# CIEMAT
## Research Center on Energy, Environment and Technology

## DEPARTMENT OF ENVIRONMENT
## Atmospheric Pollution Characterization Unit

**Begoña Artíñano**

GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA E INNOVACIÓN

Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

# Research Area

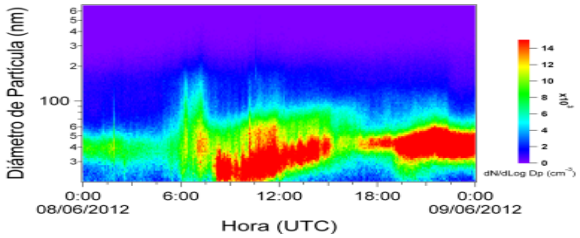
# Air pollution & climate change

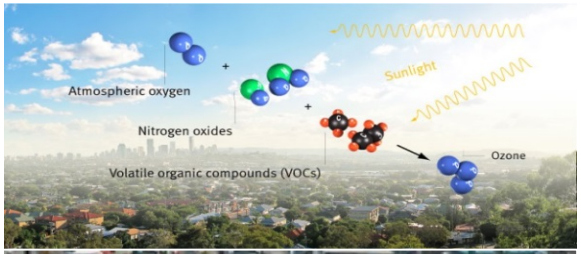
## MAIN AIMS

- Improving knowledge on physico-chemical processes of the air pollutants
- Contribute to identify and mitigate air quality problems and their impacts
- Investigate cross interactions between air pollution and climate change

# Research Activities

## Physical-chemical processes on aerosols and gases



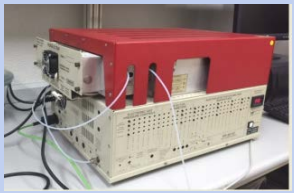

## Air Quality studies in different scenarios


## Atmospheric aerosols and CC (radiative forcing)


# Experimental Facilities and instrumentation

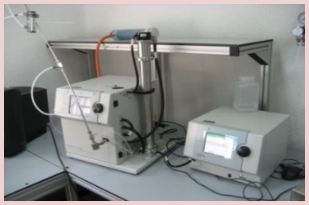


## Gaseous Atmospheric pollutants



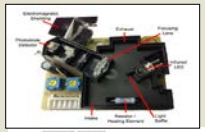
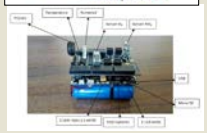



## Aerosols/Particulate matter




## Optical remote sensing techniques: gases and aerosol properties


## New sensors for air quality measurements

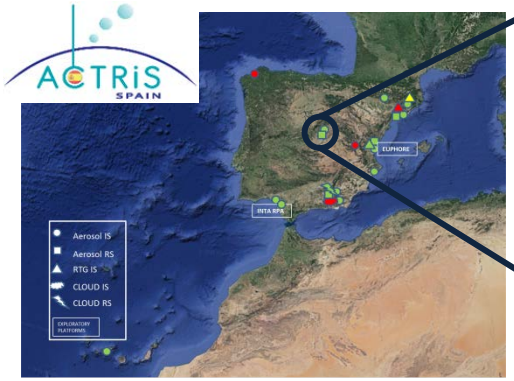




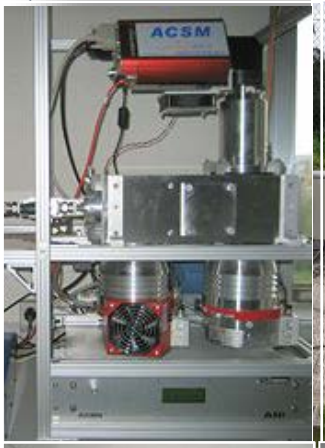

**FROM STANDARD TO INNOVATIVE /STATE OF THE ART MEASUREMENT TECHNIQUES**

# Experimental Facilities

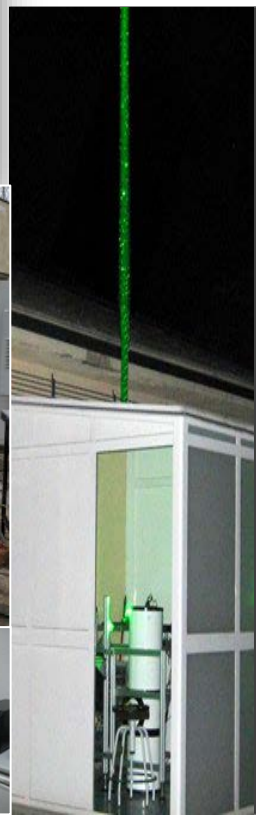
## Monitoring of aerosol microphysical properties

