure the operational service. The network will form an integral part of a wider volcanic ash response strategy, which will incorporate additional observations as well as dispersion models. One aim is a better characterisation of aerosol types using the combination of aerosol backscatter/extinction coefficient and depolarization ratio from Lidar as well</p>	Intercalibration

				Aerosol Optical Depth (AOD) and further products from the Sunphotometer. Furthermore events such as Sahara dust episodes, air pollution and influence from sea salt aerosols will be monitored, as well as compared to models. Different parameters derived by AERONET inversions such as particle size distribution, refractive index or phase function will be used to characterize such events.	
AELOA_IE_COR1-16		RP2	1		Intercalibration
AELOA_FR_LIL5_16	Calibration of CIMEL CE318, CE318T, sun/sky/polar photometer	RP2	1	Since 25 years, Cimel has developed several instruments dedicated to atmosphere sciences that are used by leading scientific organisations in the world. In particular, Cimel's photometer CE318 equips the worldwide AERONET federation and has become the reference instrument for aerosol monitoring networks. All instruments are designed according to Cimel's philosophy resulting in high quality measurements with field proven reliability and very low maintenance requirements. Cimel provides direct support for installation, training and maintenance. CIMEL request access to AERONET-EUROPE calibration facility to provide high quality measurements and data to its customers.	Intercalibration

AELOA_CH_DAV1-17	Davos Calibration CIMEL	RP2	1	Re-Calibration within 12-month period as requested by AERONET.PMOD hosts the World Optical depth Research and Calibration Centre of the World Meteorological Organization, acting as calibration facility for the AOD network of WMO Global Atmosphere Watch program. A permanent link between the PHOTONS and GAWPFR networks is maintained through co-location of a well calibrated Cimel instrument with PFR radiometers at Davos.	Intercalibration
AELOS_UK_WAT1-17	Met Office aerosol network	RP2	1	The eruption of Eyjafjallajökull in 2010 has triggered the rapid development of volcanic ash remote sensing activities at the Met Office. As a response, a Lidar – Sunphotometer network for near real time monitoring of volcanic ash will be set-up across the United Kingdom. The networks will consist of 9 fixed sites with a Lidar and Sunphotometer, as well as a mobile platform across the UK to ensure a spatial coverage. The station at Camborne will be one of them. Additional calibration units and spares will help to ensure the operational service. The network will form an integral part of a wider volcanic ash response strategy, which will incorporate additional observations as well as dispersion models. One aim is a better characterisation of aerosol types using the combination of aerosol backscatter/extinction coefficient and depolarization ratio from Lidar as well Aerosol Optical Depth (AOD) and further products from the Sunphotometer. Furthermore events such as Sahara dust episodes, air quality or influence from sea salt aerosols will be monitored, as well as compared to	Intercalibration

				models. Different parameters derived by AERONET inversions such as particle size distribution, refractive index or phase function will be used to characterize such events.	
AELOA_FR_LIL1_17	Calibration of CIMEL CE318, CE318T, sun/sky/polar photometer	RP2	1	Since 25 years, Cimel has developed several instruments dedicated to atmosphere sciences that are used by leading scientific organisations in the world. In particular, Cimel's photometer CE318 equips the worldwide AERONET federation and has become the reference instrument for aerosol monitoring networks. All instruments are designed according to Cimel's philosophy resulting in high quality measurements with field proven reliability and very low maintenance requirements. Cimel provides direct support for installation, training and maintenance. CIMEL request access to AERONET-EUROPE calibration facility to provide high quality measurements and data to its customers.	Intercalibration

AELOA_IT_MOD1-16	Modena sun-photometer (AERONET #253) Calibration 2013	RP2	1	<p>Due to their effect on human health, the study of atmospheric pollutants is an important concern in the Po valley – northern Italy – one of the main industrialized and populated areas of the country. Our work focuses on the applicability of satellite Aerosol Optical Depth (AOD) retrievals in support of air quality monitoring and assessment in urban environments within the Po valley. First, this has been accomplished by using the implementation of the International MODIS/AIRS Processing Package (IMAPP) Air Quality Applications software, IDEA-I (Infusing satellite Data into Environmental Applications-International) over the Po valley study area. IDEA-I is a globally configurable software package that uses either Terra or Aqua Moderate resolution Imaging Spectro-radiometer (MODIS) AOD product retrievals to identify local domains of high values of aerosol. For our specific analyses, IDEA-I has been used over the large European domain, centred over the Po Valley. AERONET data are used to study the correlation between ground measurement of PM and MODIS AOD satellite data. For this reason, to ensure the accuracy of AERONET measurements, sun photometer calibration is fundamental.</p>	Intercalibration
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AELOA_NL_CBW1-16	CESAR CIMEL 2013	RP2	1	<p>CESAR Observatory is a unique site. Although other atmospheric observatories exist worldwide, only a few are as well-instrumented as CESAR. An important advantage of the site is its location: both close to the sea and to some of the major European industrial and populated areas. This location leads to a large variety of air mass types at the site. Other advantages are its long term dataset of advanced parameters, the coinciding location of the different instruments, and the area around the site, which is flat and therefore easier to model. These advantages have made the observatory very appealing to the international scientific community. International research groups aiming at targeted measurement campaigns are attracted by the complete set of observations continuously available at CESAR. By calibration of the CIMEL sun-photometer the QA throughout the actual year will be guaranteed</p>	Intercalibration
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AELOA_IT_MIL1-17	A new AERONET station in North Italy (Garda Lake)	RP2	1	<p>The aerosol data collection performed within this project has multiple purposes. First, we aim to use the AERONET inversion products (micro-physical properties) for calibrating/validating remote sensing data of Lake Garda, the largest lake in Italy. Since 1999, Lake Garda is our test area for different research projects on water quality remote sensing (e.g. EC: FP4-SALMON, FP5-Hysens-Rosalma, Central Europe-EuLakes, FP7-GLaSS). Within this framework, (see Giardino et al., 2014; Bresciani et al. 2012; Bresciani et al. 2011a; Bresciani et al. 2011b; Guanter et al. 2010; Odermatt et al. 2010; Giardino et al. 2007a; Giardino et al. 2007b; Giardino et al. 2005 and Brivio et al. 2001), we use AERONET data for either corrects the images for the atmospheric effects or for validating the aerosol concentration estimated by radiative transfer codes. Second, AERONET data in Sirmione, combined with those gathered from other surrounding stations (e.g., Ispra, Modena and Venice) are used to assess the deposition of aerosols in the Lake Garda region within the regional project SINOPIAE (Regione Lombardia). Within this framework, we are particularly interested in study the effect of the deposition of Saharan dust on phytoplankton growth (i.e. dust fertilization hypothesis) in (once more) Lake Garda.</p>	Intercalibration
AELOA_DE_FZJ1-17	FZJ-JOYCE CE318 calibration 2012	RP2	1	FZJ-JOYCE CE318 calibration 2012	Intercalibration

