Barcelona Supercomputing Center
Centro Nacional de Supercomputación

EXCELENCIA SEVERO OCHOA

CALIOPE

Mobile application for Europe Air quality forecast

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MYGEOSS First Call For Innovative Apps in the environmental and social domains

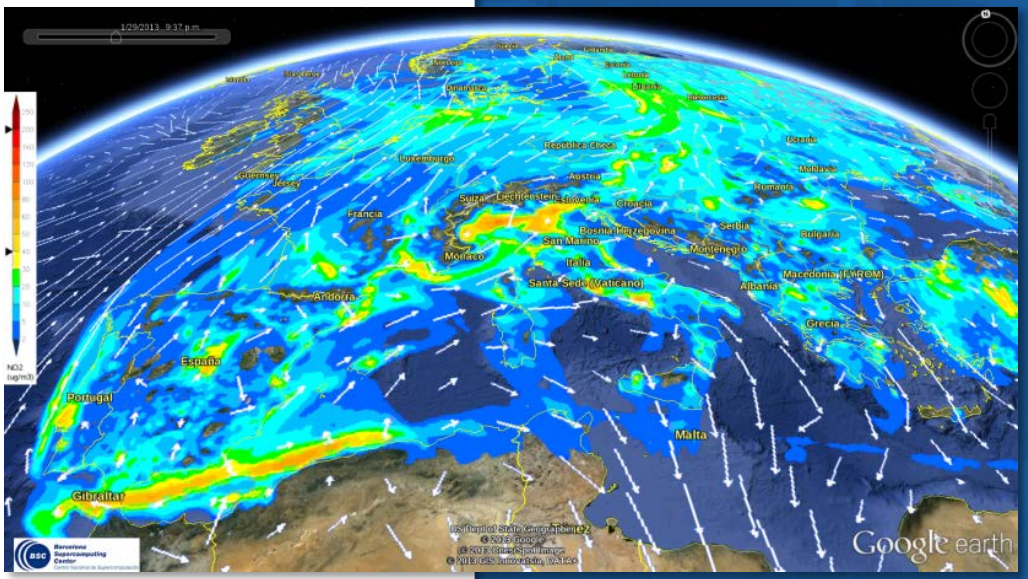
AIR QUALITY FORECAST AT HAND

CALIOPE is a smartphone application for air quality forecasts.

Centered in the field of atmospheric composition, it provides citizens with qualitative information about the air we breath.

Through CALIOPE application, any user can check the air quality forecast for the next 24 hours for major air pollutants in both air quality stations and maps.

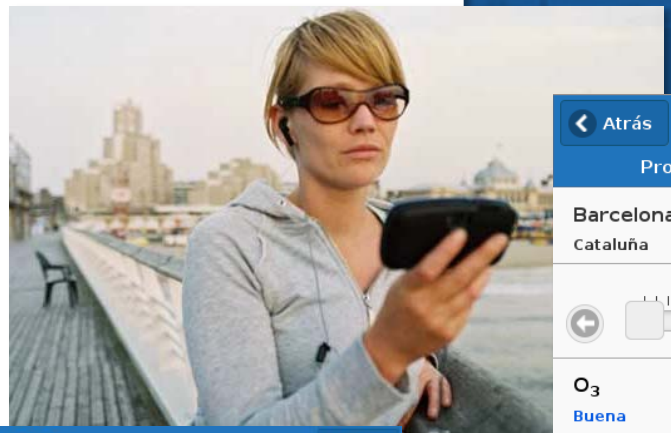
The information shown is based on the CALIOPE air quality forecast system; an open, operational, detailed prediction aimed at air pollution managers (www.bsc.es/caliope).

