

WP2- NA2: Remote sensing of the vertical aerosol distribution
Deliverable D2.4: Minutes of the third workshop

ACTRIS

WP2 – NA2: Remote sensing of the vertical aerosol distribution

WP20 – JRA1: Lidar and sunphotometer

3rd Joint Workshop

Cyprus University of Technology

Department of Civil Engineering and Geomatics

26 – 29 November, 2013

Agenda

26 November 2013

14:00 – 19:00

WP2 NA2: Remote sensing of vertical aerosol distribution

Welcome and introduction

Task 2.1 Exchange of expertise, integration and outreach

ACTRIS status and integration

Progress on the measurement report system

Task 2.2 Quality assurance

Task 2.2.1 Intercomparison campaigns

Task 2.2.2 Internal quality check-ups

Task 2.3 Improvement of lidar techniques and data analysis

Task 2.3.1 Definition of new aerosol parameters

Task 2.3.2 SCC web graphic interface

27 November 2013

9:00 - 17:00

Task 2.3 Improvement of lidar techniques and data analysis (cont'd)

Task 2.3.1 Definition of new aerosol parameters

Task 2.1 Exchange of expertise, integration and outreach (cont'd)

EARLINET database publication in CERA

Outreach strategies

Technical discussion session

28 November 2013

9:00 – 18:00

WP20 JRA1: Lidar and sunphotometer – Improved instruments, integrated observations and combined algorithms

Activity report and overview of WP status

Task 20.1 Improved daytime capabilities of lidar instruments

Comparison of the different configurations for the retrieving of the aerosol extinction coefficient using rotational Raman lidar.

Discussion on further work regarding instrument improvements.

Task 20.3 Integrated retrieval schemes for aerosol microphysical properties

Progress of development of integrated algorithm and software package (LIRIC+) for processing combined lidar and sun photometer data

Progress of development of GARRLiC algorithm for combined lidar and sun photometer data inversion

Discussion on algorithm development status and further needs

Task 20.2: Integrated observation strategies

Overview on WP20 database

Discussion on use of the database

Task 20.2/20.3: Integrated observation strategies and integrated retrieval schemes for aerosol microphysical properties

Integrated observation strategies and algorithm evaluation

Discussion on conclusions from algorithm tests and applications

Discussion on work to be done in WP20 until end of ACTRIS

29 November 2013

9:00 – 13:00

WP2 NA2: Remote sensing of vertical aerosol distribution

Task 2.1 Exchange of expertise (cont'd.)

WP2 / WP20 Scientific presentations

The 3rd Joint Workshop of ACTRIS WP2 (NA2: Remote sensing of vertical aerosol distribution) and WP20 (JRA1: Lidar and sunphotometer – Improved instruments, integrated observations and combined algorithms) was held in Limassol (Cyprus), from 26 to 29 November 2013 (see agenda), hosted by the Department of Civil Engineering and Geomatics of Cyprus University of Technology. The workshop had an attendance of 68 present in Limassol, plus 11 who participated remotely through Webex (see list of attendees at the end of these minutes). The attendance included participants in ACTRIS work packages other than WP2 and WP20 and, in particular, modelers.

Progress and achievements in all the tasks were reviewed, with emphasis on task 2.3 (improvement of lidar techniques and data analysis for aerosol characterization) in the case of WP2, and on task 20.2 (integrated observation strategies) for WP20.

All the presentations listed in the following are available on the [ACTRIS intranet](#).

**Note that you must be [logged in to the ACTRIS intranet](#)
first in order to use the interactive links below!**

WP2 NA2: REMOTE SENSING OF VERTICAL AEROSOL DISTRIBUTION

A brief overview of progress in WP2 since the last workshops and of next steps is given in the presentation

- [WP2: Introduction and progress \(Adolfo Comerón, UPC\)](#)

The **31st of December 2013 deadline** is reminded to **submit retrievals** corresponding to the ACTRIS period to the EARLINET database for a lidar station to be considered active within ACTRIS. The 31st of January 2014 deadline to send the results of the mandatory internal quality assurance tests to Volker Freudenthaler is also reminded.

