AEMET-ISCIII collaboration agreement to monitor the effects of air pollution on the incidence and spread of CoVid-19 disease.

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Carlos III Health Institute (ISCIII),

1. **AEMET – ISCIII Collaboration Agreement and future work**
2. Health and Air pollution: ISCIII contribution
3. EPSgrams of AirPollution using CAMS: AEMET contribution

WORK PLAN

1.- Analysis and detection of reference weather station by different climatological areas. These stations will be used to guide in the meteorological information delivered.

2.- Obtaining, analysis and filtering of data related to the meteorological variables used as independent variables of the study:
- Daily maximum, average and minimum temperature (ºC)
- Daily thermal amplitude (ºC), ("preprint paper" published by the Institute of Occupational Health and Environmental Health of Lanzhou University in China)
- Absolute humidity (daily average) (gr/m3) or specific humidity (daily average) (gr/Kg)
- Average daily atmospheric pressure (HPa)
- Hours of daily sunlight
- Other variables that are considered necessary for a better analysis.

3.- Analysis of the advection of Saharan dust intrusions found in the AEMET Atmospheric Mineral Dust Prediction Center for North Africa, Middle East and Europe (https://dust.aemet.es/).

4.- Advice on obtaining conclusions: New redefinition of hypothesis related to environmental variables if the results so require as well as in the execution of modelling and projections.

WORK PLAN

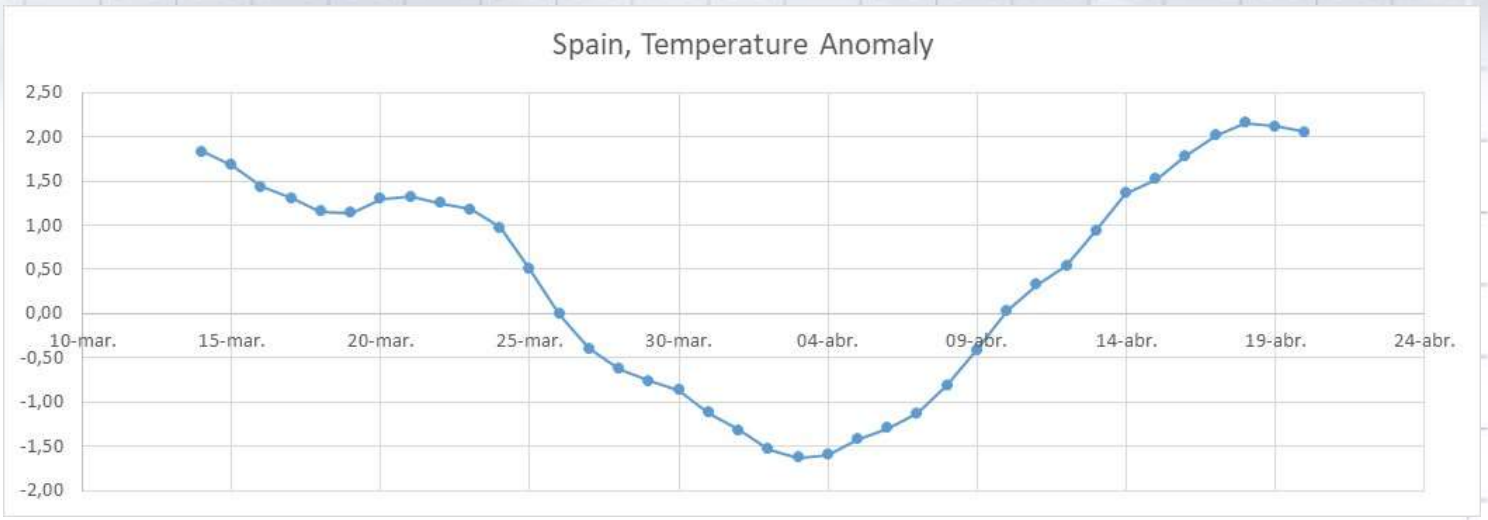
5.- Obtaining, analysis and filtering of data: on daily mortality data, urgent admissions and ICU admissions for positive CoVid19 at provincial level. These data will be provided by the Ministry of Health.