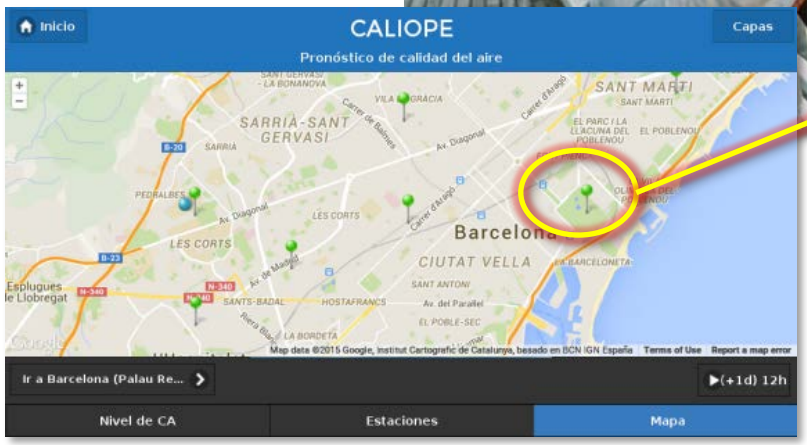


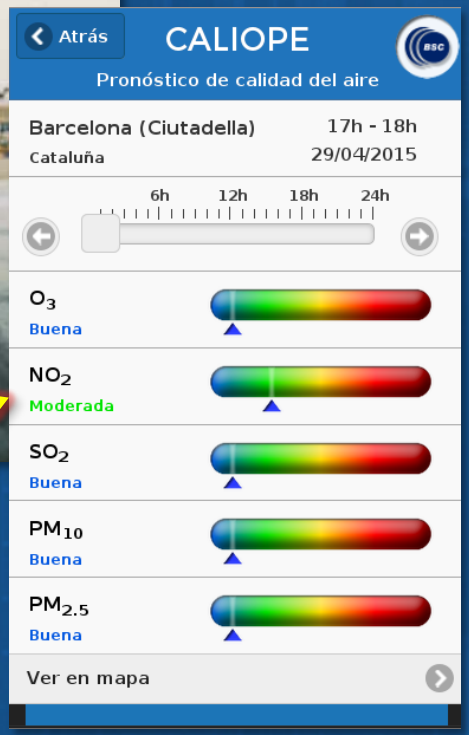
TARGET AUDIENCE

The App is aimed at anyone interested in the state of air quality, either because they are susceptible to cardio-respiratory diseases, have small children, make outdoor sports activities or because they simply care about the air we breathe.

For instance, by using CALIOPE app, an amateur runner living in Barcelona can plan their route according to the app outputs.







RESPIRATORY DEFICIENCIES

CALIOPE has received many favorable comments, some of them coming from people with respiratory diseases.

Health effects of air pollution on the respiratory system include acute and chronic changes in pulmonary function, increased incidence and prevalence of respiratory symptoms, sensitization of airways to allergens, and exacerbation of respiratory infections.

Moreover, the World Health Organization (WHO), classified outdoor air pollution as a leading cause of cancer in humans.

