"The University Network of Atmospheric Observatories"

Centro de Ciencias de la Atmósfera
Universidad Nacional Autónoma de México

www.ruoa.unam.mx

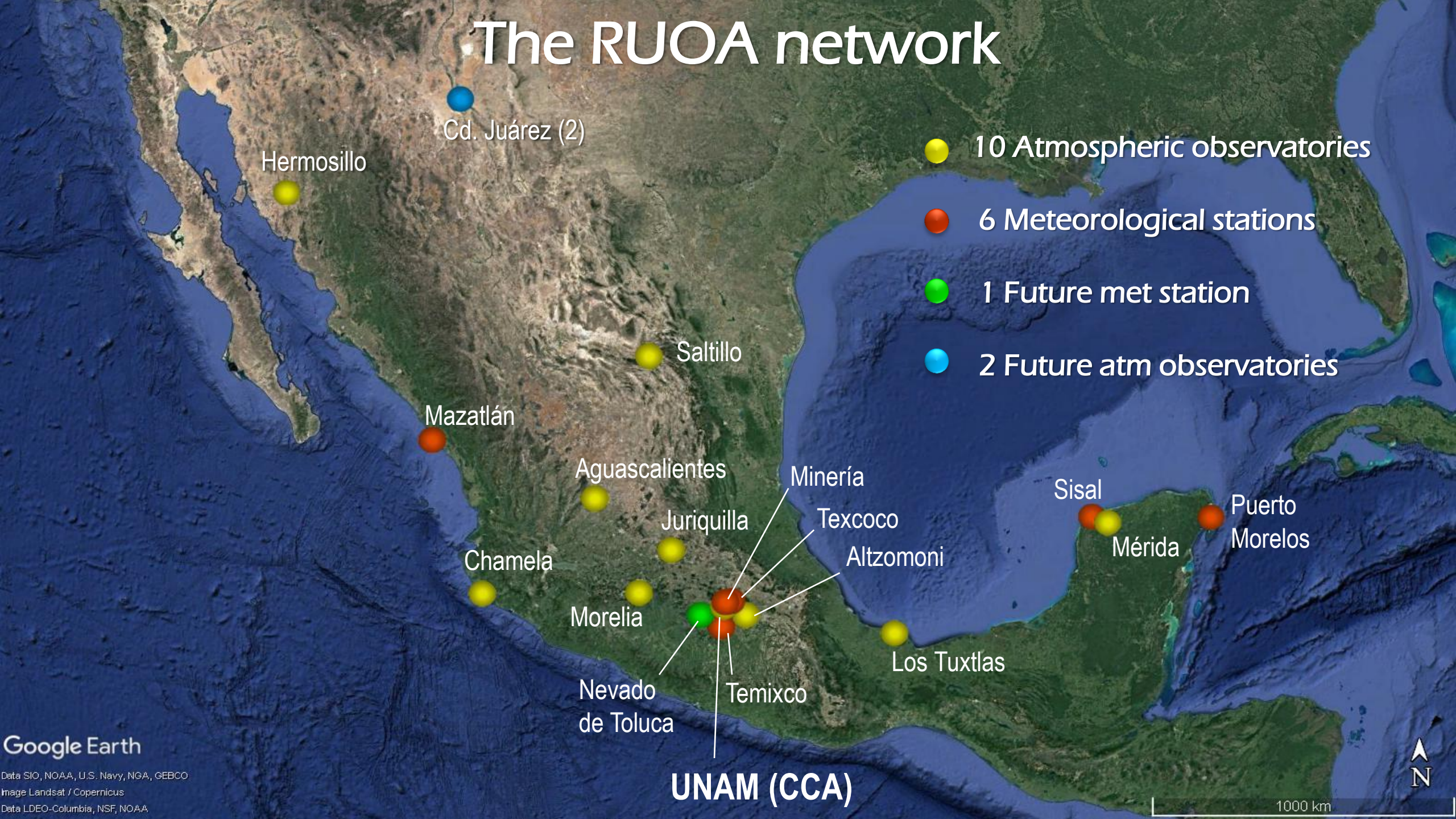
Objectives

- Promote the research and teaching of atmospheric sciences by establishing collaborations among different academic institutions throughout the country

- Provide open access of relevant and reliable data in support of studies on climate change, air pollution, water availability, and food security, among others

- Develop transparent and robust protocols for data collection, quality control and data dissemination to end users

The RUOA network



Research topics

	UNAM	ALTZ	JQRO	ERNO	AGSC	MEDA	MORE	SLLO	LTUX	CHAM	MINE	MAZT	TMIX	SISL	PTOM	TEXO	NTOL
Meteorology	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Air Quality	✓*	✓*	✓	✓	✓	✓	✓	✓									
GHGs (CO_2, CH_4)	✓	✓	✓	✓†		✓			✓	✓							
Disdrometers	✓	✓	✓						✓	✓							
Wet deposition	✓	✓	✓														
Black carbon	✓	✓	✓			✓											
Electric field	✓		✓	✓					✓†	✓†							
Persistent Organic Pollutants	✓	✓		✓													
Aerobiology	✓	✓	✓						✓	✓							
Chemical composition of Aerosols	✓		✓														
Wind profiling	✓																
Other sensors (PAR, UV, water conductivity, pH, DO)										●					●		●

* Secretaría del Medio Ambiente, Ciudad de México

Institutional collaboration

Universities

Universidad Autónoma de Aguascalientes

UNAM

Universidad Autónoma de Yucatán

Universidad Autónoma Agraria Antonio Narro

Universidad Autónoma de Cd Juárez

- **Centro de Ciencias de la Atmósfera** (UNAM, ALTZ, MINE, TEXO)
- Facultad de Ciencias – UNAM Campus Juriquilla (JQRO)
- Instituto de Geología – ERNO (ERNO)
- Instituto de Biología – (CHAM, LTUX)
- Instituto de Ciencias del Mar y Limnología (MAZT, PTOM)
- Instituto de Ingeniería (SISL)
- Facultad de Ingeniería (MINE)
- ENES-Morelia (MORE)
- Instituto de Energías Renovables (TMIX)
- FES-Iztacala (NTOL)

Government agencies

SEDEMA

CONANP
Comisión Nacional de Áreas Naturales Protegidas

CONAGUA
Comisión Nacional del Agua

Incorporation of older met stations:
Station '**Ernesto Jáuregui Ostos**' at downtown Mexico City

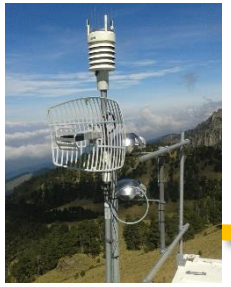
Palacio de Minería, former Escuela de Minería (School of Mines)

Meteorological station
'Ernesto Jáuregui Ostos', 1993 -

New highly instrumented stations:
Centro de Ciencias de la Atmósfera, in southern Mexico City

Data flow, QC and storage

Sensors



Data logging

Raw data

Temporal integrity:
- No repeated timestamps
- Missing periods replaced by 'null'