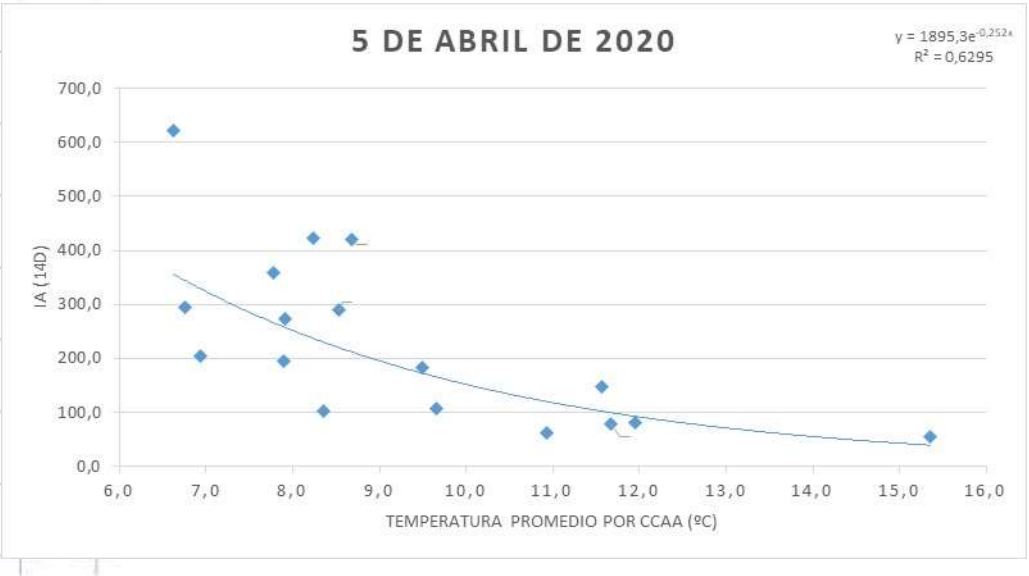
6.- Obtaining, analysing and cleaning data on the following air pollutants at provincial level:
- Average daily concentration of PM10 and PM2.5 (where available) in microg / m3
- Data of days with advection of Saharan dust intrusions
- Average daily NO2 concentration in microg / m3. These data will be used as a control variable.
- Average daily concentration of O3 in microg / m3.

7.- Performing the statistical analysis: Time series analysis to determine the possible impact of the independent variables. On the one hand, the cross-correlation functions of the preblanched series will determine the delays in which there are statistically significant associations ($p < 0.05$). These significant variables, together with the control variables described above, will be those introduced in the GLM Poisson regression models.

8.- The subsequent analysis at several scales and areas will determine the possible effect that other factors such as population density, income level, population pyramid, among others, has on the associations found.