Task 2.1. Exchange of expertise

Interaction with other work packages, integration and outreach

ACTRIS coordinator, Gelsomina Pappalardo, stresses the need to take into account integration both within WP2 and towards other work packages and to higher level products atmospheric products. She comments on the outlooks of a follow-up ACTRIS project within H2020 and of a scientific infrastructure in the ESFRI context, for which work has to be devoted to sustainability and outreach. Concerning WP2 activities this calls for keeping up measurements and uploading the results to the EARLINET database in a timely way. To facilitate the task of tracking measurements and their status, a web-based automated measurement report system under development is presented:

- [EARLINET Report System](#) (Giuseppe d'Amico and Ioannis Biniotoglou, CNR-IMAA; S. Chatzimichelakis and A. Stamou, impworks)

A first prototype of this system is already available at <http://earlinet-reports.impworks.gr> (those not having done it yet should request the creation of an account to Giuseppe d'Amico). Until now it works under the principle of reporting periods, but it seems it would be more flexible if no reporting periods were implemented. It is agreed that work will be pursued under the latter option (case 1 in the previous presentation).

An instance of interaction and integration with WP5 (NA5: Clouds and aerosol quality-controlled observations) and with WP22 (JRA3: A framework for cloud-aerosol interaction

studies) is discussed and presented by Holger Baars (see link to the presentation “*Implementation of PollyXT into the Cloudnet scheme for an advanced target classification*” in the contributed presentations to task 2.3.

Guidelines to enhance WP2 outreach are outlined in the presentation by WP2 leader, Adolfo Comerón

- *Outreach strategies: ACTRIS-I conclusion and beyond* (Adolfo Comerón, UPC)

Aspects of technology developments in WP2 in partnership with European SMEs are discussed. This partnership is welcome as one of the ACTRIS objectives, and in fact two SMEs are participating in this workshop.

Savvas Kleanthous, head of the Air Quality Sector of the Cyprus Department of Labour Inspection gives the invited presentation

- *Air Quality Status in Cyprus* (Savvas Kleanthous, Cyprus Department of Labour Inspection)

EARLINET database publication in CERA

The EARLINET database for the period 2000 – 2010 is already uploaded to the World Data Center for Climate (WDCC) and will be soon published with an assigned DOI in the database-based Climate and Environmental Retrieval and Archive (CERA) catalogue and archive (<http://www.dkrz.de/daten-en/cera>). Access to CERA is at <http://cera-www.dkrz.de/WDCC/ui/> (request for account needed). Details of access, citation, problems found in the EARLINET database prior to its publications and the solutions applied, as well as future work for successive updates are explained by Holger Linné in the presentation

- *EARLINET database publication in CERA-1* (Holger Linné, MPI-HH)

Lucia Mona explains the approach to the quality check carried out on the EARLINET database before its publication. Details can be found in the presentation

- *EARLINET database publication in CERA-2: Database quality check* (Lucia Mona, CNR-IMAA)

A contributed presentation is given by Nicolas Pascal about the ICARE data and services center:

- *Ground-based observations database for aerosol and cloud characterization at the ICARE Data and Services Center* (Nicolas Pascal, ICARE, Université de Lille 1, HYGEOS)

Technical presentations session

Practical problems and possible solutions are discussed around the following presentations:

- *A new generation of lidar electronics at Garmisch-Partenkirchen* (Thomas Trickl, KIT-IMK-IFU)

The possibility is suggested that non-linearity observed above a certain signal level have its origin in the PMT socket. Licel can provide ground-free acquisition systems not on its catalogue, but available upon request.