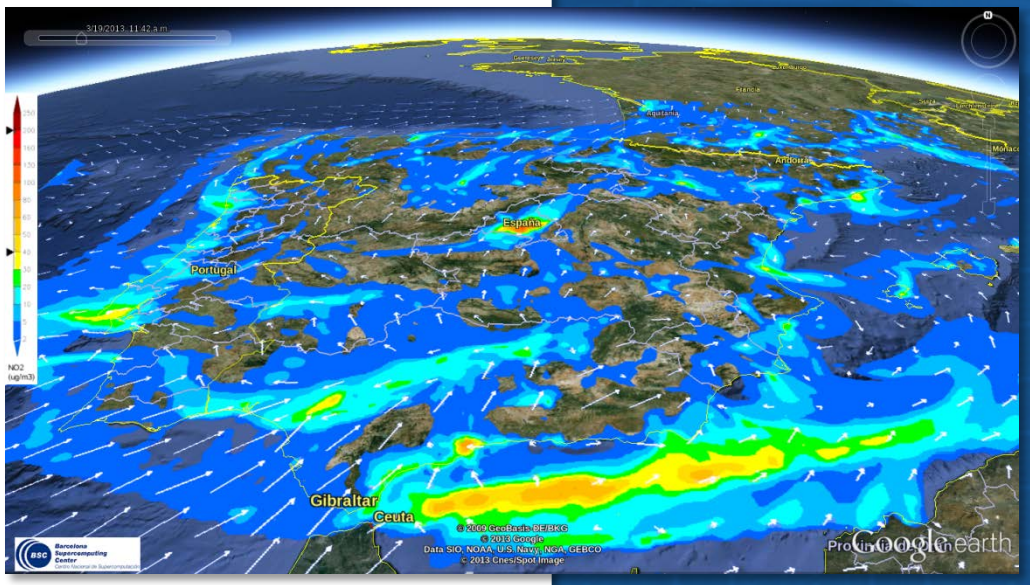
CALIOPE FOR ALL EUROPE

CALIOPE APP is the only application for mobile devices designed to display air quality information in forecasting mode.

There are other applications for Europe but they display air quality data in near-real time or for the last few hours.

CALIOPE app is already functional for Spain, but our goal is to broaden its range to cover all of Europe and translate it at least to English, to ensure its usability all over Europe.

It is also feasible to expand the visualization in the current version to show a 48-h air quality forecast.

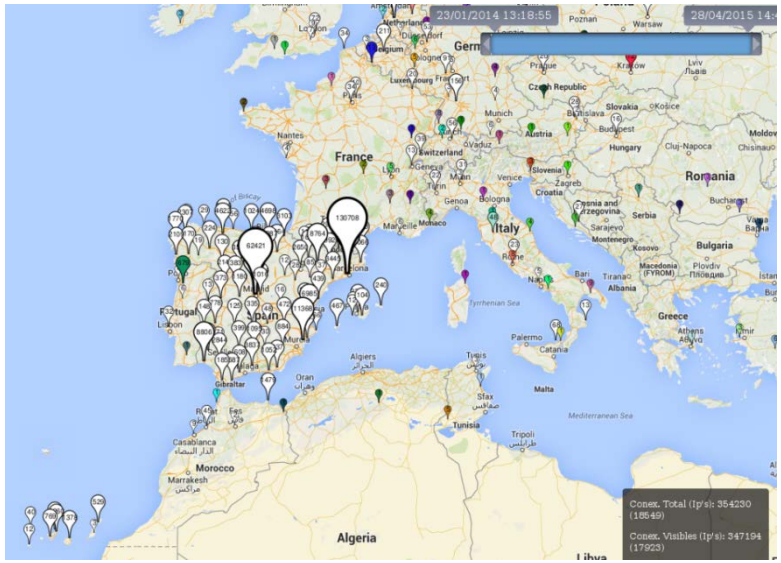


APPLICATION USE

CALIOPE is a multiplatform App available for both Android and iOS.

First launched in 2013, it has ca. 10.000 downloads in Google store and more than one hundred user reviews with a score of 4.0/5.0

There is an average of 1.000 daily user connections. Most of them in Spain but some from the rest of Europe.



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App Description

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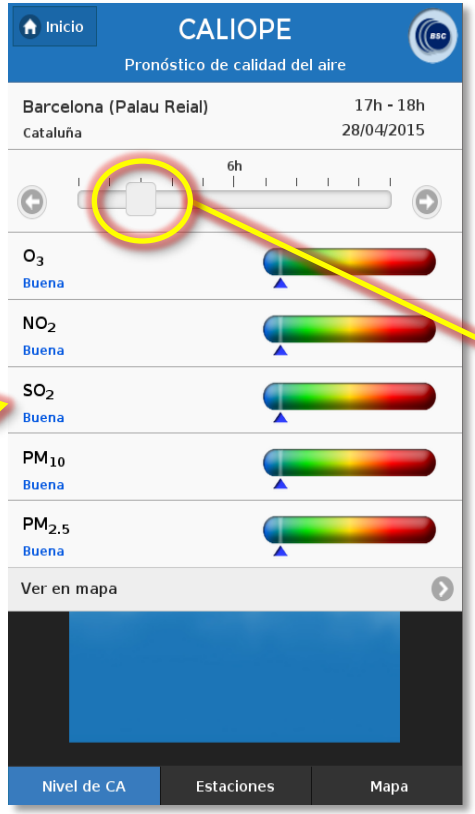
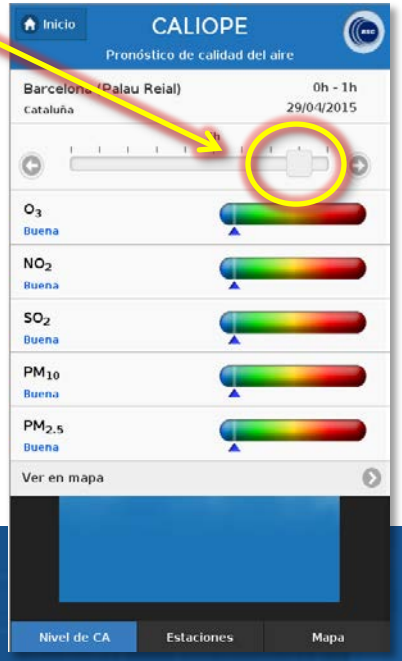
The app displays the air quality of major air pollutants: ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

