EUNADICS-AV DELIVERABLE (D -N°: D12)
Inventory of ground based data suitable for satellite validation

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Reporting period:

Release date for review: *17/11/2017*   Final date of issue: *12/12/2017*

Revision table			
Version	**Date**	**Name**	**Comments**
0.1	17 Nov. 2017	A. Apituley	Based on material related to milestone M11
0.2	24 Nov. 2017	A. Apituley	Updated descriptions
0.3	1 Dec. 2017	A. Apituley	Integrated table into document
0.4	6 Dec. 2017	A. Apituley	Reference added

Abstract

This deliverable consists of two documents. The first part is this report, giving a summary overview based on material prepared for the milestone M11. The second part of this deliverable is a detailed spreadsheet on specific products delivered by the networks which are considered to be potentially relevant for the scope of EUNADICS-AV. The spreadsheet provides information on their performance, spatial coverage, time delivery and accessibility, and link to documentation. In addition to the version prepared for M11, the column indicating useability for (satellite) validation, has been completed.

EUNADICS-AV - Contract number: 723986

Executive Summary

This deliverable consists of two documents. The first part is this report, giving a summary overview based on material prepared for the milestone M11. The second part of this deliverable is a detailed spreadsheet on specific products delivered by the networks which are considered to be potentially relevant for the scope of EUNADICS-AV. The spreadsheet provides information on their performance, spatial coverage, time delivery and accessibility, and link to documentation. In addition to the version prepared for M11, the column indicating usability for (satellite) validation, has been completed.

The aim of this deliverable is to identify the different ground-based remote sensing networks and data products available suitable for satellite validation. It builds on the material prepared for the Milestone M11, based on which this deliverable identifies quantitative data products for cross calibration and validation.

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List of figures

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List of tables

Accompanying spreadsheet document (see Appendix 1).

Please note that the attached spreadsheet is the result of an exhaustive analysis and gathering of information which was accomplished within milestone M11. Due to the limitation of the EC participants's portal to upload only one document as deliverable the respective table here in this deliverable is of only poor quality and hardly readable. For any review or further interest we will of course be happy to provide the original spreadsheet.

1. Objective

The aim of this deliverable is to identify the ground-based remote sensing networks and data products available suitable for satellite validation.

2. Results

Based on the material collected for M11 this deliverable identifies quantitative data products for cross calibration and validation.

The material is described in the technical note M11 "Identification of common data products from different ground-based remote sensing networks". The table accompanying M11 has been extended with the completion of the column indicating usability for (satellite) validation.

Note that the data sources indicated as useable for (satellite) validation in column AH in the table are of mixed nature in the sense that some variables are suitable for direct validation of satellite products, such as aerosol optical thickness (AOT). On the other hand, other variables can be used in a more indirect way, e.g. to provide additional background information that can be used to validate the satellite or models. Wind related parameters are an example.

The data from the ACTRIS/EARLINET network (currently 30 stations distributed over Europe) are included, since these provide quantitative vertical profiles optical properties of aerosols. From this type of data, aerosol type, shape information and microphysical properties of the aerosols can also be derived [Mueller, 2016]. This information is invaluable for satellite validation. However, not all stations are able to provide data 24/7 and only very few stations are capable of providing data in near real time. In this category are also a number of stations outside Europe affiliated with global networks such as NDACC/Ny-Alesund.

MPL Net data are included since these provide vertical profiles optical properties of aerosols and shape information. The data is not as detailed as the EARLINET data, but MPL stations operate 24/7 in various locations worldwide, which makes the dataset very valuable for satellite validation. In order for quantitative optical interpretation of the vertical profiles, a collocated sunphotometer is needed.

Data from EUMETNET E-Profile is included since this provides a high potential for satellite validation, since the number of stations is potentially very large and the density of the stations is high – estimated to 200 stations over Europe by end of 2017. The data is provided by ceilometer type instruments, or low power lidars. The current generation of ceilometers is capable of aerosol layer detection and operational 24/7. However, the optical data is not

quantitative and collocation with sunphotometers is available only in few places. An important asset for validation of this dataset is the NRT availability. It should be noted that the infrastructure needed to make the data available is in development at the moment. A pilot is ongoing for a subset of stations.

AERONET and SKYNET stations are very valuable for satellite validation, since these automated instruments provide automatic and in NRT data of the aerosol optical thickness (AOT) which can often be directly compared to a satellite product, even if the aerosol related qualtity derived from the satellite is slightly different. The timing, location and intensity of the observed events should often correlate well.

Doppler lidar instruments provide wind profiles and boundary layer heights. These instruments are included in this list from ACTRIS/Cloudnet and various other sites. These data are important for understanding dispersion and transport of e.g. aerosols, ash, smoke and gases, and can be considered as auxiliary information for validation purposes.

Gas columns (integrated concentration over a full atmospheric column) are provided by the ground based sprectrographs (Brewer) organised in Eubrewnet. These will be important for satellite validation of trace gas concentrations, in particular gases associated with fires and volcanic eruptions, e.g. SO2. Satellites also primarily retrieve the total column.

In the table, similar instrumentation as described above are included for near-source information, in particular volcanically active areas in Europe: Iceland and close to the Etna. These instruments will be the most direct source of information in case of eruptions, close to the source. This is important for satellite validation, as well as model input and validation.

3. Perspectives

It is expected that this table will be updated if new insights arise during the course of the project.

References

Müller, D., Böckmann, C., Kolgotin, A., Schneidenbach, L., Chemyakin, E., Rosemann, J., Znak, P., and Romanov, A.: Microphysical particle properties derived from inversion algorithms developed in the framework of EARLINET, Atmos. Meas. Tech., 9, 5007-5035, https://doi.org/10.5194/amt-9-5007-2016, 2016.

Appendix 1