Processes server

L0 data

Data cleaning:
- Physically impossible or implausible values replaced by 'null'
- Data below detection limits are flagged

L1 data

Graphs

FTP repository

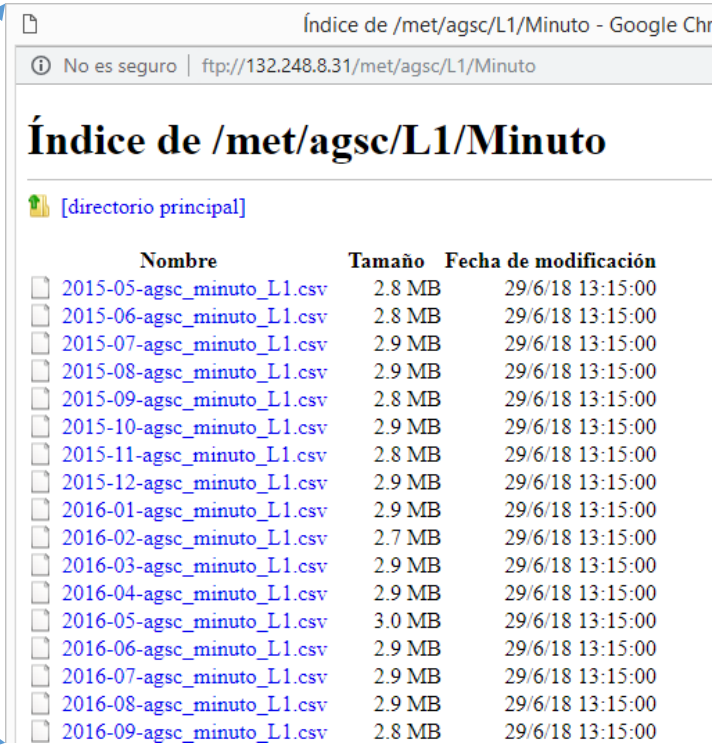
Database

Web server

Open data

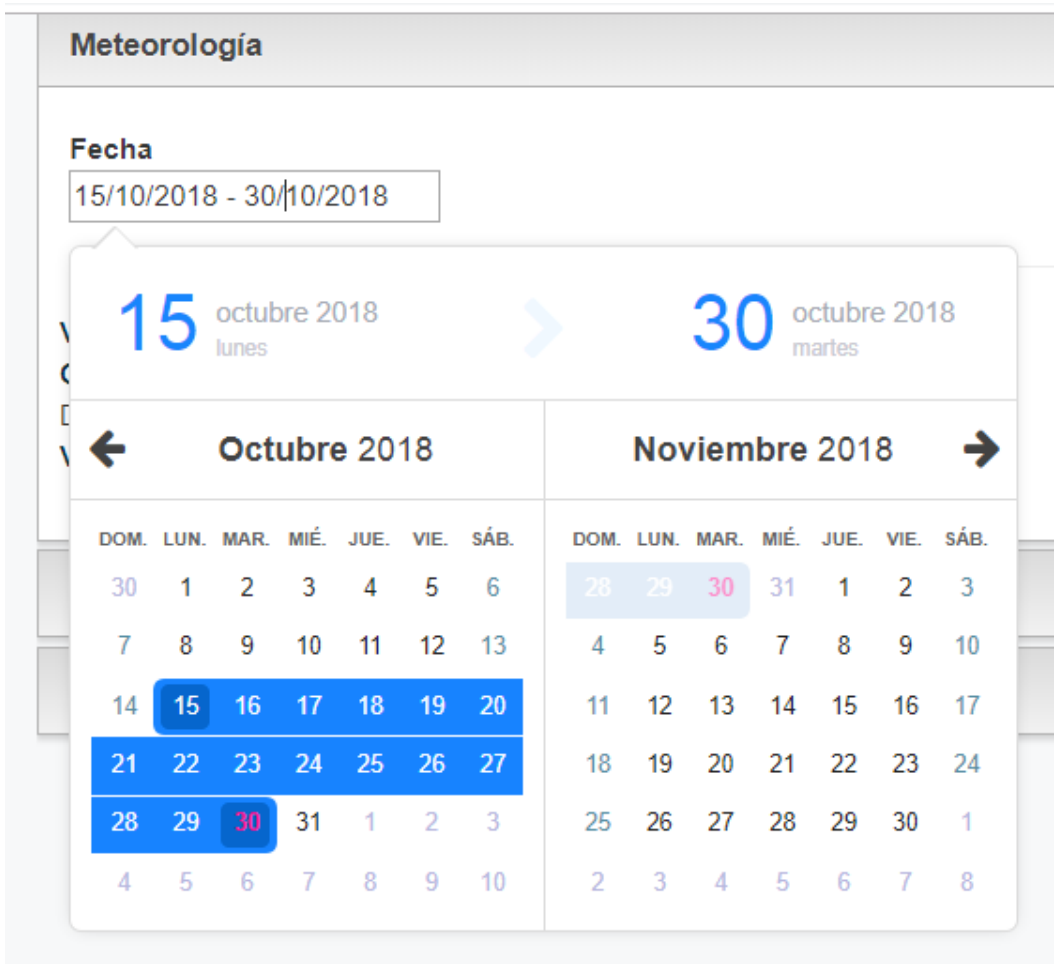
Data directly accessible from https://ruoa.unam.mx, two main routes:

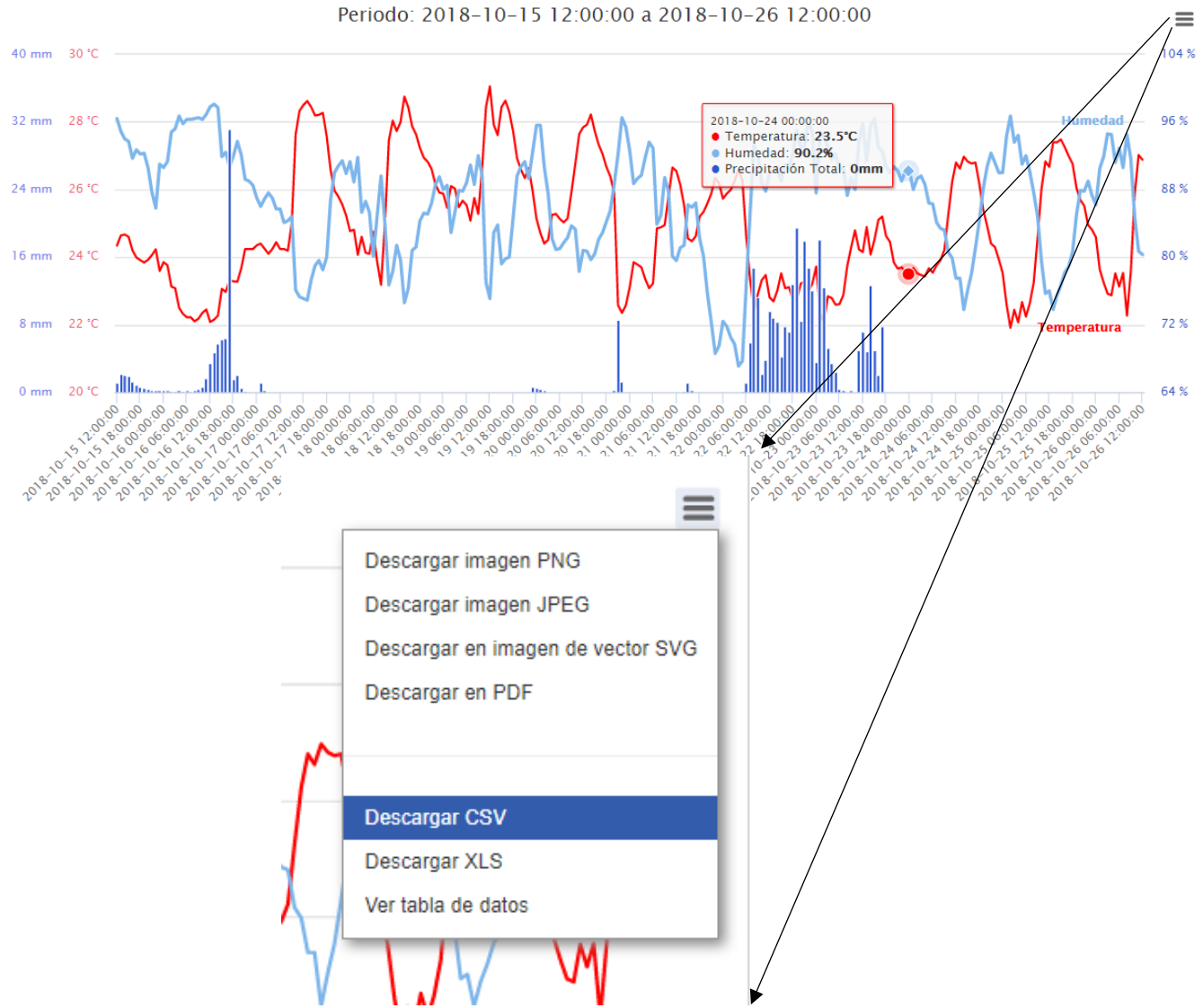
1. **Monthly repository, via FTP**



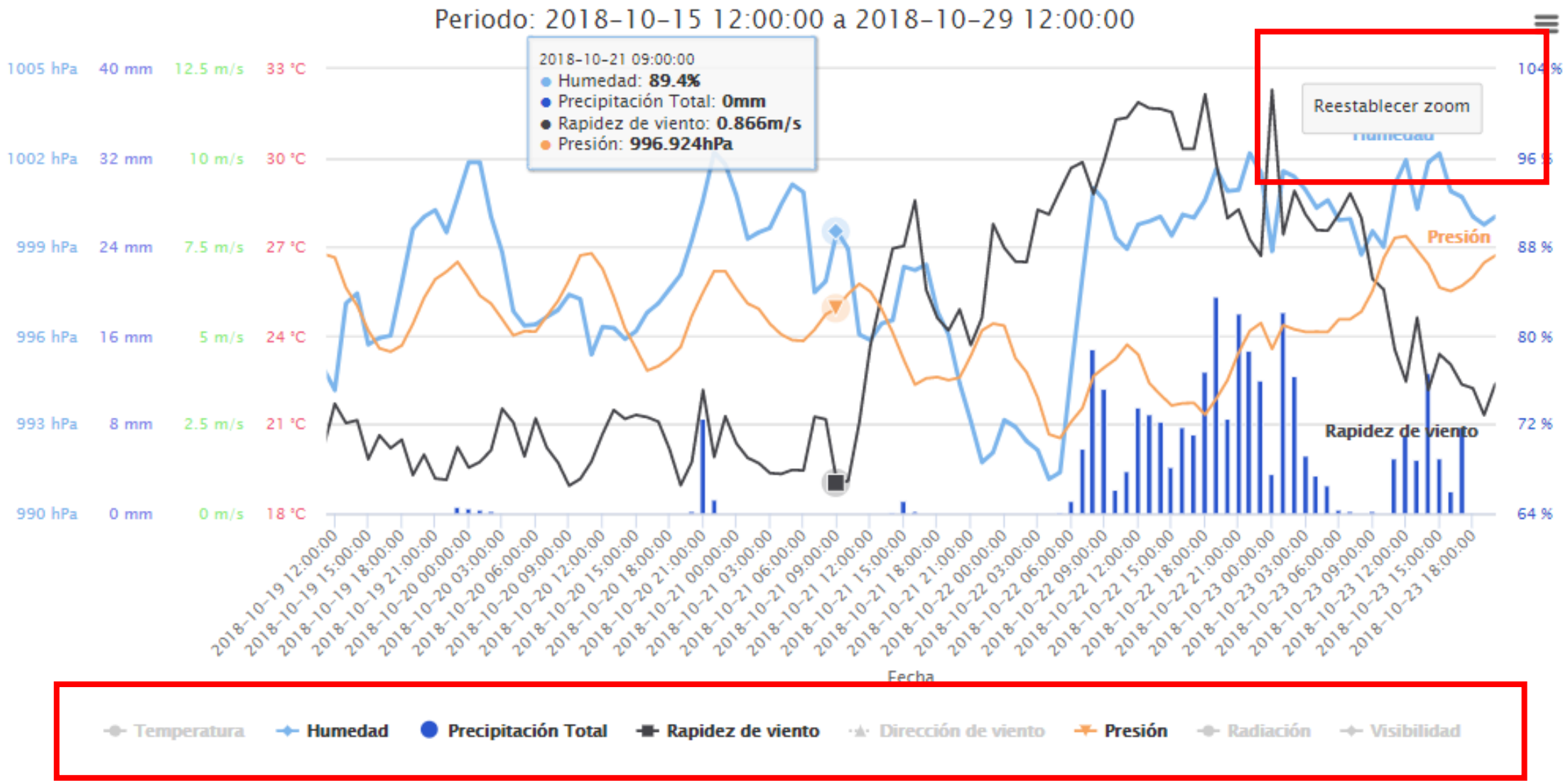
2. Web-based graphical template: user-selectable range of dates and data format

