

luardo Landulfo, Alvaro Bastidas, Antonieta Silva, Boris Barja, Doina Nicolae, o Lopes, Henrique Barbosa, Juan C. Antuña-Marrero, Juan L. Guerrero-Rascado, oelzemann, Lucas Alados-Arboledas, Marcos Andrade, Pablo Ristori, Ricardo Forno

# **LALINET INTRODUCTION**



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## LALINET

### The First Latin American–Born Regional Atmospheric Observational Network

JUAN CARLOS ANTUÑA-MARRERO, EDUARDO LANDULFO, RENÉ ESTEVAN, BORIS BARJA, ALAN ROBOCK, ELIÁN WOLFRAM, PABLO RISTORI, BARCLAY CLEMESHA, FRANCESCO ZARATTI, RICARDO FORNO, ERRICO ARMANDILLO, ÁLVARO E. BASTIDAS, ÁNGEL M. DE FRUTOS BARAJA, DAVID N. WHITEMAN, EDUARDO QUEL, HENRIQUE M. J. BARBOSA, FABIO LOPES, ELENA MONTILLA-ROSERO, AND JUAN L. GUERRERO-RASCADO

A Latin American community of scientists engaged in atmospheric research using lidar has created a regional lidar network.



Journal of Atmospheric and Solar-Terrestrial Physics Volumes 138–139, February 2016, Pages 112-120

Latin American Lidar Network (LALINET) for aerosol research: Diagnosis on network instrumentation Juan Luis Guerrero-Rascado <sup>a, b, c</sup> A <sup>III</sup>, Eduardo Landulfo <sup>a</sup>, Juan Carlos Antuña <sup>d</sup>, Henrique de





## **LALINET'S OPERATIONAL DRIVES**

- Perform measurements and data acquisition following established protocols
- Maintain a QA/QC routine among all participating stations
- Apply an unified data analysis routine common to all stations, e.g., Single Calculus Chain
- Create a scientifically significant distributed database, e.g., lidar ratio, particle extinction, backscatter, angstrom exponents and particle depol. regional values



## **LALINET'S OPERATIONAL DRIVES**

- Guarantee the continuity of LALINET's biannual workshops by the intensification of its role as a mechanism of transfer of knowledge, evaluation of joint actions conducted and agreements on how to continue under the new evolving situations. In 2018 second semester, the host site should be in Medellin, Colombia
- Search inter-network exchange, ACTRIS 1 and ACTRIS
   2, SAVERNET





### LALINET.ORG

### Main

The Latin America Lidar Network (LALINET a.k.a ALINE) is a Latin American coordinated lidar network measuring aerosol backscatter coefficient and aerosol extinction profiles for climatological studies of the aerosol distribution over Latin America, as well as other atmospheric species such as ozone and water vapor. This federative lidar network aims to establish a consistent and statistically sound database for enhancement of the understanding of the aerosol distribution over the continent and its direct and indirect influence on climate.

#### Read more about our history

LALINET is a contributing network to the GAW Programme.

#### Barclay Clemesha (22 October 2018)



After finishing his first degree at the University of London in 1957, Barclay Clemesha left his native England to work as an International Geophysical Year research assistant at University College Ibadan, Nigeria. Although he intended to return to work in the UK at the end of his eighteen-month contract, he has not done so.

After three years at Ibadan, working on the physics of the lower ionosphere, he moved to the University of Ghana, Accra, where he worked on F-region irregularities for 3 years. Working with a Radar he detected field aligned irregularities at equatorial region which only years after would be known as Equatorial Plasma Bubbles.

In 1963 he moved to the University of the West Indies, Kingston, Jamaica, where together with

Geoffrey Kent and Ray Wright, he developed one of the first laser radars for atmospheric studies. He completed his Ph. D. at the University of the West Indies in 1968. While in Jamaica he participated of the First International Symposium of Equatorial Aeronomy in Peru and of the Second Symposium that took place at INPE, São José dos Campos, Brazil in 1966. There he knew Ida, at the time bilingual Secretary of the Symposium. They got married and after living in Jamaica to the end of 1968 they returned to Brazil and Dr. Clemesha started to work as Researcher at INPE and where he worked for the next 47 years.