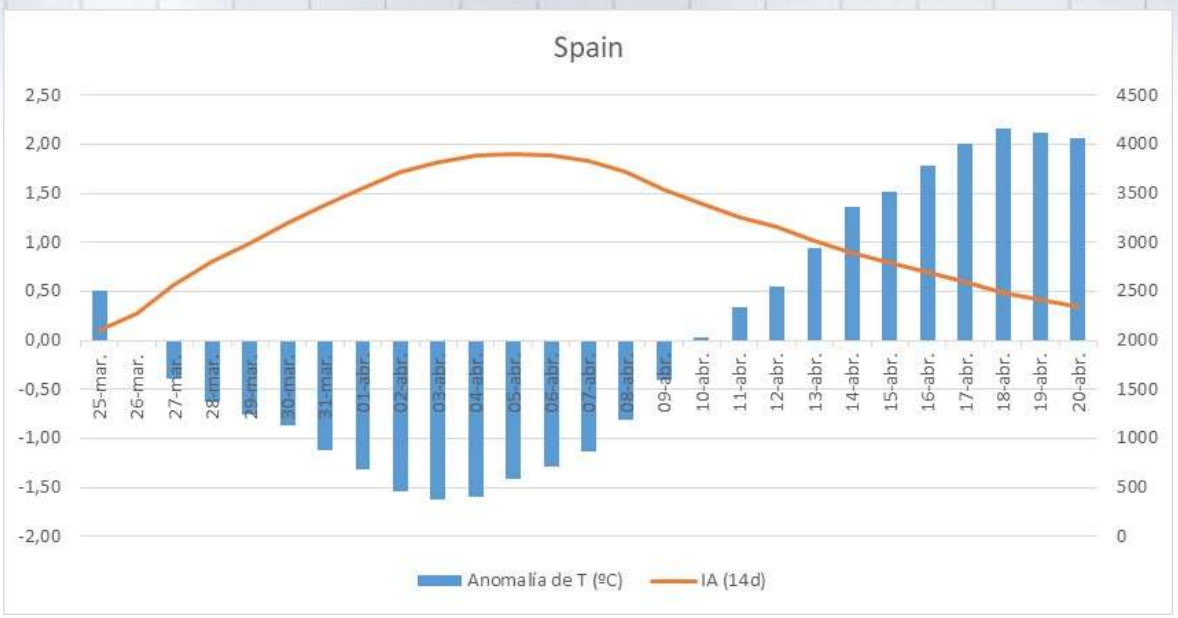
RESULTS

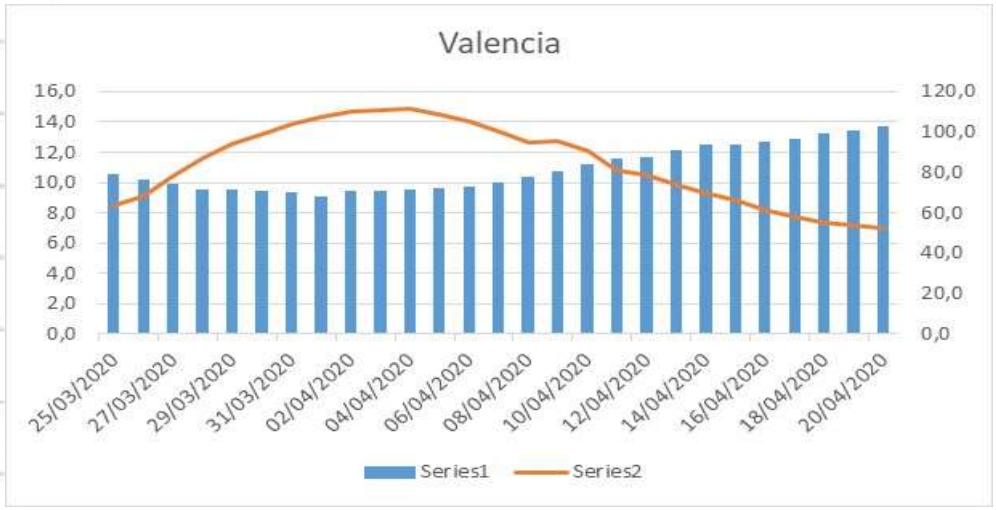

Spain, Temperature Anomaly
2,50
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
10-mar.
15-mar.
20-mar.
25-mar.
30-mar.
04-abr.
09-abr.
14-abr.
19-abr.
24-abr.


5 DE ABRIL DE 2020
y = 1895,3e-0,252x
R² = 0,6295
IA (14D)
TEMPERATURA PROMEDIO POR CCAA (ºC)


20 DE ABRIL DE 2020
y = 25639e-0,41x
R² = 0,504
IA (14D)
La Rioja
Castilla-La Mancha
Castilla y León
Madrid
Navarra
Cataluña
País Vasco
Aragón
Cantabria
Extremadura
Galicia
Asturias
C.Valenciana
Andalucía
Baleares
Murcia
Canarias
TEMPERATURA PROMEDIADA POR CCAA (ºC)

RESULTS


Spain
2,50
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
4500
4000
3500
3000
2500
2000
1500
1000
500
0
25-mar.
26-mar.
27-mar.
28-mar.
29-mar.
30-mar.
31-mar.
01-abr.
02-abr.
03-abr.
04-abr.
05-abr.
06-abr.
07-abr.
08-abr.
09-abr.
10-abr.
11-abr.
12-abr.
13-abr.
14-abr.
15-abr.
16-abr.
17-abr.
18-abr.
19-abr.
20-abr.
Anomalía de T (ºC)
IA (14d)