By default it uses the nearest station to show the air quality levels



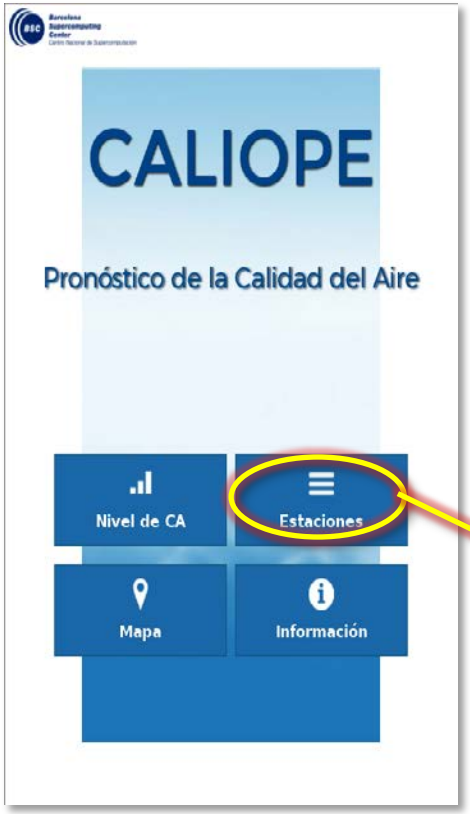
You can move the lever to visualize the next 24-h prediction of air quality in the selected station.