- *Validation and intercomparison protocol of R-MAN510 Raman lidar* (Philippe Royer, Leosphere)
- *A case of electromagnetic disturbance on photocounting lidar signal* (Patrick Fréville et al., OPGC – Université Blaise Pascal)
- *Results of depolarization tests on MUSA with tools for diattenuation measurements* (Aldo Amodeo et al., CNR-IMAA)

Scientific presentations session

In this session, elaborated results and tools related to lidar measurements, but not necessarily confined to them, were presented. At the beginning, Len Barrie introduces himself and the Cyprus Institute members participating in the workshop and explains the opportunities afforded by the soon-to-start FP7 BACCHUS project, which aims to quantify key processes and feedbacks controlling aerosol cloud interactions by combining advanced measurements of cloud and aerosol properties with state-of-the-art numerical modelling (http://cordis.europa.eu/projects/rcn/110886_en.html).

The following presentations were given and discussed:

- *Comparison of the aerosol size distribution retrieval from a sun photometer with in situ measurements at high altitude: taking into account the effect of water uptake* (Aurélien Chauvigné et al., OPGC – Université Blaise Pascal)
- *35 Years of Stratospheric Aerosol Measurements at Garmisch-Partenkirchen* (Thomas Trickl et al., KTI-IMK-IFU)
- *Lidar and sunphotometry synergy to define an aerosol model for space applications* (Alexandra Tsekeri et al., NOA; Ulla Wandinger, TROPOS, Elina Giannakaki, FMI)
- *LIVAS global aerosol climatology and future improvements utilizing EARLINET* (Eleni Marinou et al. NOA; Ulla Wandinger, TROPOS; Elina Giannakaki, FMI; Rodanthe Mamouri, CUT; Panos Kokkalis et al., NTUA; Dimitris Balis et al., AUTH; Lucia Mona et al, CNR-IMAA)
- *Lidar measurements of the troposphere aerosols on the territory of Georgia* (Maya Todua and Goderdzi Didebulidze, Abastumani Astrophysical Observatory - Iliia State University)
- *Comparison of satellite estimates of ash AOD and height from Eyjafjallajökull with EARLINET data* (Nikos Siomos et al., AUTH; KNMI; OXF; ULB; RAL; INVG)
- *EARLINET long-term climatology* (Lucia Mona et al., CNR-IMAA)
- *CALIPSO Level 2 and level3 data vs EARLINET profiles* (Lucia Mona et al., CNR-IMAA)
- *ACTRIS Summer 2012 campaign* (Lucia Mona et al., CNR-IMAA)
- *Lidar/photometer observations at CUT, Limassol with focus on Turkish fine soil dust, Arabian dust, and Saharan dust* (Argyros Nisantzi et al., CUT; Albert Ansmann, TROPOS; presented by Albert Ansmann, TROPOS)
- *Application of the regularized inversion to the retrieval of spherical aerosols' microphysics* (Stefanos Samaras et al.; University of Potsdam; Lev Labzovskii et

al., INOE; Ioannis Biniotoglou, CNR-IMAA; Alexandros Papayannis, NTUA; presented by Doina Nicolae, INOE)

- *Application of active and passive remote sensing to study aerosol hygroscopic growth* (María José Granados-Muñoz et al., UGR-CEAMA)

- *iSPEX: First Results of Aerosols Measured by Smartphones in The Netherlands* (Arnoud Apituley et al., KNMI)

Task 2.2 Quality assurance

Volker Freudenthaler reports on the performed internal checks during the last year and reminds the data that must be sent to him and their format for the next round of internal instrument checkup, with emphasis on depolarization calibration, as particle linear depolarization profiles is the most recent quality-assured parameter introduced in the EARLINET standard set of aerosol parameter. The deadline for submitting results is 31 January 2014. Status of direct intercomparison campaigns is also commented. Details are found in the presentation

- *Report on hardware quality assurance* (Volker Freudenthaler, LMU)

The proposal for lidar quality levels dependent on instrument capabilities and quality-assurance procedures implemented, already presented in the ACTRIS 1st joint WP2-WP20 workshop is reminded:

- *Proposal for lidar quality levels* (Volker Freudenthaler, LMU)

This document is also available as a WP2 document in the ACTRIS intranet at <http://www.actris.net/LinkClick.aspx?fileticket=smf4d1LhGQo%3d&tabid=11052&mid=17180&language=en-GB>.