Valencia
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8,0
6,0
4,0
2,0
0,0
120,0
100,0
80,0
60,0
40,0
20,0
0,0
25/03/2020
27/03/2020
29/03/2020
31/03/2020
02/04/2020
04/04/2020
06/04/2020
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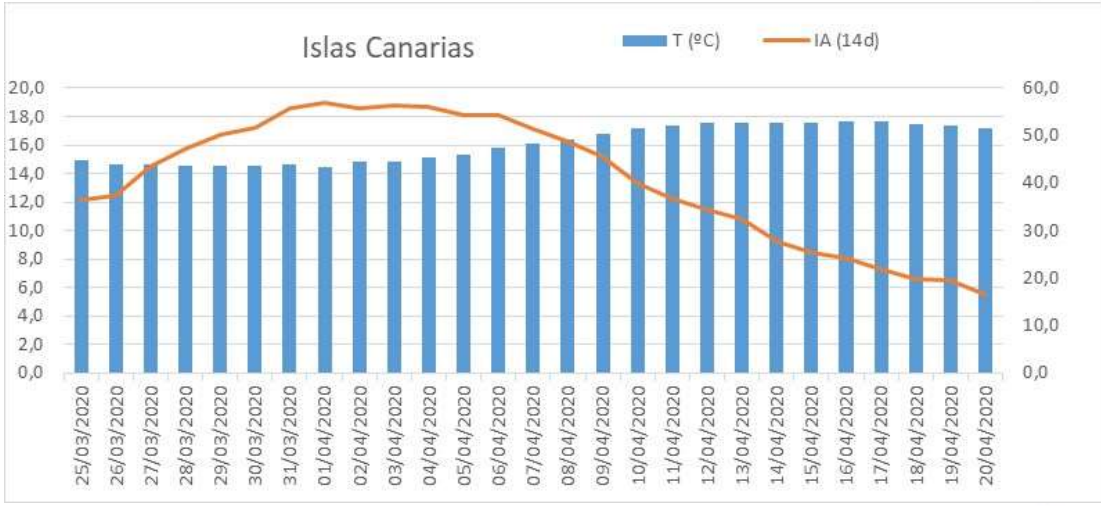
12/04/2020
14/04/2020
16/04/2020
18/04/2020
20/04/2020
Series1
Series2


Islas Canarias
T (ºC)
IA (14d)
20,0
18,0
16,0
14,0
12,0
10,0
8,0
6,0
4,0
2,0
0,0
60,0
50,0
40,0
30,0
20,0
10,0
0,0
25/03/2020
26/03/2020
27/03/2020
28/03/2020
29/03/2020
30/03/2020
31/03/2020
01/04/2020
02/04/2020
03/04/2020
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10/04/2020
11/04/2020
12/04/2020
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14/04/2020
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17/04/2020
18/04/2020
19/04/2020
20/04/2020

RESULTS

PRELIMINARY RESULTS: of the joint work comparing the cumulative incidence rate in the last 14 days (New daily infections per 100,000 inhabitants) with the average temperature corresponding to the same period by Autonomous Community evidencing that the transmission of the virus would decrease at higher temperatures, results that are in line with that observed by some authors, Wang et al., 2020 or Chang et al, 2011.

MODELLING: The analysis is carried out daily with data provided by the Ministry of Health and AWS network from AEMET with an assessment of the information in near-real time. ANALYSIS, DIAGNOSIS, PROGNOSIS

↓

EARLY WARNING SYSTEM

An epidemiological early warning system will be developed at the state level based on the influence of the environmental factors analysed

COOPERATION: **This line of research remains open at the national and international level with the consideration of other meteorological variables with the support of COPERNICUS (mainly CAMS and C3S), analysing the effect of air pollution as well as the inclusion of other biological and social factors.**