https://www.ruoa.unam.mx/index.php?page=estaciones&st=cham&id=5





2. Web-based graphical template: variable selection is available



Meteorology

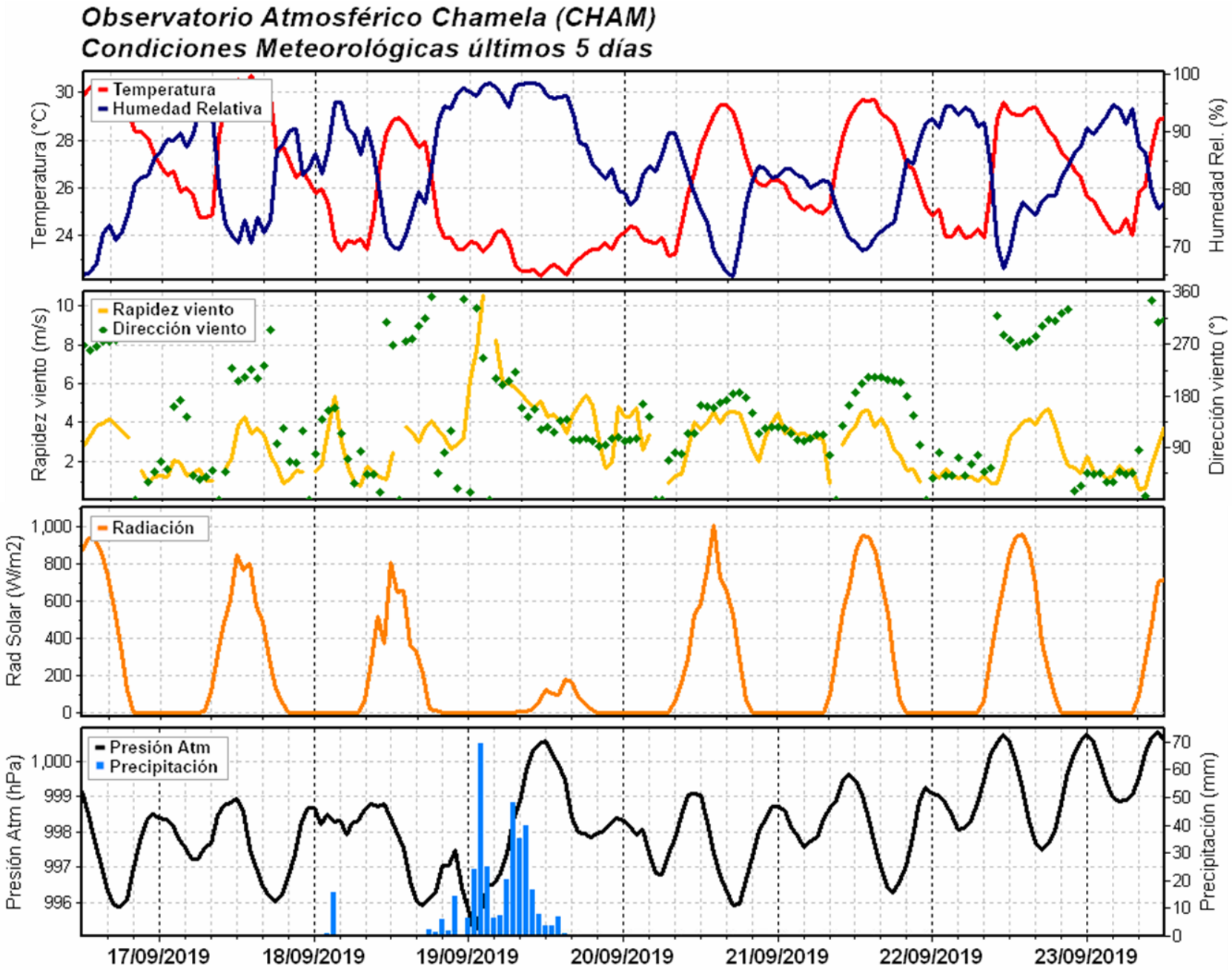
Extreme weather events

Hurricane 'Lorena'

