

## Co-designing an interactive tool to communicate the uncertainty of urban air quality models

<https://earth.bsc.es/shiny/uncertAIR>



### Air Quality

Pollutants in the air are compounds that can be harmful to humans, animals and the environment. One of the most common in urban environments is Nitrogen Dioxide (NO<sub>2</sub>).

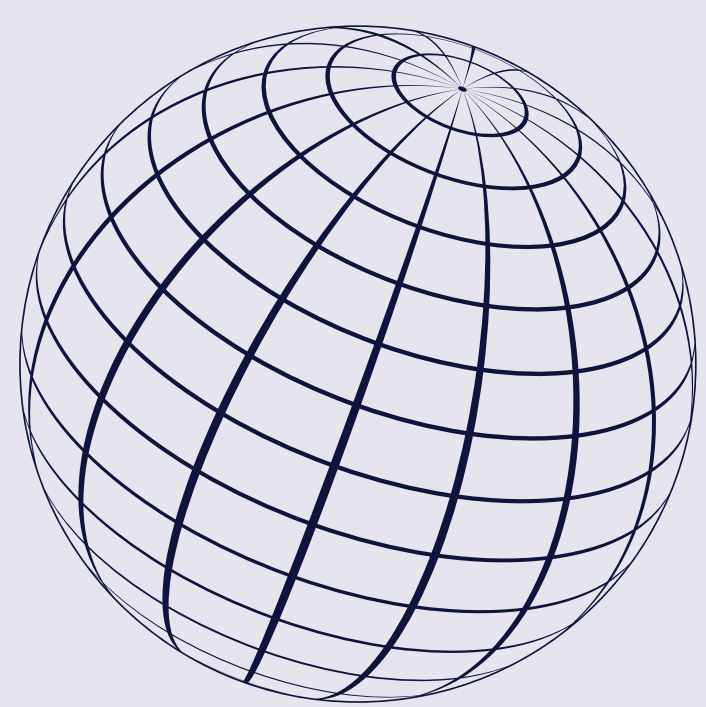


Street-scale air quality models are used to characterize citizens' exposure to air pollution. However, these models have significant uncertainty.

### The model:

#### CALIOPE-Urban

Hourly high-resolution concentrations of surface NO<sub>2</sub> at the street scale with 20m x 20m spatial over the city of Barcelona are estimated using the CALIOPE-Urban multiscale air quality model.



### Post-processing: data fusion

We apply a data-fusion technique to (i) bias-correct NO<sub>2</sub> hourly maps, (ii) obtain the correction uncertainty, and (iii) to map the probability of exceeding the NO<sub>2</sub> limit values. It is based on:

- Near-real-time hourly observations
- The output of CALIOPE-Urban
- A microscale-LUR model based on machine learning, using NO<sub>2</sub> experimental campaigns and various urban datasets

In 2019, 30% of Barcelona (95% of Eixample district) had a probability of 0.5 or higher of exceeding the NO<sub>2</sub> annual EU-limit value (Criado et al. 2023).



Within this context, we co-designed and co-developed an interactive tool to report the uncertainty of urban air quality simulations.

## uncertAIR

### 1 Spatial visualisation



Users can visualise NO<sub>2</sub>, uncertainty, and probability of exceedance maps based on annual means in Barcelona for 2019-2022.

The maps can be visualized in a 20m x 20m resolution or census areas.

### 2 Socio-economic layers



With the use of different layers, the uncertAIR tool allows a broader analysis of the results by combining NO<sub>2</sub>, uncertainty, and socioeconomic data.

For example, users can link the location of schools in Barcelona with the levels of air quality.

### 3 Download data



With the uncertAIR tool, users can download daily and annual means of NO<sub>2</sub>, uncertainty and probability of exceedance in different formats (shapefile, raster or csv) and spatial aggregations (20mx20m or census areas)