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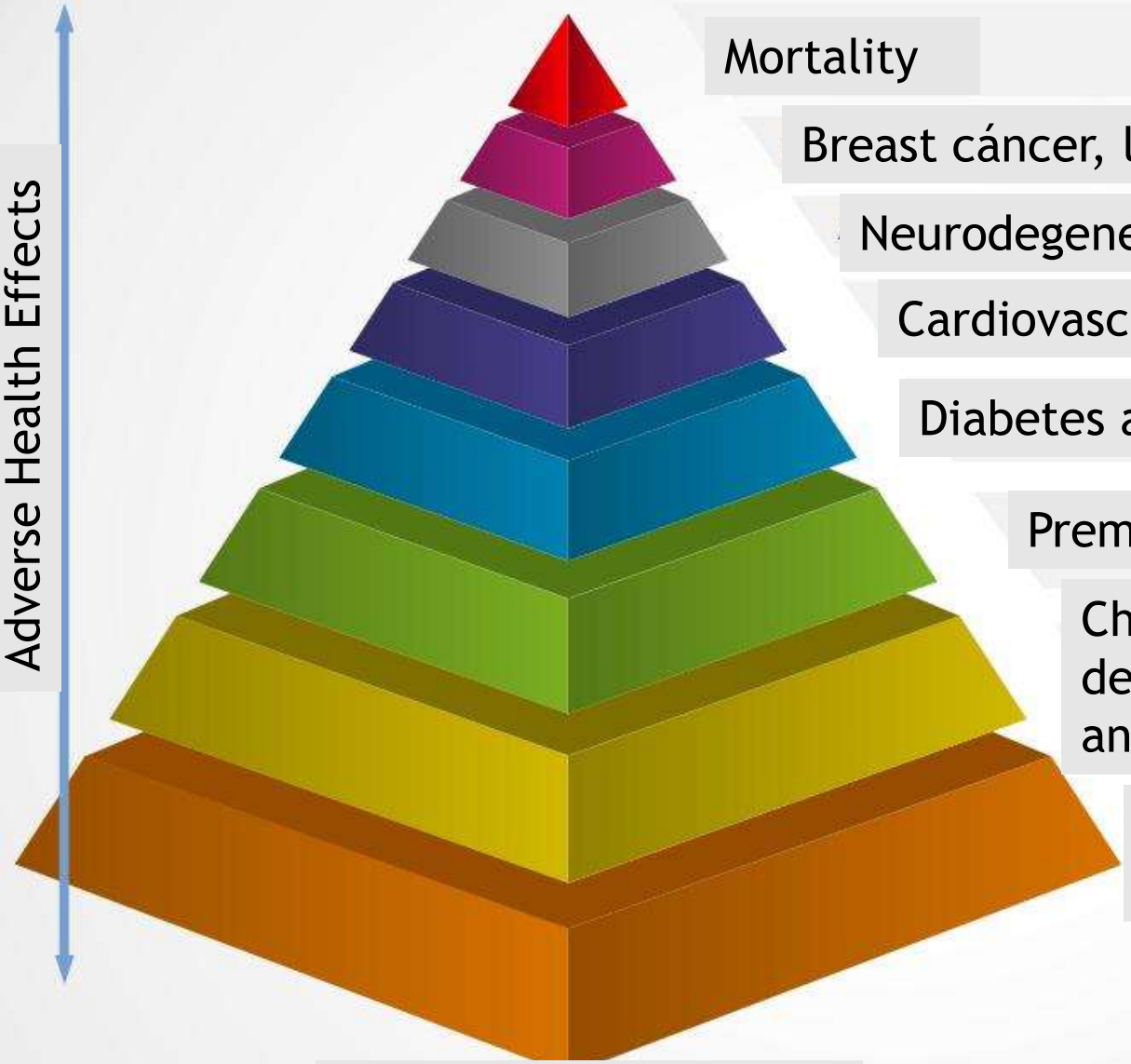
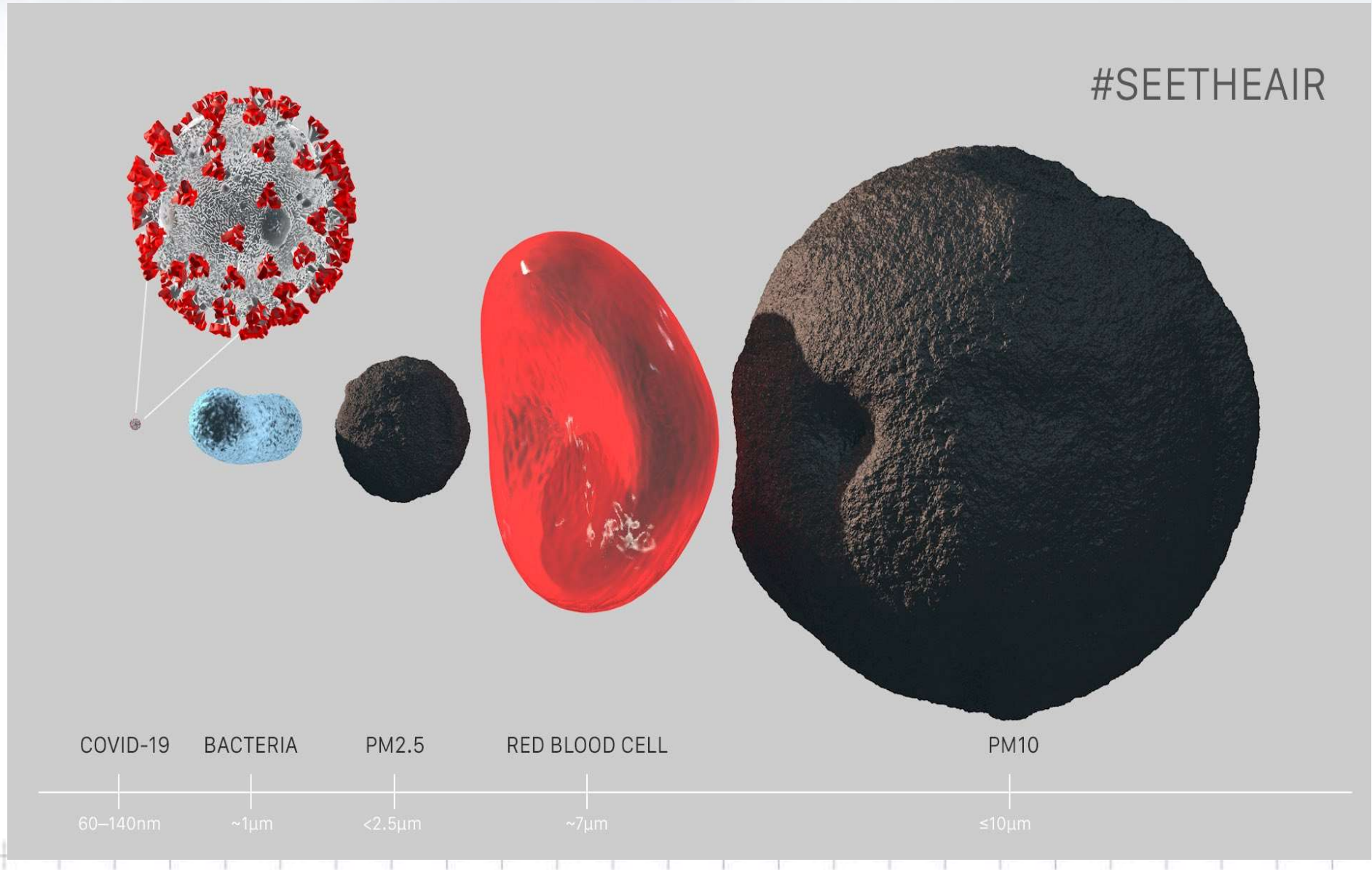