18-19 September, 2019

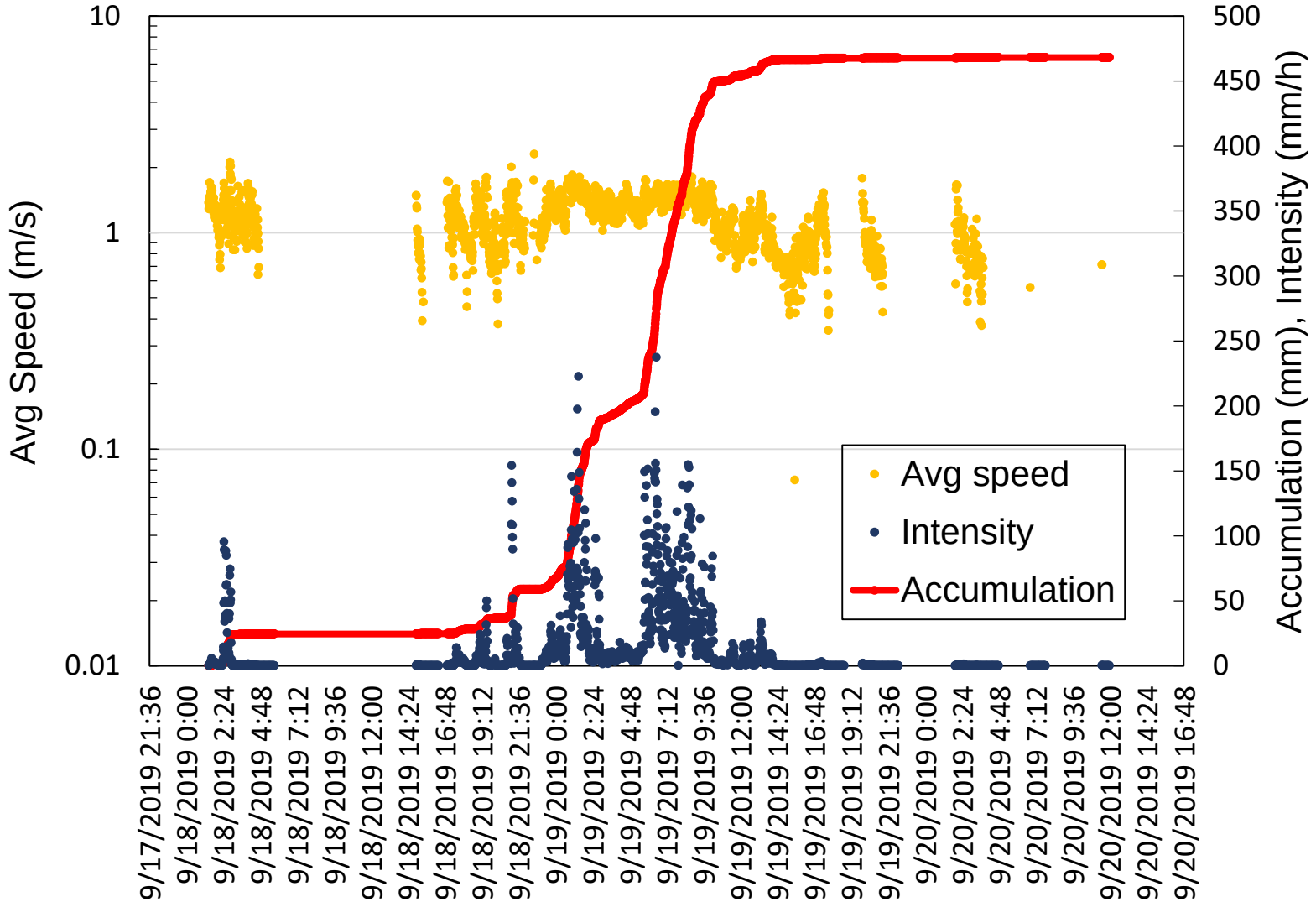
Chamela, Jalisco

- 366 mm total rainfall
- 349 mm in 25 h
- 70 mm from 01:00 to 02:00



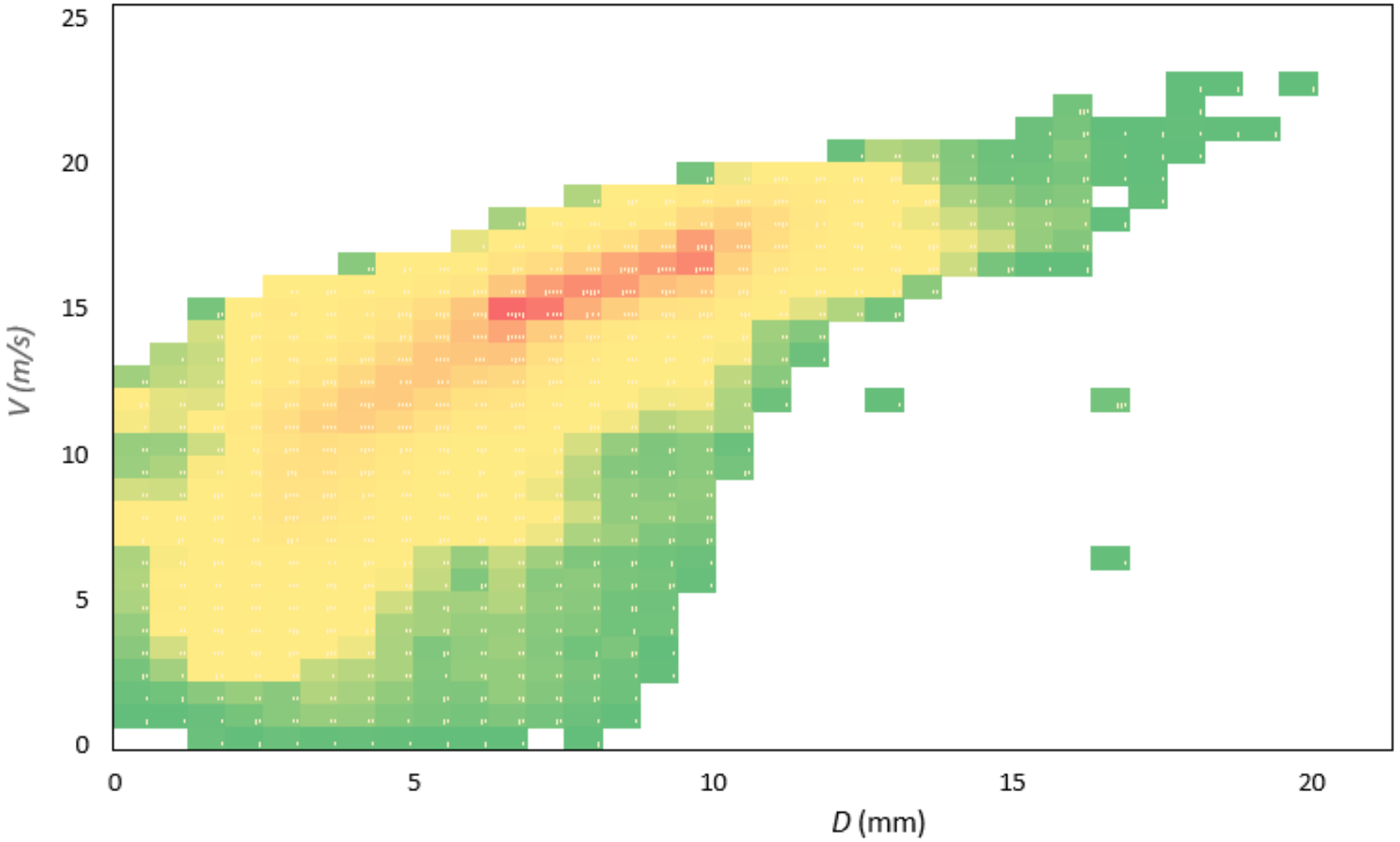
Hurricane Lorena; Chamela, Jalisco

CHAM
JQRO
UNAM
ALTZ
LTUX



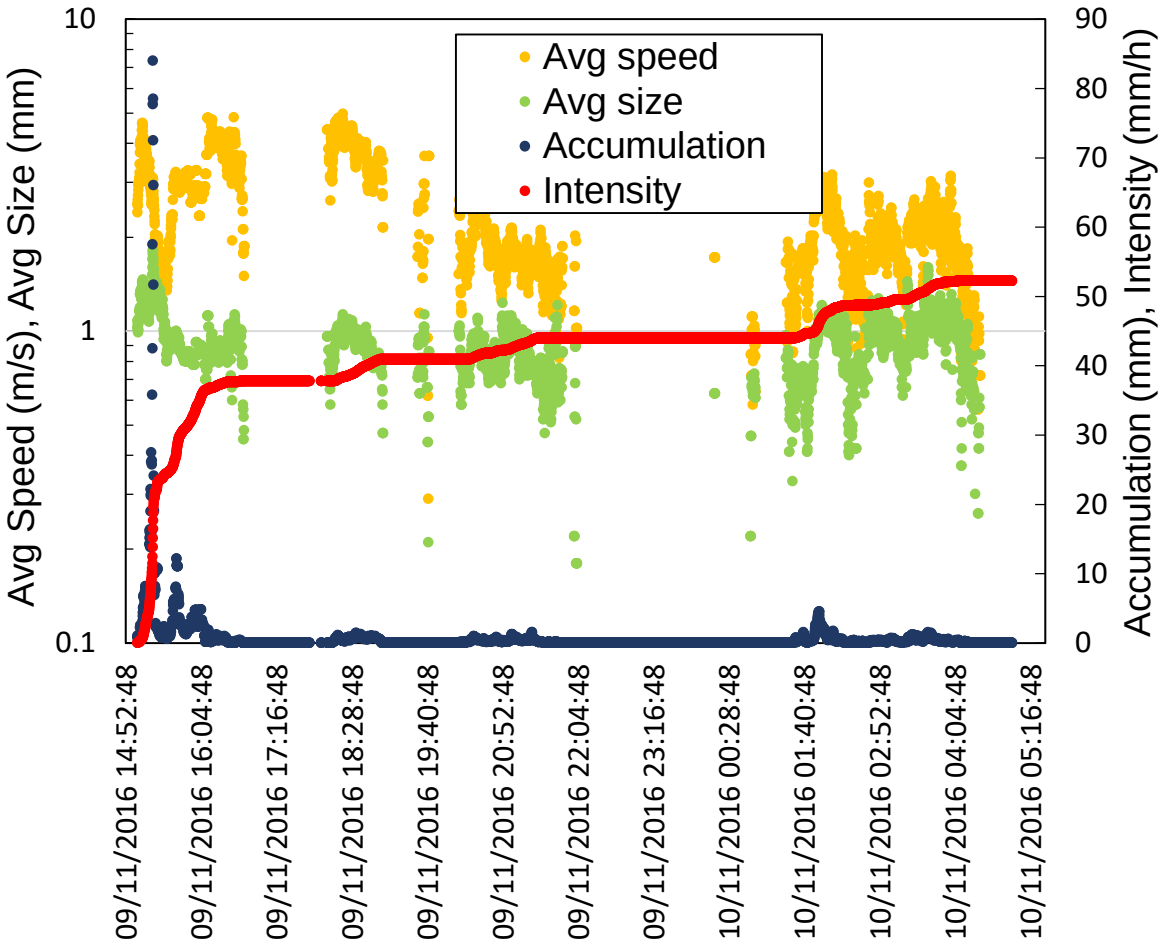