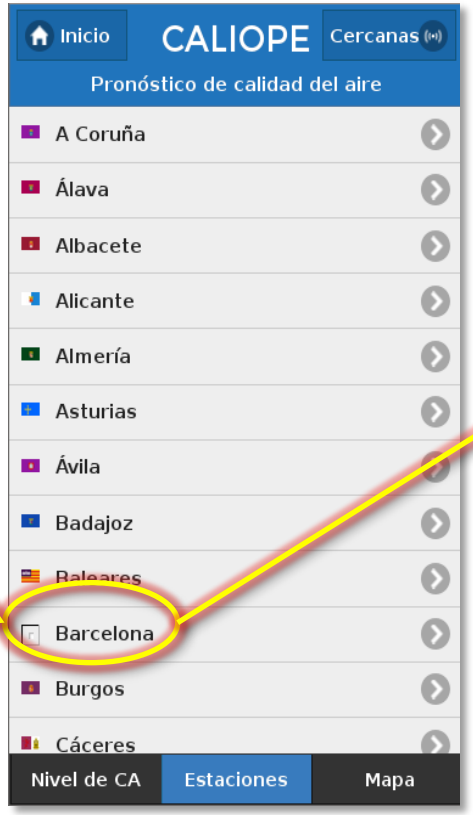


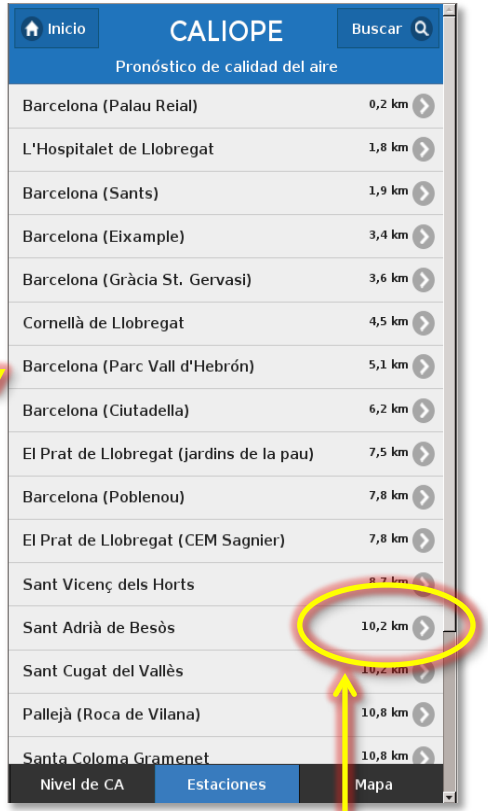
Main page

five quality categories: good, acceptable, poor, bad and very bad

The application uses GPS from the user's mobile or tablet device to set its location and query online databases of CALIOPE system



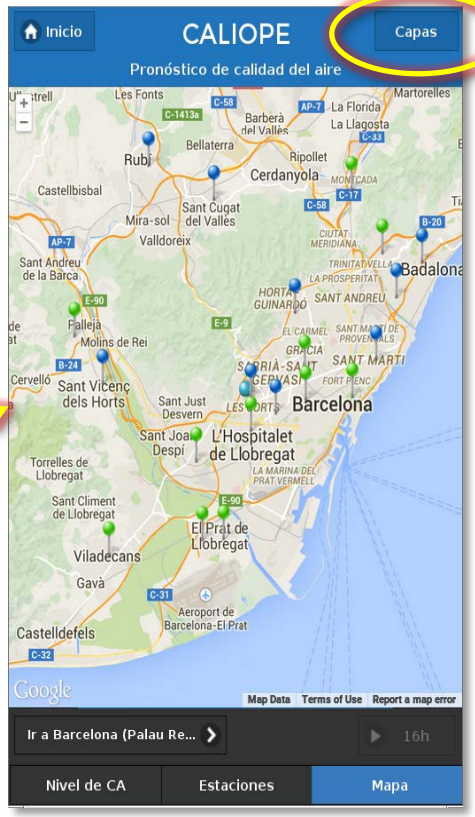


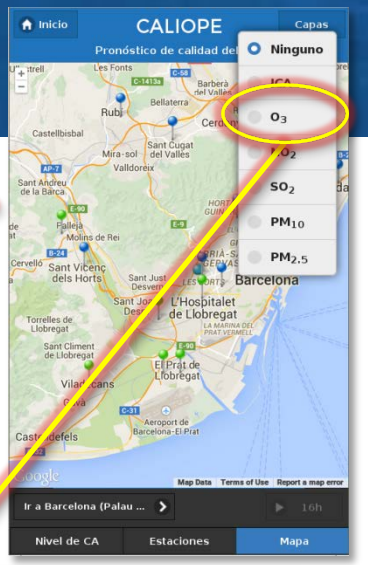


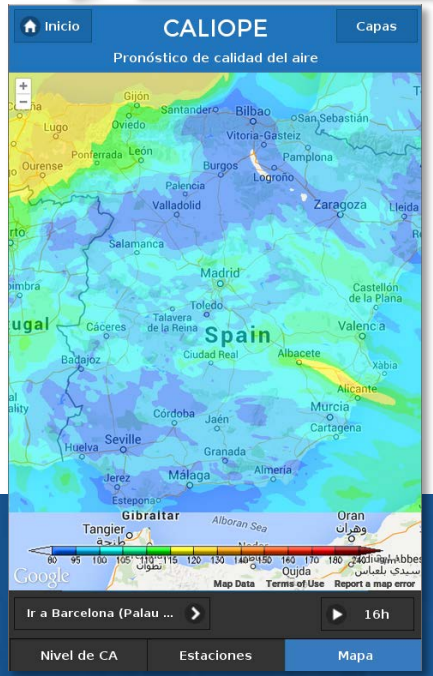
It is possible to choose the air quality station in Spain by province