FUENTE: CRISTINA LINARES Y JULIO DÍAZ, INSTITUTO DE SALUD CARLOS III.


#SEETHEAIR
COVID-19
BACTERIA
PM2.5
RED BLOOD CELL
PM10
60–140nm
~1µm
<2.5µm
~7µm
≤10µm

1. Chemical atmospheric pollution has an important incidence both on daily mortality and on the multiple associated pathologies.
2. Mortality attributable in the short term to chemical atmospheric pollution in *Madrid* represents 15% of production in Spain.
3. In light of current scientific knowledge, it is unlikely that PM are related to a higher incidence of COVID-19 affecting its spread.
4. According to current research, it does seem plausible that air pollution affects the severity and lethality of COVID-19.
5. Further investigation on this topic is necessary. Collaboration Agreement and ISCIII-AEMET Project.

Source: ISCIII

1. AEMET – ISCIII Collaboration Agreement and future work
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3. **EPSgrams of AirPollution using CAMS: AEMET contribution**

Air Quality Modeling Group

***AEMET team**: Isabel Martínez, María Allue, Antonio Manzano, Juan Andrés García, Candelas Peral,Ángel Martínez, José Ernesto Barrera, Lorea García, Jose Luis Casado*

- The objective of the group is to provide information on the chemical composition of the atmosphere that provides operational predictions for different chemical species, *such as ozone (O3), nitrogen dioxide (NO2), nitrogen monoxide (NO), carbon monoxide (CO) or sulfur dioxide (SO2),* and particulate matter of sizes less than 10 microns and less than 2.5 microns, PM10 and PM2.5, on the Iberian Peninsula and the Balearic Islands.

- The prediction system is based on the MOCAGE (Modèle de Chimie Atmosphérique de Grande Èchelle) chemical transport model, developed by Météo-France, and uses the European emissions inventory TNO-MACC3 based on 2011 emissions.