The ACTRIS MAD-CIEMAT research station on atmospheric aerosols and trace gases







### Measurement components

1. **In-situ measurements of aerosol properties**
2. **Remote Sensing of atmospheric aerosols**

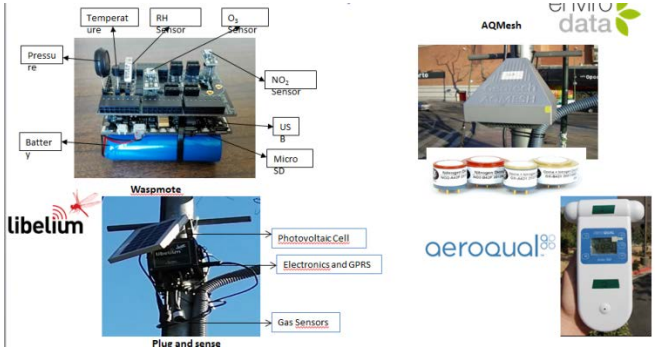
+

- Meteorology and trace gases

# Air quality monitoring

## LOW –COST SENSORS EXPERIENCE

Gases



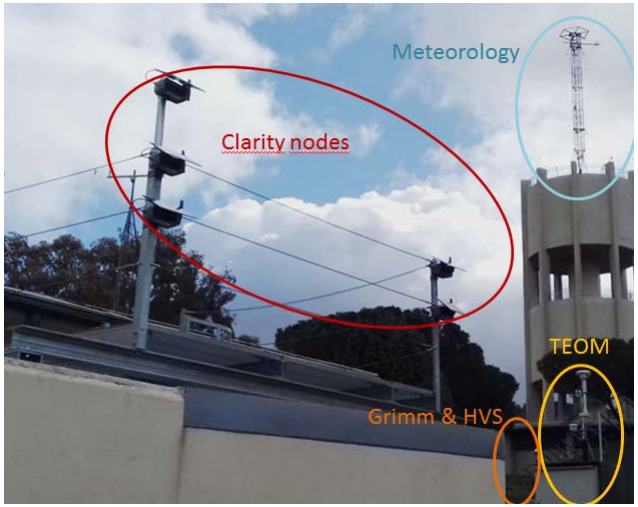

COMMERCIAL AND PROTOTYPES


Laboratory

Ambient air

BEHAVIOUR TESTS

Aerosols/ particles




Evaluation against reference and standard methods

# CONCLUSIONS (I)

**Low-cost sensor can make revolutionary changes in air pollution monitoring providing high density spatiotemporal data reducing monitoring costs**

# BUT...

# CONCLUSIONS (II)

- Environmental conditions in the urban atmosphere (relative humidity, temperature, and pressure) and cross-sensitivity to other pollutants affect sensor signal. Ozone was identified as a major interference for NO2 sensors.

- The characteristics, type and levels of pollution, affect the response of the sensors (example:  particles composition and concentration)

- Sensitiviy varies among instruments (in some cases it could be corrected with adjustments in the calibration). Each individual sensor behaves differently and therefore each unit requires the development and application of **a specific calibration** model to obtain reliable results.

- Calibration using AI algorithms is complex and **requires reference data** (air quality stations)

- Pending issues: time drift, durability of the sensors, dependence on databases and external data platforms ...

# THANKS!!!!

**Begoña Artíñano**
**Head of the Atmospheric Pollution Characterization Unit**
**DEPARTMENT OF ENVIRONMENT**
**CIEMAT**
**b.artinano@ciemat.es**

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