Aldo Amodeo presents the results of the intercomparison campaigns of the Potenza's MUSA reference system with the systems in Naples and Potenza; the details can be found in the presentation

- *Lidar intercomparison measurement campaigns for Napoli and Lecce systems NALII3 and LELII3* (Aldo Amodeo et al., CNR-IMAA; Nicola Spinelli et al., CNISM; Maria Rita Perrone et al., University of Salento)

David Daou presents the new ADAM lidar system operating since April 2013 in Ispra:

- *ADAM (Atmospheric Detection of Aerosols & Molecules)* (David Daou et al., JRC)

Task 2.3 Improvement of lidar techniques and data analysis for aerosol characterization

An overview of progress in the task is given by Giuseppe d'Amico. Details can be found in the presentation

- *Improvement of lidar techniques and data analysis for aerosol characterization* (Giuseppe d'Amico et al, CNR-IMAA; TROPOS; LMU; CNISM)

Milestone MS12 (Assessment of all calculus subsystems inside and outside EARLINET) has resulted in a document available as a WP2 document in the ACTRIS intranet at <http://www.actris.net/LinkClick.aspx?fileticket=iE55O7ifX%2bc%3d&tabid=11229&mid=17544&language=en-GB>.

Progress on the EARLINET Lidar Data Analyzer (ELDA) is reported by Holger Baars. Details can be found in the presentation

- *Current state of ELDA and comparison with EARLINET database profiles* (Holger Baars et al., TROPOS; CNR-IMAA; DWD; University of Évora)

The implementation of particle linear depolarization ratio calibration and retrieval in the SCC are discussed around the presentation

- *Implementation of linear depolarization ratio calculation and calibration in the SCC* (Giuseppe d'Amico, CNR-IMAA)

In the discussion a warning is issued about the 3-signals method being implemented, as it may need strongly depolarizing layers for proper operation.

Concerning the SCC state, there are currently two on-line versions, one operational and another one for developers. Some bugs exist in the implementation of the Klett algorithm in the current operational version that will be fixed in the next operational public version to be on-line by the end of January 2014. Nevertheless users are encouraged to submit data immediately, since these will be automatically reprocessed by the new version when it is ready.

Volker Freudenthaler proposes that the cases in which an overlap-function correction is used be indicated, so that an uncertainty assessment can be carried out on them.

The experience on the use of the SCC through the web-graphic interface developed under task 2.3.2 is discussed, aided by an on-line demonstration. A call is made to use the EARLINET forum to discuss and clarify technical issues, in particular in what concerns the SCC (<http://earlinet.impworks.gr/forum/21>).

Giuseppe d'Amico brings forth the SCC licence question, whose details can be consulted in the presentation

- *SCC licence* (Giuseppe d'Amico, CNR-IMAA)

The most suitable option seems to be the European Union Public Licence, for which official information can be found at <https://joinup.ec.europa.eu/software/page/eupl> (see also above presentation for details).