Hurricane Lorena; Chamela, Jalisco

CHAM
JQRO
UNAM
ALTZ
LTUX

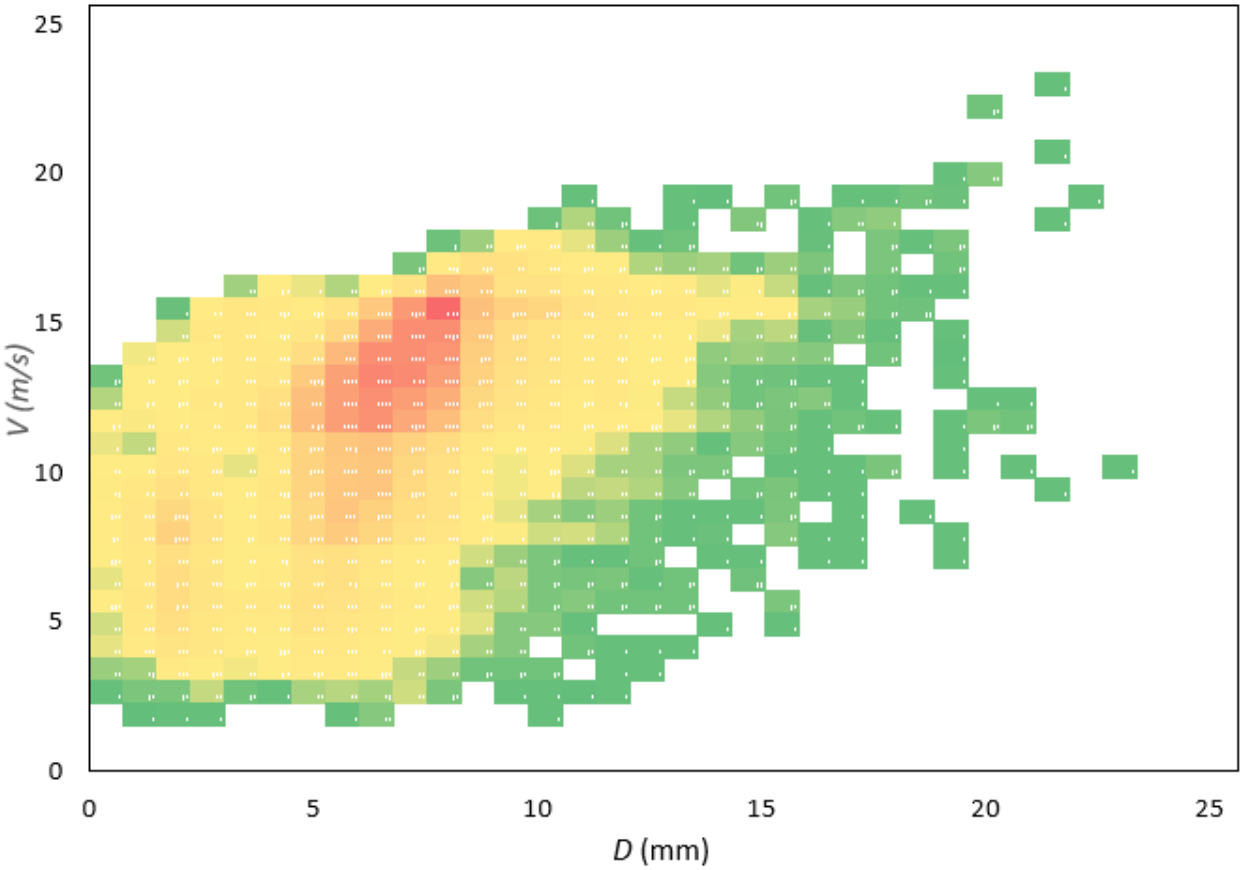


Drop size/velocity map for the event
(color indicates number of particles)

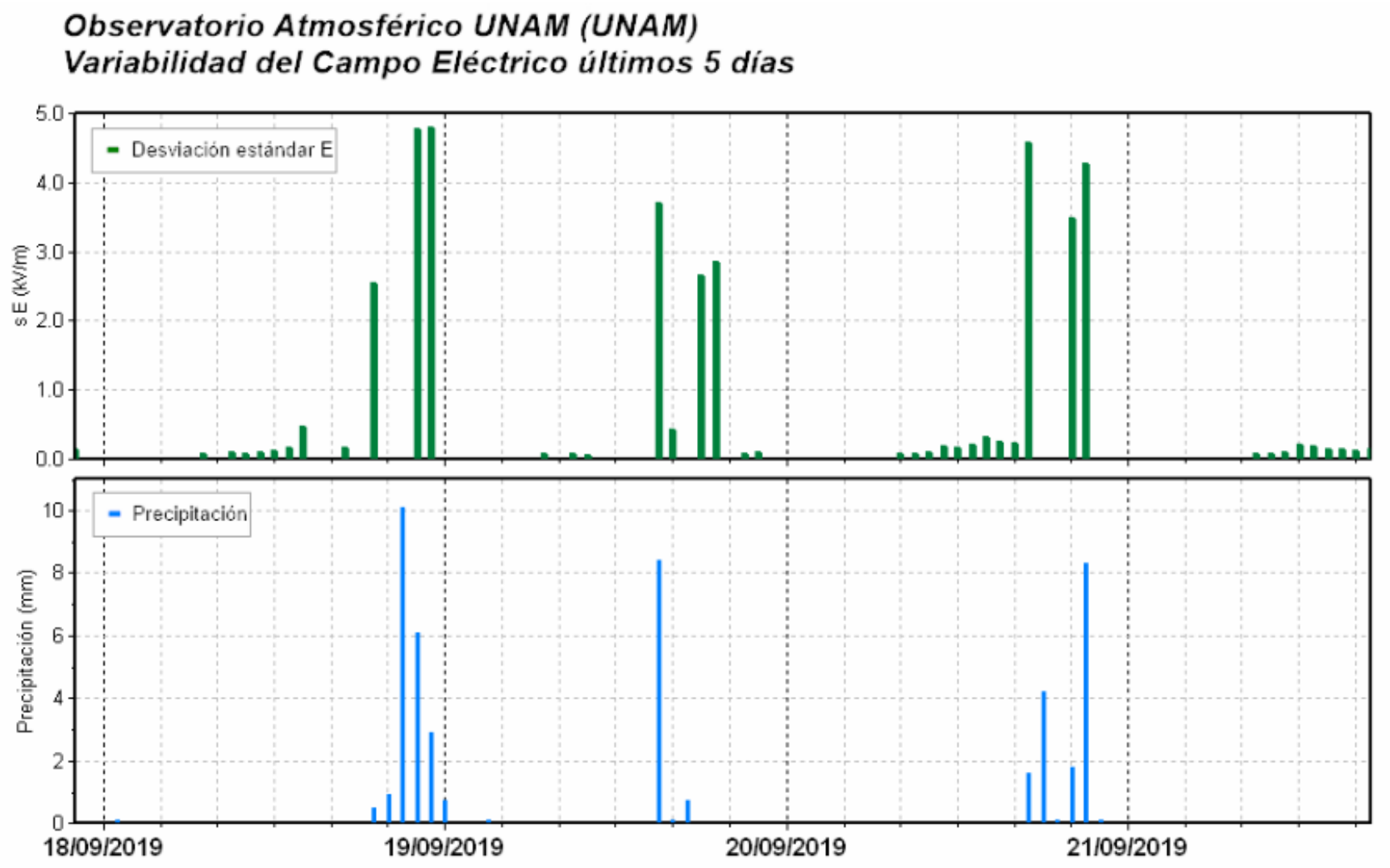
Snowfall; Altzomoni High Altitude Station