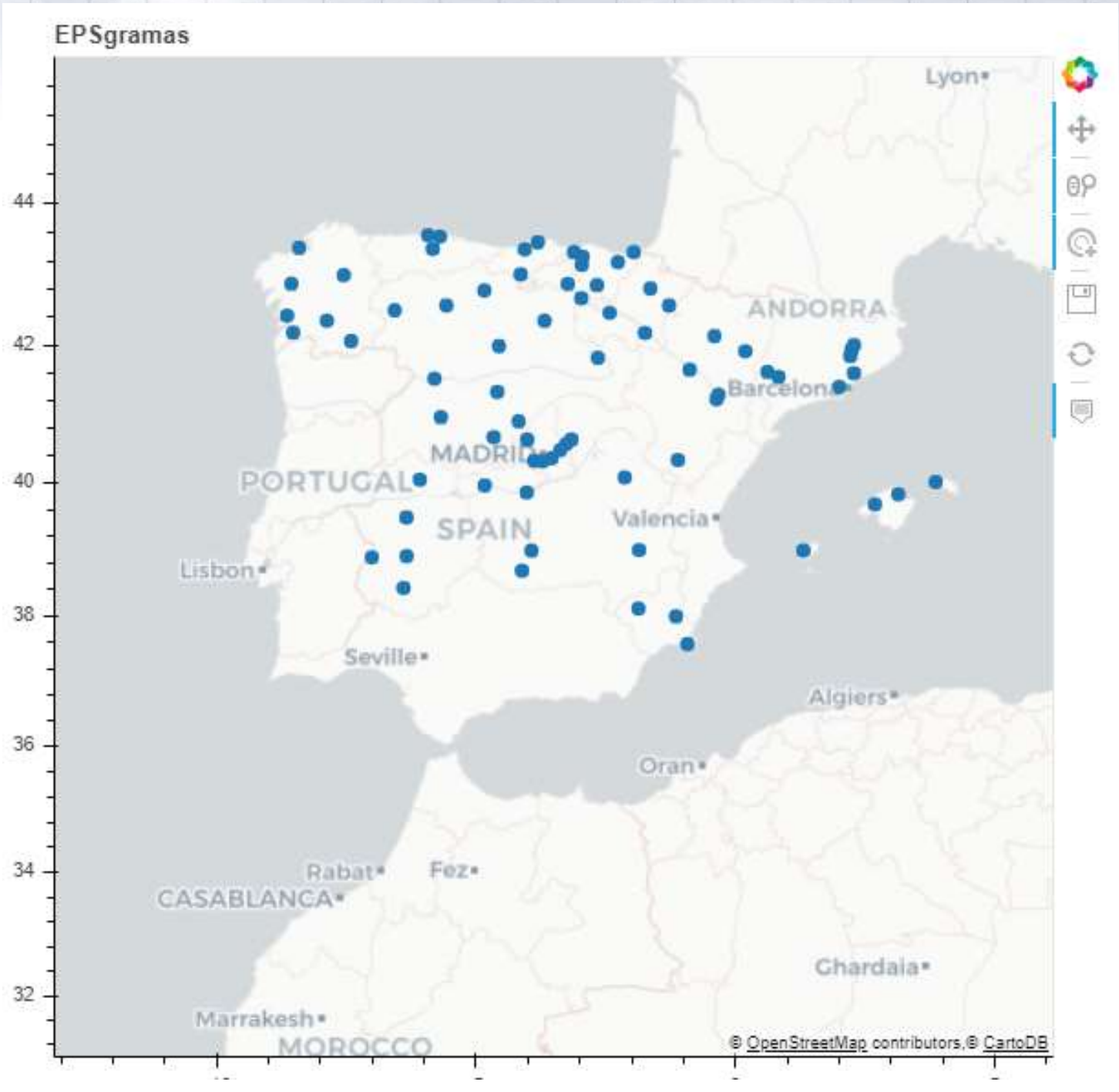
Source: AEMET

- Two daily operational of Chemical MOCAGE (00 UTC and 12 UTC) up to H + 48
- Preparation of the daily air quality index for two days.
- Preparation of EPSgrams with the regional models of CAMS (Copernicus Atmospheric Monitoring Service) and delivery to the Autonomous Communities in more than 800 points.
- Development of an hourly air quality index in measuring stations.
- Emergency support activities (Eyjafjallajökull (2010) and Grimsvötn (2011) volcanic eruptions, Fukushima nuclear accident), drills, chemical and / or nuclear accidents and civil protection using the MOCAGE-Accident
- Implementation of a new FLEXPART dispersion model that complements the current MOCAGE-Accident for more local episodes.
- Ultraviolet Radiation Modeling. Operational prediction of UVI up to D + 5.

