LALINET STATUS - STATION EXPANSION AND LIDAR RATIO SYSTEMATIC MEASUREMENTS

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ABSTRACT

LALINET is expanding regionally to guarantee spatial coverage over South and Central Americas. One of the network goals is to obtain a set of regional representative aerosol optical properties such as particle backscatter, extinction and lidar ratio. Given the North-South extension and influence of distinct airmass circulation patterns it is paramount to distinguish these optical parameters in order to gain better perfomance in radiation transfer models. A set of lidar ratio data is presented.

1 INTRODUCTION

Latin **A**merica **L**idar **N**etwork is a federative fully operative lidar for aerosol research in South and Central America. Its operational cycle concerns probing the atmosphere on regular basis to retrieve vertically and temporally resolved aerosol optical and microphysical properties(Luis Guerrero-Rascado et al., 2016). Most of the instruments based in the network were customized and produced configurations suitable for the aerosol observation task. The network was officially established in 2013 by recognition as being part of **GAW-GALION** programs under the supervision of World Meteorological Organization(Antuña-Marrero et al., 2016). The present goals of LALINET are:

1. Consolidate the measurement and data acquisition protocols

2. Establish a QA/QC routine among all stations

3. Improve and establish an unified data analysis routine common to all stations, e.g., Single Calculus Chain(D'Amico et al., 2015)

4. Create a scientifically signficant distributed database,e.g., lidar ratio, particle extinction, backscatter, angstrom exponents and particle depol. regional values

5. Guarantee the continuity of LALINET's biannual workshops by the intensification its role as a mechanism of transfer of knowledge, evaluation of joint actions conducted and agreemnts on how to continue under the new evolving situations. In 2018 second semester, the host site should be in Medellin, Colombia

Yet regarding the vast majority of stations share a collocated AERONET station the use of the GRASP approach is also envisaged(Torres et al., 2016) in order to obtain particle microphysical properties. Currently LALINET is seeking its expansion to better cover up a region roughly twice the size of EARLINET(Mona, L. et al., 2016) and therefore a region where more circulation patterns take place. A careful establishment of a regional distributed aerosol optical parameter database pose a challenge wich could be tackled with the network expansion. In this matter 2 stations were deployed as seen in table 1. One in Natal, Brazil, which should be focused on long-range aerosol transport from Saharan dust. The other in Punta Arenas in Chile, which is also part of SAVER.NET(Quel, Eduardo et al., 2016) which merges the efforts of LALINET and AD-NET(Nishizawa, Tomoaki et al., 2016).

1.1 LALINET Lidar Stations

Up to date there are 14 operative stations, see Table 1, distributed along the South american continent. The vast majority has collocated AERONET sunphotometer stations which helps in the lidar data retrieval of the lidar ratio by means of a closure between the two instruments and further on the implementation of data integration algorithms such as GRASP.

2 METHODOLOGY

LALINET measurement protocol follows an twice a week measurements on Mondays and Thursdays, even though pne station operates continuously (MAO) and with other schedules for other proposes. The products obtained are aerosol backscattering and extinction profiles, Lidar ratios (average and profiles when raman channels are operative). Since the vast majority of stations have collocated AERONET sunphotometers it is possible to obtain microphysical products. Some of the station also have polarization-sensitive channels which allows information on shape and identification of aerosols.

## 3 RESULTS

3.1 Calbuco Eruption

On April 22, 2015, the Calbuco volcano in Chile (41.33^oS, 72.62^oW) erupted after 43 years of inactivity, followed by an injection of pyroclastic material dispersed into the atmosphere on weeks after the event. At first a threat-alarm to aviation traffic and air quality over a large area was released, and the stations on the southernmost part of SA were triggered on daily monitoring basis in Argentina, Brazil, and Chile. Below we find a temporal serie of range corrected signal at 532 nm the quick look of the

*Table 1: LALINET Lidar Stations - The boxes in green are newly added stations in 2016. *Temuco station is the previous Concepcion Station.*

ST.	ID	LAT(S) LON(W)	Channels (nm)
Buenos Aires	AEP	34.56°S 58.42°W	1064, 532ᵖ & 355ᵖ
Buenos Aires	VMA	34.56°S 58.51°W	1064, 607, 532ᵖ, 387 & 355ᵖ
Neuquen	NQN	38.95°S 68.13°W	1064, 532ᵖ & 355ᵖ
Bariloche	BRC	41.15°S 71.16°W	1064, 607, 532, 387 & 355
Commodoro	CDR	45.79°S 67.46°W	1064, 532 & 355
Gallegos	RGL	51.61°S 69.31°W	1064, 532ᵖ & 355ᵖ
Punta Arenas	PAR*	53.13°S 70.88°W	1064, 607, 532ᵖ, 408, 387 & 355ᵖ
S. Paulo	SPU	23°13′ 46°28′	1064, 607, 532, 408, 387 & 355
S. Paulo	SPT	VAR	607, 532
Manaus	MAO	02.60°S 60.21°W	408, 387, 355
Natal	NAT	05.82°S 35.20°W	1064, 532ᵖ & 355ᵖ
Temuco*	TMU*	38.74°S 72.62°W	1064, 532ᵖ & 355ᵖ
Medellin	MED	06.26°N 75.58°W	532 & 355
La Paz	LPZ	16.54°S 68.07°W	1064, 532ᵖ & 355ᵖ

lidar measurements conducted at AEP station, in Buenos Aires, Argentina. The volcanic layer detected on April 24 shows a persistency along the entire day ranging between 5 and 7 km Later on there is a subsidency of this layer not mixing however with the urban mixing layer below the PBL around 1.5 - 2.0 km. This station, to the east of the Calbuco, measured a tropospheric aerosol layer at about 6 km a.g.l. which subsided along the day of measurement.
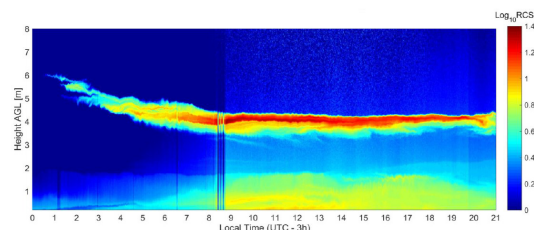
Figure 1: RCS quicklook obtained by AEP station, in Buenos Aires, Argentina, 2 days after the Calbuco Eruption allowing a consistent tracking of the pyroclastic material ejected by the volcano spreading over south of South America.

3.2 Lidar Ratio Evaluation

Aiming to create a consistent lidar ratio climatology regionally distributed we have evaluated the yearly mean values of some LALINET stations which included the results obtained from procotol measurements taken routineously. Some of the values are from intensive campaigns taken previously (BUE and PAR) using lidar/sunphotometer sinergy in clear sky conditions. All LR"s are at 532 nm except MAO (355 nm). The standard deviations at each value are about $10 - 15\%$.

4 CONCLUSIONS

LALINET is in expansion and working to reach good standards and practices for regional monitoring of aerosols and trace gases in South and Central America. The network now comprehends 14 operative stations. The network has been capable of monitoring events under

Figure 2: Lidar Ratios at some of LALINET's stations. These values should be updated and extended to other stations in order to have a regional representative values.

a routine and obtaining aerosol optical properties with regional representation and sparse events such as volcanic eruptions. Network capabilities are also under scrunity to comply with QA/QC protocols.

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