

The miniMET Project of the air observatories for education and science

version 2.2

*“Care and respect for our environment, and particularly for the atmosphere, should be the natural response of our love for them. This response arises from the knowledge, and lead us to methodically **promote as an educational method the atmospheric observation** in both meteorological and qualitative aspects (chemical composition and acoustic contamination), as well as the climatological analysis of data observed in space and time. **This constitutes the starting point of an awareness raising state.**”*

Scientists and meteorology professionals, and educators of every level, have the unavoidable duty of communicating to students of every age this love for the study and observation of the environment as the basis of knowledge and **scientific method**, and providing them the appropriate **tools** and also the **enthusiasm** of the discovery.

From **meteorology** and with the complicity and support of **education community** we will be able to involve the whole **society**, encouraging from the school, to potential *amateur scientists* of every age the vocation and voluntary commitment to **participate** in this scientific process of observation and discovery.

It will also deliver a huge and valuable **feedback data** to the scientific, professional and academic environment, within the **OPEN SCIENCE** paradigm promoted both from the scientific community and civil society, as well as from the European Union, mainly through Citizen Science projects.

Citizen Science and the principles of **Research and Responsible Innovation (RRI)** are part of the European agenda for research and innovation, **HORIZON 2020**, which is based on the concept of **science with and for society (SWAFS)**, promoting active participation of citizens in science and the social commitment of researchers and innovators with society, in order to build effective cooperation between science and society that links scientific excellence with social awareness and responsibility.



AEMET, the Spanish Meteorological Agency, is the ideal civil entity to promote, within its scope of environmental and meteorological competences, the **development of education, citizen science and crowdsourcing (collaborators)** in this area with an ambitious strategic proposal facing the challenge of "Research and Responsible Innovation" of Horizon2020 of the European Commission.

The **Production Department** of AEMET launches this initiative of clear scientific, educational and social vocation, promoting the awareness of meteorology with the **miniMET Project**, a **necessarily cross-project**, with the advice and support of agency areas such as *Observation Network, Exploitation and Data Management, Climatology, Modeling, Training, Quality, Innovation, Communication, etc.*

At the same time, it will be promoted **collaboration agreements with the Educational Community**, at autonomic and state levels, to extend this cross-cutting component to the professionals of education, who are the ones who can and are intended to generate and adapt the educational contents of the project, at every teaching level.

In order to materialize this project, we do contribute, from the **RasPiMAX initiative**, with the definition and building of an **air observatories network** for schools, environmental study centres, Aemet official collaborators, as well as for amateur meteorologists, proposing several **automatic open weather station (AOWS)** prototypes, of simple and well-defined construction as **technology projects** with affordable and reliable elements of **open hardware** and **free software**.

With **low cost sensors** we will measure *temperature and humidity, atmospheric pressure, wind speed and direction, rain, visible light, infrared and UV, gases, acoustic levels, lightning detection, a webcam* to monitor sky conditions, etc.

We are ready to develop and manage this data network from the Aemet **collaborative opendata** that will fulfill a triple function: **collecting** data, **showing** them to the educational community and society through digital maps on the Internet, and finally **sharing** them back as **open data**, as *Open Science* and *Open Data* are inseparable concepts.

The project deals with the following study and working topics:

- DIY to build a weather station shelter
- Introducing to miniPCs and development boards
- Introducing to sensors and communications
- Introducing to programming in Python and other languages
- Integration and testing of stations
- Location, installation and start up
- Reading and analysis of observed data
- Transmission and retrieval of data

And it will provide didactic materials to several areas:

- Technology, ICT (hardware, programming, internet)
- Environmental studies: meteorology and climatology
- Statistics, mathematics, physics and chemistry...

After a pilot phase, AEMet will publish the **White Book of the miniMET Project** that will contain all the **technical specifications** and **assembly instructions**, both for the automatic station and the meteorological garden. It will also provide **training** and **advice** through courses and seminars to those responsible for each center enrolled in the project, and will finally **supervise** and **approve** each of the candidate facilities.

Likewise, and jointly with **education authority**, Aemet will promote and sponsor the research, development and improvement of station prototypes with annual school events that recognize the best initiatives, according to the **co-creation** principles of the H2020's Citizen Science.

Finally, Aemet and accordingly society itself, will benefit from these **returning data**, as they will constitute an extensive and homogeneous **layer** of air measurements throughout the territory. This methodology will produce at the same time a way to test and to know if it is possible to extrapolate results from these data, comparing them to the measures from the Aemet official **automatic weather stations** network, providing valuable added information within its **mission to "contribute to the safety of people and goods, and to the welfare and sustainable development of Spanish society."**

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