The following contributions are also presented:

- *From DEMO to CAPRI to GAAIA: Inversion of data from 3+2 lidar and from combined lidar/sunphotometer observations* (Detlef Müller, University of Hertfordshire)
- *E-PROFILE: EUMETNET programme for European-scale wind and LIDAR network* (Giovanni Martucci and Alexander Haefele, MeteoSwiss)
- *Implementation of PollyXT into the Cloudnet scheme for an advanced target classification* (Holger Baars et al., TROPOS, with contributions from EARLINET and CLOUDNET communities)
- *The latest software and hardware developments at SIRTÀ-IPSL in Palaiseau: STRAT+ and IPRAL* (Christophe Pietras et al., SIRTÀ-CNRS-IPSL-LMD-Ecole Polytechnique)
- *Improving the automatic determination of the planetary boundary layer height using lidar depolarization* (Juan Antonio Bravo-Aranda et al.; UGR-CEAMA)

WP20 JRA1: LIDAR AND SUNPHOTOMETER – IMPROVED INSTRUMENTS, INTEGRATED OBSERVATIONS AND COMBINED ALGORITHMS

WP20 leader, Ulla Wandinger, goes through the WP20 workshop agenda and presents the activity report:

- *Activity report and overview of WP20 status* (Ulla Wandinger, TROPOS)

Task 20.1. Improved daytime capabilities of lidar instruments

Fabio Madonna reports on progress on the study of lidar configurations allowing retrieve the aerosol extinction coefficient from measurements of the N_2+O_2 pure rotational Raman spectrum. Details can be found in the presentation

- *Comparison of the different configurations for the retrieving of the aerosol extinction coefficient using rotational Raman lidar* (Fabio Madonna et al., CNR-IMAA; Ulla Wandinger, TROPOS; Ilya Serikov)

A contributed presentation is given by Giovanni Martucci on the RALMO system operated in Payerne, which is similar to the one currently operated in Hamburg:

- *Operational aerosol detection by the Raman LIDAR for Meteorological Observation (RALMO) and the CHM15K ceilometer at Payerne, Switzerland* (Giovanni Martucci and Alexander Haeefe, MeteoSwiss)

Task 20.2. Integrated observation strategies

Ulla Wandinger reminds the stations that have used LIRIC and those that have contributed to the database (60 measurements from 6 stations; more than 30 cases evaluated with LIRIC; 5 cases discussed in detail in peer-reviewed publications; almost 40 cases with Saharan dust, see the [WP20 activity report presentation](#) for details). Groups other than those officially involved in WP20 are also invited to contribute to the database (found at http://lidar.space.noa.gr/lidar_db/; contact Vassili Amiridis to obtain an account allowing upload). Gelsomina Pappalardo puts forward that a connection should be made to the ACTRIS Data Centre when work is more advanced.

The following presentations report progress in this task as well as in task 20.3 (Integrated retrieval schemes for aerosol microphysical properties):

- *Temporal evolution of LIRIC retrieved microphysical properties at Granada during the Summer 2012 EARLINET potential operational exercise* (María José Granados-Muñoz et al.; UGR-CEAMA)

Although this presentation reports comparisons with the operational BSC-Dream8b model, BSC has already been contacted to have access to comparison against more advanced models. In addition, a sensitivity study on the adjustable parameters of LIRIC is also ongoing.

- *BSC-DREAM model vs. LIRIC: A statistic comparison* (Juan Luis Guerrero-Rascado et al., UGR-CEAMA; Marta Melgao, Évora Geophysics Center, University of Évora; Sara Basart et al., BSC; Ulla Wandinger, TROPOS; Anatoli Chaikovskiy, IPNASB)

This presentation and the next one are in the framework of the WMO's SDS-WAS system.

- *Use of LIRIC and dust transport models to study dust over Europe* (Ioannis Biniotoglou et al., CNR-IMAA; presented by Gelsomina Pappalardo)
- *Saharan dust outbreak over the Balkans as observed by synergy of active and passive sensors: A case study of long-range transport of aerosols in September* (Alexandros Papayannis et al., NTUA; Doina Nicolae et al., INOE; M. M. Cazacu, ALI.Cuza University of Iasi; I. Vetres, Politechnica University of Timisoara; Ioannis Biniotoglou, CNR-IMAA; L. Ilic, University of Belgrade; presented by Doina Nicolae)
- *LIRIC estimates of aerosol concentration during selected dust cases over Thessaloniki* (Nikos Siomos et al., AUTH)
- *Towards LIRIC and GARRLiC evaluation using in-situ airborne measurements* (Alexandra Tsekeri et al., NOA)