The app shows the distance of the station from your location

It is possible to select the map layer among several pollutants to show the concentration maps

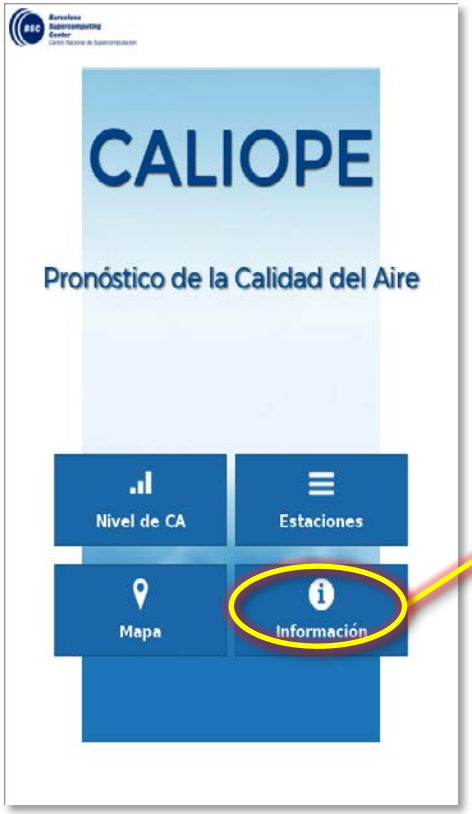


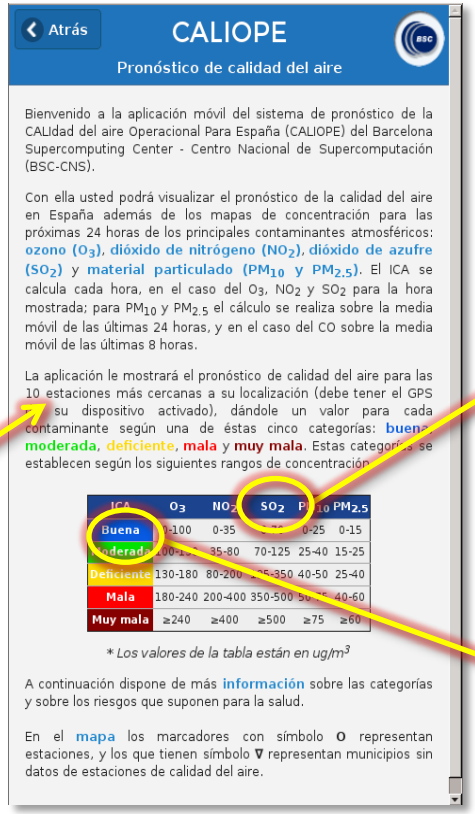




Description of the app and the categories used

Description of pollutants and legal limits information





Description of categories and some health prevention advices

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Open Access, Open Data

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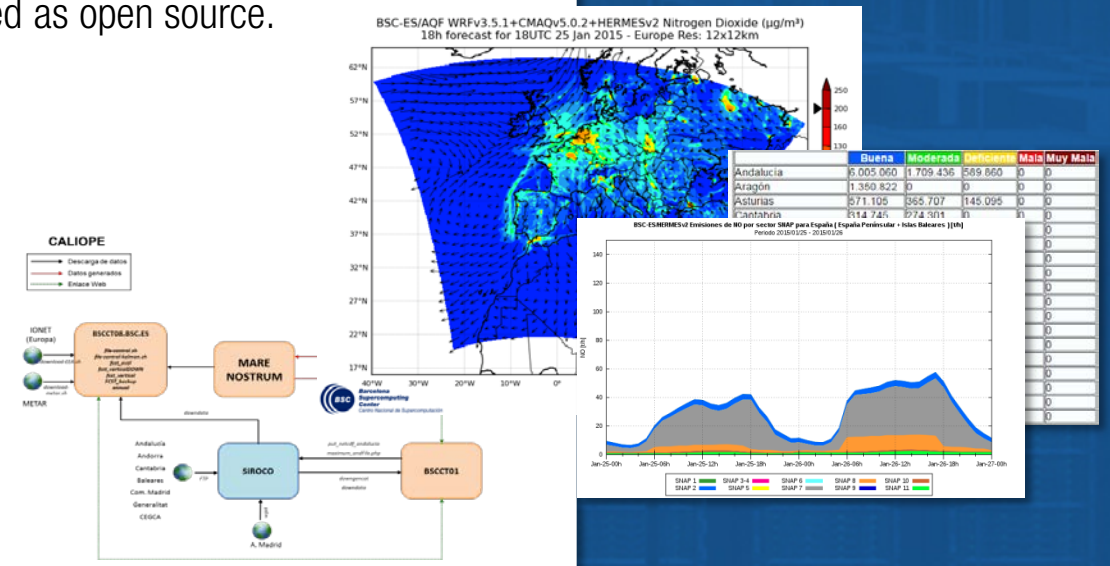
OPEN ACCESS