His pioneering continued at INPE where he built the first Laser Radar (Lidar) of the Southern Hemisphere and measured Stratospheric Aerosols from 1969 to 1972. That time was also an era or great progress in Lasers Development and Dr. Clemesha built here at INPE an almost handmade Dye Laser used to measure Sodium, metal present in the upper atmosphere due to the incidence of meteors. His interests in Physics of The Upper Atmosphere did not limited to Lidars, but has extended also to experiments on board of sounding rockets, Airglow, and also to the measurements of wind and temperature in the upper atmosphere. Besides a productive scientist, professor and advisor we have lost also a great human being.

Dr. Paulo Prado Batista Senior Researcher Aeronomy Division INPE

#### X WLMLA

The Y WI MI A will be held in Meddelin Colombia in the third week of November More details on the event webnader

#### Network

#### History

Measurement Protocol

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- Galion/GAW

Newsletter and Reports

### Opportunities

Post-graduation	with	Lidar	
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Post-graduation in atmosphere

#### **Contributing Teams**

#### Argentina

Bolivia Brasil - Manaus Brasil - Sao Paulo Chile Colombia Cuba	Argentina								
Brasil - Manaus Brasil - Sao Paulo Chile Colombia Cuba	Bolivia		 10				-		
Brasil - Sao Paulo Chile Colombia Cuba	Brasil - Manaus				-	-	-	-	
Chile Colombia Cuba	Brasil - Sao Paulo								
Colombia Cuba	Chile	 							
Cuba	Colombia	 	 						
	Cuba							1	

#### Algorithm's Workshops

#### Concepcion 2014

Online meetings

#### Campaigns

Calbuco volcano 2015 Pilot Campaign 2012

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#### Publications

	LALINET STATIONS	ST.	ID	LAT(S) LON(W)	Channels (nm)
		Buenos Aires	<u>AEP</u>	34.56°S 58.42°W	1064, 532 <sup>p</sup> & 355 <sup>p</sup>
	Sign     Saint Lucia     Se       Nicaragua     Curaçao     Trinidad       Panama     Curaçao     Trinidad       Panama     Venezuela	Buenos Aires	VMA	34.56°S 58.51°W	1064, 607, 532 <sup>p</sup> , 387 & 355 <sup>p</sup>
	Colombia	Neuquen	NQN	38.95°S 68.13°W	1064, 532 <sup>p</sup> & 355 <sup>p</sup>
AREA GT 18 WIKM	Peru Peru	Barilo- che	BRC	41.15°S 71.16°W	1064, 607, 532, 387 & 355
-	Brazil	Commo doro	CDR	45.79°S 67.46°W	1064, 532 & 355
	Bolivia	Gal- legos	RGL	51.61°S 69.31°W	1064, 532 <sup>p</sup> & 355 <sup>p</sup>
	Paragua	Punta Arenas	PAR*	53.13°S 70.88°W	1064, 607, 532 <sup>p</sup> , 408, 387 & 355 <sup>p</sup>
	Chile Argentina	S. Paulo	SPU	23°13′ 46°28′	1064, 607, 532, 408, 387 & 355
		S. Paulo	SPT	VAR	607, 532
		Man- aus	MAO	02.60°S 60.21°W	408, 387, 355
-	Fabland Islands South Georgia and Bolith Sandwich Islands	Natal	NAT	05.82°S 35.20°W	1064, 532 <sup>p</sup> & 355 <sup>p</sup>
	LALINET	Temuco*	TMU*	38.74°S 72.62°W	1064, 532 <sup>p</sup> & 355 <sup>p</sup>
	STATIONS – 2017	Medellin	MED	06.26°N 75.58°W	532 & 355
	2 4 6 8 10 12	La Paz	LPZ	16.54°S 68.07°W	1064, 532 <sup>p</sup> & 355 <sup>p</sup>

# **SOUTH AMERICAN AIR CIRCULATION**





### 200 hPa height difference and 850 hPa winds during austral summer.

# **NETWORK SCIENTIFIC DRIVES**





# **VOLCANIC ASHES & PLUMES**

• 22<sup>nd</sup> – 23<sup>rd</sup> of April, 2015 – Calbuco volcano began eruption