AELOA_UK_EAS1-17	Met Office aerosol network	RP2	1	<p>The eruption of Eyjafjallajökull in 2010 has triggered the rapid development of volcanic ash remote sensing activities at the Met Office. As a response, a Lidar – Sun photometer network for near real time monitoring of volcanic ash will be set-up across the United Kingdom. The networks will consist of 9 fixed sites with a Lidar and Sun photometer, as well as a mobile platform across the UK to ensure a spatial coverage. The station at Glasgow Bishopton will be one of them. Additional calibration units and spares will help to ensure the operational service. The network will form an integral part of a wider volcanic ash response strategy, which will incorporate additional observations as well as dispersion models. One aim is a better characterisation of aerosol types using the combination of aerosol backscatter/extinction coefficient and depolarization ratio from Lidar as well as Aerosol Optical Depth (AOD) and further products from the Sun photometer. Furthermore events such as Sahara dust episodes, air pollution and influence from sea salt aerosols will be monitored, as well as compared to models. Different parameters derived by AERONET inversions such as particle size distribution, refractive index or phase function will be used to characterize such events.</p>	Intercalibration
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AELOA_SK_POP1-17	First aerosol measurements quality check in the ARC SHMI Poprad-Gánovce	RP2	1	<p>The aerological and solar radiation centrum (ARC) of the Slovak Hydro meteorological Institute (SHMI) organizes upper-air measurements, monitoring of total column ozone and spectral solar UV radiation by the Brewer ozone spectrophotometer, measurements of the long-wave and the short-wave radiation fluxes and is responsible for the solar radiation measurement quality control in Slovakia. The station is involved in the GAWO3 WMO project. The total column ozone and UV data are sent to the WOUDC Toronto and the observatory participates also in the EUBREUNET project. The radiation data have been regularly sent to the WRDC in St. Petersburg. Meteorological, aerological and air quality measurements performed at the observatory are shared in the frame of the WMO data exchange. The observatory cooperates with the national scientific organizations - the Comenius University and the Geophysical Institute of the SAS and participates also in some international activities (COST 726, COST 1207). The sun photometer CIMEL 318-NE DPS9 together with the CIMEL lidar CE 370-2 were installed at the station in November 2014 with aim to retrieve complex information on atmospheric aerosols. An aerosol parameters have not been monitored in Slovakia before and information on aerosols needed for modelling of the solar radiation used to be obtained from satellites or from the literature. Continuous monitoring of the aerosols is required also for the national climate monitoring programme. The on-line measurements of aerosol</p>	Intercalibration
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				properties and its vertical profile (including the PBL thickness) will be directly utilized by the air traffic services provided by the SHMI.	
AELOA_CZ_KOS1_1 7	BUC-CEH- sat_AOD_2017	RP2	1	In the context of regional climate change and air quality, the project goal is to make comparative study with satellite AOD for a new site in Czech Republic. Initially set up in Bucharest, the instrument is operational from 2007. For the new site, a full maintenance and calibration is required. The instrument is scheduled to perform measurements at the new site for at least one year. Aerosol products by AERONET sun-sky radiometer measurements are going to be used for the retrieval of satellite AOD. The instrument will be used for a one year campaign for inter validation/calibration purposes. The calibration of the #359 sun-photometer is important for the validation of data products since quality assured data is required in these applications. Sun photometer observations of the particle optical depth at eight wavelengths from 340-1020nm will be used to fully characterize column-	Intercalibration

				integrated atmospheric properties of boundary-layer aerosol such as volume and surface concentrations, effective radius, refractive index, and single scattering albedo.	
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