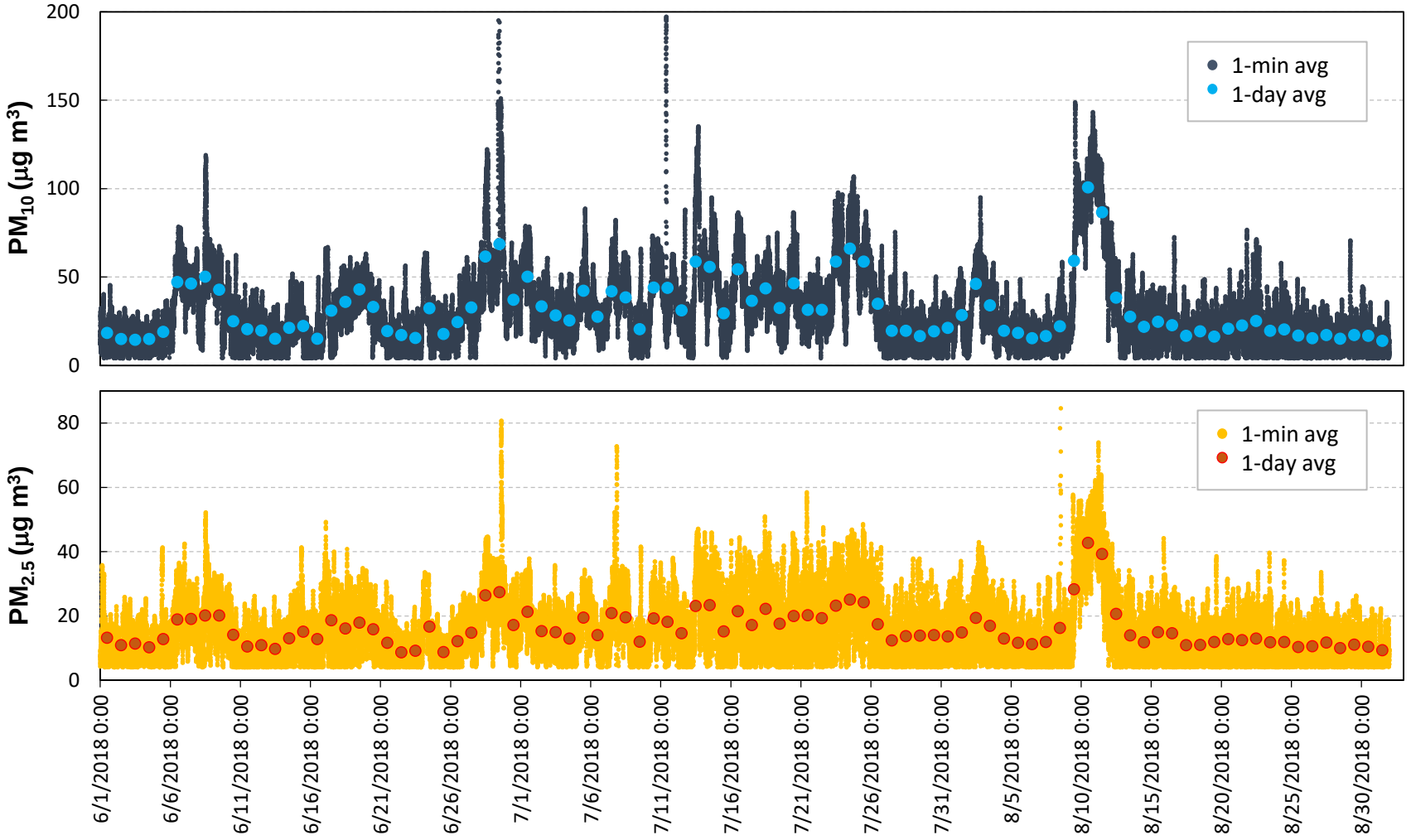
Drop size/velocity map for the event

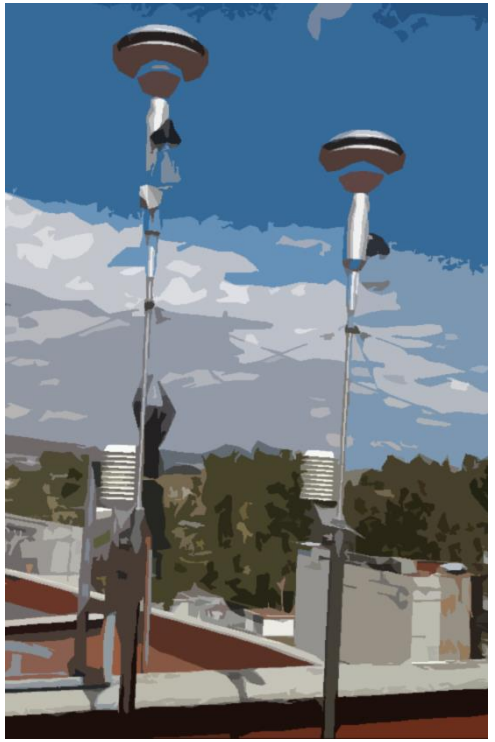


Electrical field monitoring



Air quality monitoring

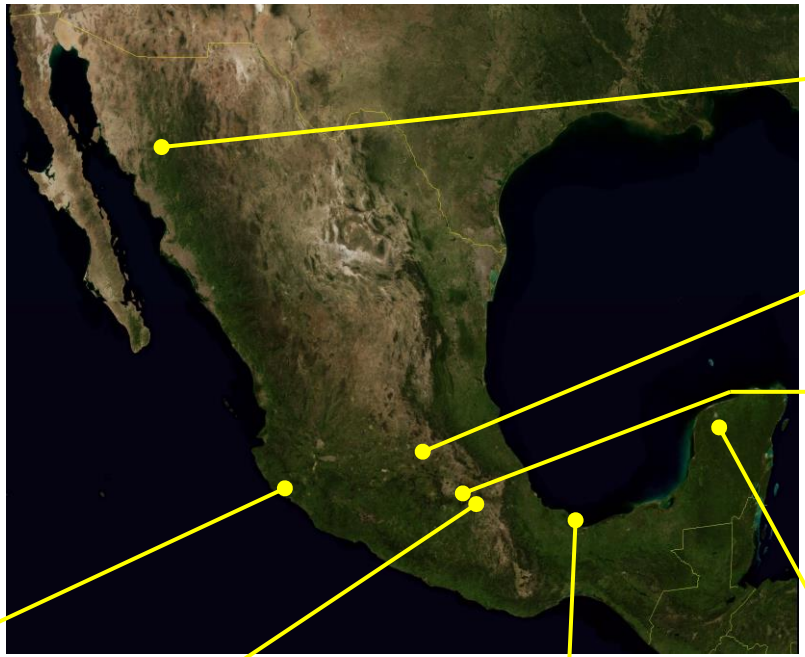




Rosas, Daniel, *Pers. Comm*. (Proyecto ADABBOY - African Dust and Biomass Burning Over the Yucatan, lead by Graciela Raga and Luis Ladino (CCA)) *https://www.researchgate.net/project/African-Dust-and-Biomass-Burning-over-Yucatan-ADABBOY*

GHGs monitoring

The RUOA network comprises six sites for continuous monitoring of CO_2, CH_4 and CO since 2014



Rural stations

Background concentrations

Estación de Biología Chamela (JAL)
91 msnm

Estación de altura Altzomoni (MEX)
3,985 msnm

Estación de Biología Tropical Los Tuxtlas (VER)
180 msnm

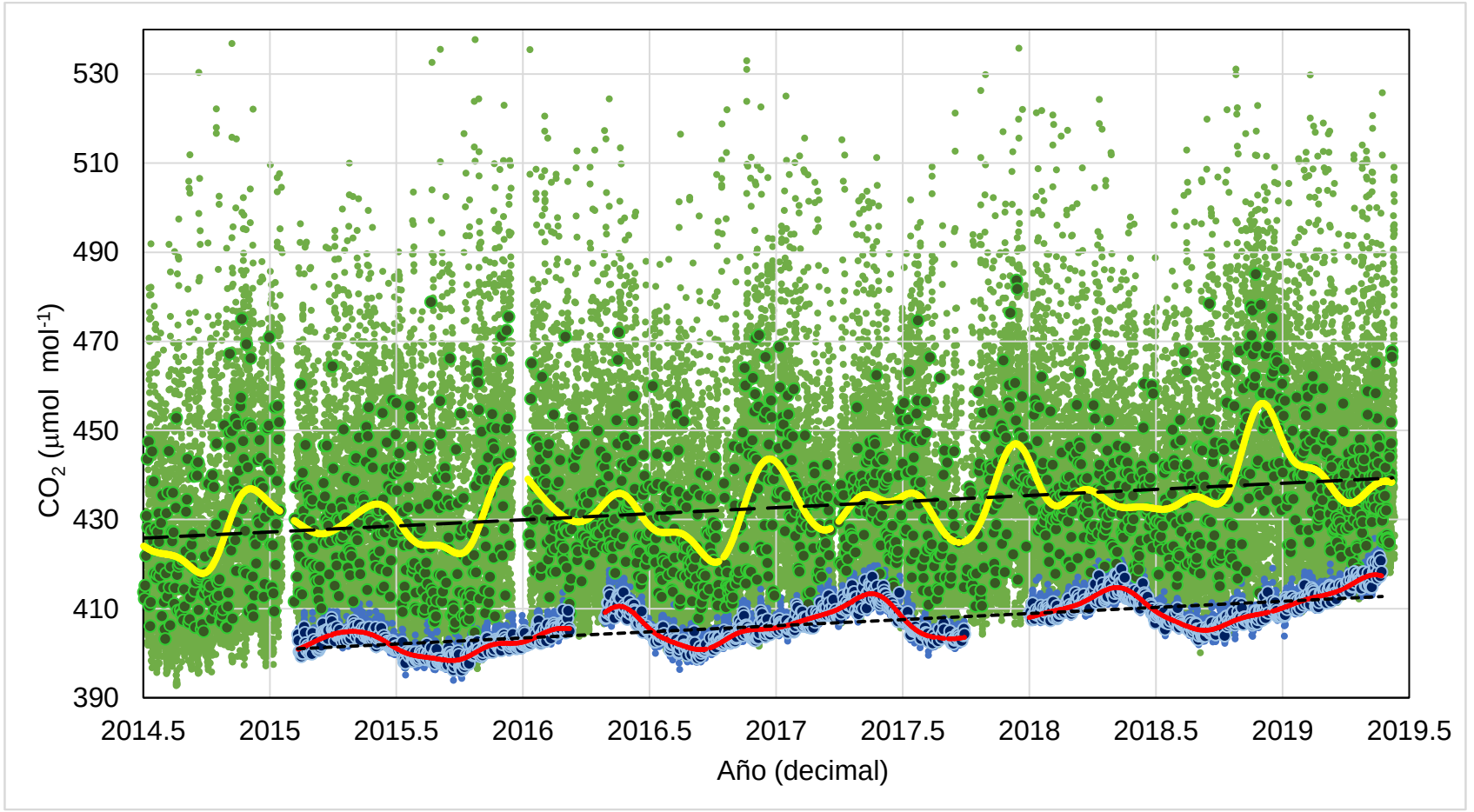
Urban stations

Estación Regional del Noroeste Hermosillo (SON)
2014-2018

UNAM Campus Juriquilla (QRO)
1,945 msnm

CCA - UNAM (CDMX)
2,280 msnm

Facultad Química UADY (YUC)
25 msnm
2018-


530
510
490
470
450
430
410
390
CO_2 (µmol mol^{-1})
2014.5
2015
2015.5
2016
2016.5
2017
2017.5
2018
2018.5
2019
2019.5
Año (decimal)
ALTZ, promedio horario nocturno
UNAM, promedio horario nocturno
ALTZ, promedio nocturno
UNAM, promedio nocturno
ALTZ, ajuste función NOAA
UNAM, ajuste función NOAA
ALTZ, tendencia
UNAM, tendencia

Work in progress:

1. Incorporation of two stations with air-quality monitoring capacities in Cd. Juárez, Chihuahua, and one meteorological station at Nevado de Toluca (>4,000 masl)

2. Assimilation of several research topics into the database (electrical field, black carbon, etc.)

3. Development of a management module within the database, where technicians and on-site personnel can track maintenance routines, events, data disruptions, etc.

4. Making not only data available to users, but also processing scripts, maintenance manuals, technical descriptions of sites and equipment, among other documents

5. Merger between RUOA and PEMBU (a network of met stations located at UNAM high schools in Mexico City) – common procedures, nomenclature, databases, repositories

We are grateful to:

Technicians and administrative staff in CCA involved with RUOA

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Michel Grutter de la Mora
Tecnical coordinator
Ma. Eugenia González

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