Both the web-based CALIOPE air quality forecast system -aimed at technical air quality assessment- and the CALIOPE App for citizens have been developed with open source code and make use of open access data.

Launched within the Earth Sciences Department at the Barcelona Supercomputing Center, CALIOPE is the result of years of research on air quality modelling and public service vocation.

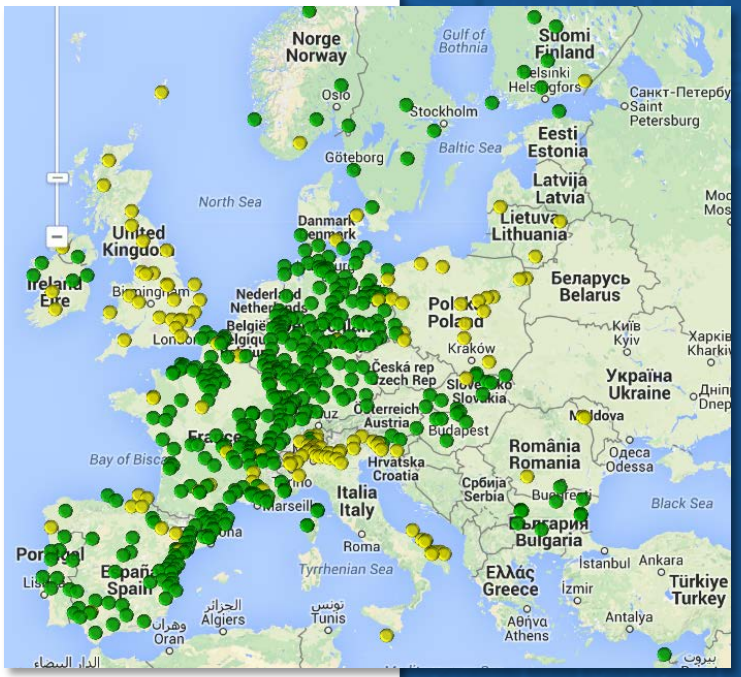
The application can be downloaded for free from the Apple Store and Google play. The results shown in the application are free, and the app code can be released as open source.



GEOSS Data CORE

To prepare the air quality forecast, the CALIOPE system uses the CORINE Land Cover database (maintained by the European Environment Agency, EEA) and the AirBase air quality database (European air quality database maintained by the EEA).

The CORINE Land Cover information is used to define the land uses for the meteorological model WRF (Weather Research & Forecasting Model from NCAR). The forecast is updated every four hours through the assimilation in post-process of the air quality data from observational data in AirBase.



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Summary

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WHY SHOULD CALIOPE BE AWARDED?

- This is the only mobile application that provides predictive information of the air quality that citizens breath in their daily routine (thanks to the smartphone).
- Since November 2013 it has demonstrated its usability and has created a community of users in Spain.
- If awarded, the funding would be used to broaden its predicted area to cover all of Europe and expand the air quality forecast to 48 hours.
- It provides citizens with an easy tool to know the air quality of their current and future locations for major air pollutants in Europe.
- The provided information can be used to schedule physical activities or raise environmental consciousness, but, among all, it has proved to be particularly helpful for all those citizens with respiratory problems.

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