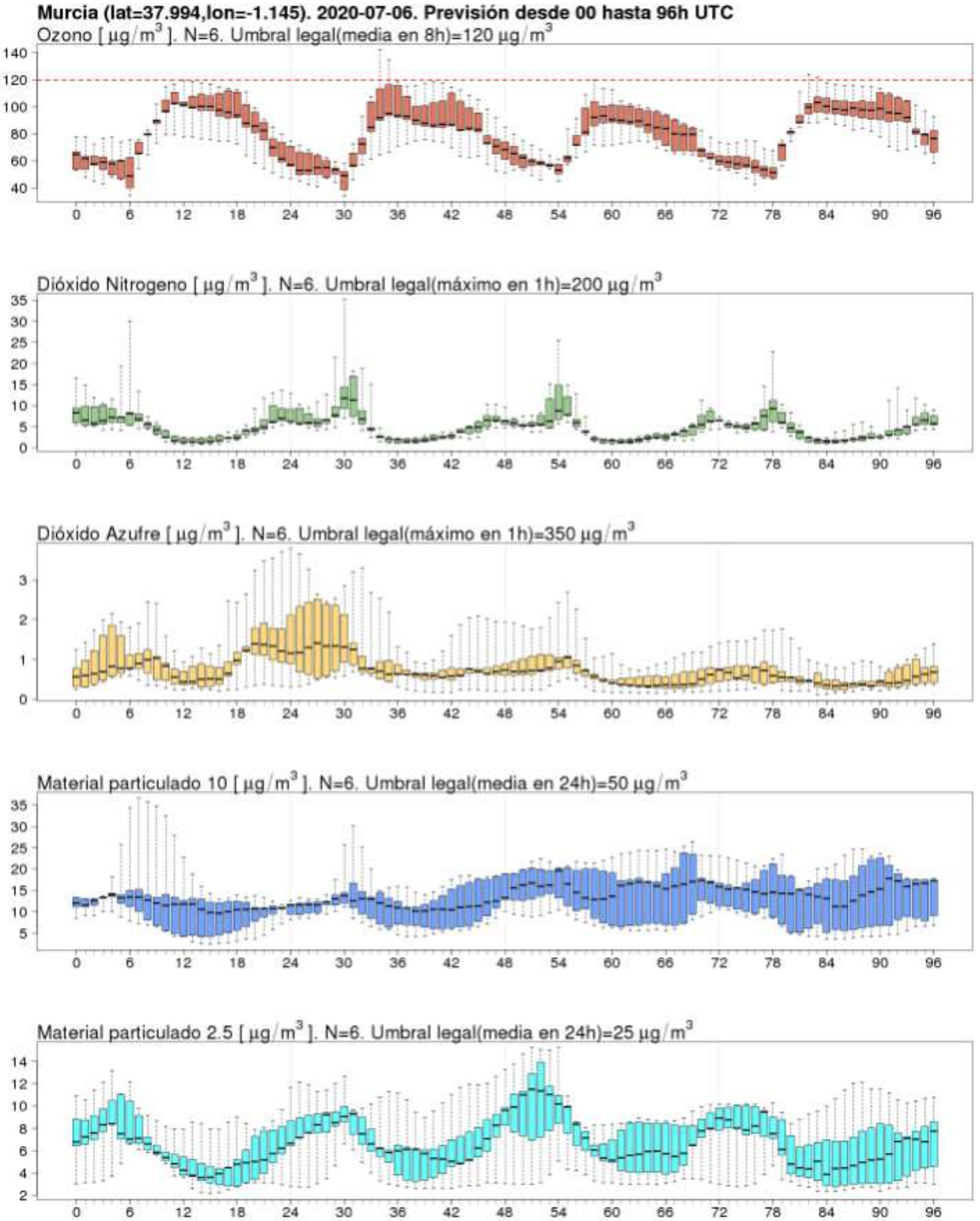
- An EPSgram is a probabilistic representation, for a given location, of the predictions of the European regional chemical transport models that are part of the Copernicus Atmosphere Monitoring Service (CAMS) program. (http://www.copernicus.eu)

- The graphs show the temporal evolution of the concentrations in µg / m3 of a series of chemical components such as O3, NO2 and SO2 and PM10 and PM2.5 particulate matter. At the top of the graph, the location with its coordinates, the start date and the scope of the forecast is presented, up to 96 hours after the start (00 UTC on the date indicated in the title). The name of the component, the number of models considered and their threshold value legislated by the European Directives appear on each particular chart.

Source: AEMET



Source: AEMET



Source: AEMET

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Grazie Mille

Muchas gracias

Thank you very much