- First eruption since 1972
- Ash cloud achieved above 15 km of altitude

# **VOLCANIC ASHES & PLUMES**



# **VOLCANIC ASHES & PLUMES**

GOES-5 / GOCART Simulation of the Calbuco Eruption – April 2015

### GEOS-5 Ash plotted ontop SO,



**Model Grid Resolution:** .5° x .5°

**Plume Top**: 18km Based on CALIPSO Obs.

**Plume Thickness**: down to 8km Based on satellite obs.

Ash Emission Rate: 5x10<sup>4</sup> Kg/s

**SO<sub>2</sub> Emission Total:** 300 Kt Based on satellite observations

**Timing:** Two Eruption Pulses (1) 04/22 21:38Z – 23:38Z (2) 04/23 04:38Z – 10:08Z Based on GOES IR and Reports

Simulation run with GOES-5 Replay Meteorology (not forecast)

## 28th International Laser Radar Conference - Bucharest



ALCANTARA INITIATIVE: INTERNATIONAL R&D STUDIES ANNOUNCEMENT OF OPPORTUNITY

## APEL

<u>A</u>ssessment of atmospheric optical <u>P</u>roperties during biomass burning <u>Events and Long-range transport of desert dust</u>









ABOUT

NETWORKS

DOCUMENTS

RESTRICTED AREA



### About

One of the main issues in research and satellite validation is the integration of data collected by the different networks. Among all observation techniques, lidar is especially useful to provide surface and vertical characterization of aerosol optical and physical properties.

The main scope of this project is to foster the exchange of expertise between the European (EARLINET) and South American (LALINET) lidar networks, and demonstrate the capability of joint research, setting the groundwork for GALION and the future Cal/Val of ESA's atmospheric satellite missions.



# APEL goal

Scientific cooperation



# Building a bridge between EARLINET and LALINET

Joint publications Joint studies Joint campaigns Harmonization of SoPs

Harmonization of data collection procedures

Harmonization of data evaluation procedures

Operational capacity



- Implementation of the EARLINET QA/QC program at LALINET stations
  - → Evaluation of the current observation capabilities in South America, by comparison with EARLINET standards and procedures
- Observation of aerosol characteristics at selected LALINET stations
  - $\rightarrow$  Apel campaign + Data analysis



	Lidar specifications	Measured parameters	Application
SPU	Emission: 1064, 532, 355nm Detection: 1064, 607, 532, 408, 387, 355nm Range: 1- 15 km	<ul> <li>backscatter coefficient at 355, 532, 1064nm</li> <li>extinction coefficient at 387 and 607nm</li> <li>derived optical parameters: lidar ratio, extinction derived Angstrom, color ratio</li> <li>water vapor mixing ratio</li> </ul>	<ul> <li>aerosol layering and dynamics</li> <li>typing based on backtrajectories and sun photometer</li> <li>advanced aerosol typing: NATALI (low res)</li> <li>long range transport studies (backtrajectories and sun-photometer)</li> </ul>
MAO	Emission: 355nm Detection: 408, 387, 355nm Range: 0.7 – 15 km	<ul> <li>backscatter coefficient at</li> <li>355nm</li> <li>extinction coefficient at</li> <li>387nm</li> <li>derived optical</li> <li>parameters: lidar ratio</li> <li>water vapor mixing ratio</li> </ul>	<ul> <li>aerosol layering and dynamics</li> <li>typing based on backtrajectories and sun photometer</li> </ul>
NAT	Emission: 1064, 532, 355nm Detection: 1064, 532p, 532c, 355 nm Range: 1 - 15 km	<ul> <li>backscatter coefficient at</li> <li>355, 532, 1064nm</li> <li>volume and particle</li> <li>linear depolarization ratio</li> <li>derived optical</li> <li>parameters: color ratio</li> </ul>	<ul> <li>aerosol layering and dynamics</li> <li>typing based on backtrajectories, depolarization parameters and sun</li> </ul>



### 532 nm particulate profiles - SPU LALINET station - 09/11/2017

### LONG RANGE TRANSPORT STUDIES





### AEROSOL TYPING







THE SEARCH FOR FUNDING



RUN CAMPAIGNS, HIRE PEOPLE (STUDENT AND TECHNICAL), MAINTAIN & UPGRADE, EXPAND NETWORK



## ACKNOWLEDGEMENTS







### The X Workshop Lidar Measurements in Latin America (WLMLA)



http://ciencias.medellin.unal.edu.co/eventos/wlmla/index.php/2-institucional/6-home