It is suggested that a work document using the ideas about mutual validation of lidar and in-situ measurements outlined in this presentation be prepared. Likewise a call is made to use every opportunity of instrumented planes (e.g. DLR Falcon, EUFAR planes...) overflying ACTRIS WP2 lidar stations to perform comparisons between lidar and in-situ measurements. Doina Nicolae reminds that the INOE lidars will be moved to Jungfraujoch for comparisons with in-situ instruments. The planned intercomparison between POLIS and the Clermont-Ferrand EARLINET lidars (see the report on hardware quality assurance in the part of WP2) could also be used to compare with in-situ instruments at Clermont-Ferrand.

- *Study of aerosol layers produced by West Coast forest fires in summer 2013 in USA with multiwavelength lidar* (Igor Veselovskii, Physics Instrumentation Center, Moscow; Dave Whiteman, NASA GSFC)

With a $3\beta + 1\alpha$ system it might still be possible to retrieve volume concentration, although the effective radius information would be lost. The presence of particles with a shell, as it often occurs in smoke, could be an issue for the retrieval of microphysical properties. A call is made to compare the results of the presented algorithm with LIRIC. For this, groups should contact Igor Veselovskii.

Task 20.3. Integrated retrieval schemes for aerosol microphysical properties

Anatoli Chaikovsky reports on progress on the LIRIC software package for processing combined lidar and sunphotometer data to retrieve range-resolved volume concentrations of aerosol fine and coarse modes. The software allows include now, in addition to depolarization, information from lidar Raman channels taking advantage of developments on rotational Raman lidar and on lidar calibrated depolarization profiles. Details can be found in the presentation

- *Progress in developing of software package LIRIC for processing combined lidar and sun photometer data* (Anatoli Chaikovsky et al., IPNASB; LOA - Université de Lille)

Oleg Dubovik reports on progress on the GARRLiC software package, which combines basic sunphotometer data (as opposed to LIRIC's AERONET inversion products) with lidar data to retrieve range-resolved volume concentrations of aerosol fine and coarse modes. Details can be found in the presentation

- Progress of development of GARRLiC algorithm for combined lidar and sun-photometer data inversion (Oleg Dubovik et al., LOA – Université de Lille; A. Lopatin et al., IPNASB)

Including Raman and polarimetric lidar data is also planned. The software package is being implemented in the GRASP (Generalized Retrieval of Aerosol and Surface Properties) algorithm, web-distributed as open source code (see movie following [this link](#)).

Discussion

In the discussion of the work package progress, the need for evaluation of the algorithms, comparison analyses, enhanced aerosol models beyond the spheric / spheroid ones, and an operation guide for LIRIC are brought forth. The validity of current aerosol models is also discussed, as they may not cover the complete observation space.

AGREEMENTS AND ACTIONS

No.	Agreement	Task	Work packages involved
1	31 st of December 2013 deadline for submission of retrievals of measurements carried out during ACTRIS for a station to be considered active.	2.1	WP2
2	Implementation of the EARLINET Reporting System with no reporting periods	2.3.2	WP2

Table 1. Agreements table

No.	Action	Task	Work packages involved	Deadline
1	Perform 3 rd year mandatory quality check-up tests and forward results to Volker Freudenthaler (stations not having done so yet)	2.2.2	WP2	31 January 2014
2	EARLINET Reporting System	2.3.2	WP2	31 March 2014
3	Improved operational version of SCC	2.3.3	WP2	31 January 2014
4	Work document on intercomparison of lidar and in-situ measurements based on ideas outlined in presentation “ <i>Towards LIRIC and GARRLiC evaluation using in-situ airborne measurements</i> ” (Alexandra Tsekeri et al. NOA)	20.2 – 20.3	WP20	-

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