Influence of temperature, humidity, UV radiation, air pollution on the incidence and spread of CoVid19 disease caused by the SARS-COV-2 virus in Spain.

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Participants:

- National Meteorological Service in Spain (AEMET), under the Ministry for the Ecological Transition and the Demographic Challenge, and

- Carlos III Health Institute (ISCIII), attached to the Ministry of Science and Innovation

Goal:

- Analyse and quantify the influence of temperature, humidity and UV radiation as well as air pollution (especially particulate matter) on the incidence and spread of CoVid19 disease caused by the SARS-COV-2 virus in Spain.

WORK PLAN

State Meteorological Agency (AEMET). Leader

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

Carlos III Health Institute

1.- 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.

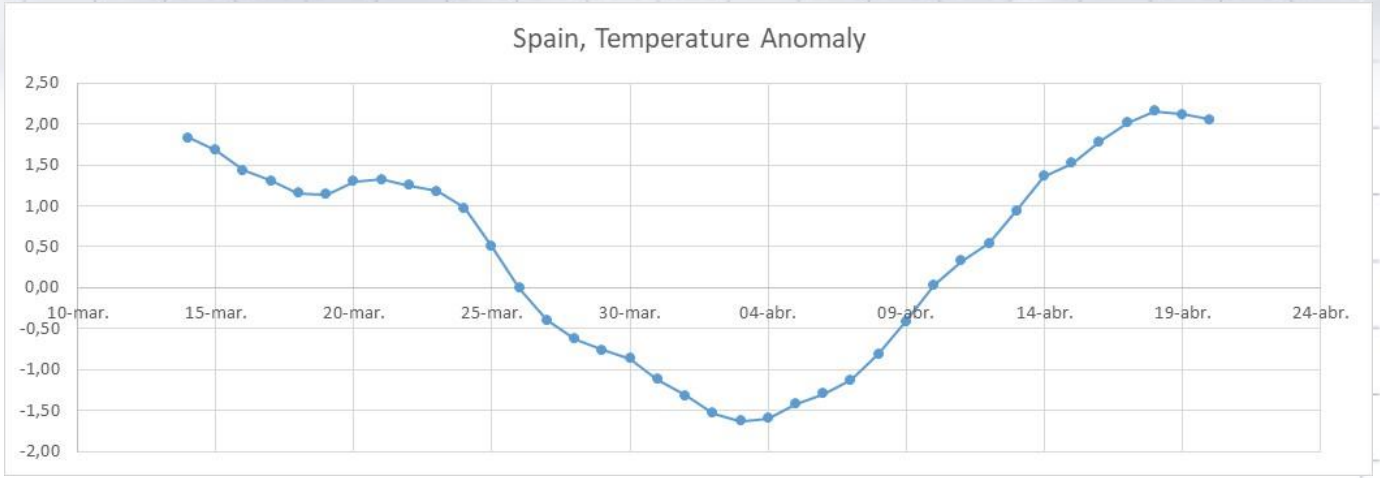
2.- Obtaining, analysing and cleaning data on the following air pollutants at provincial level:

- 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.

3.- 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.

4.- 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
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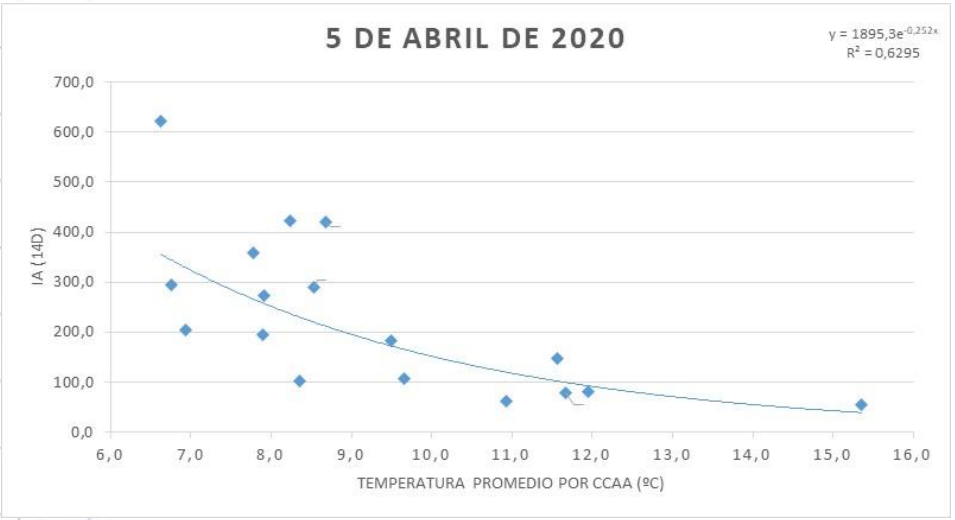
-0,50
-1,00
-1,50
-2,00
10-mar.
15-mar.
20-mar.
25-mar.
30-mar.
04-abr.
09-abr.
14-abr.
19-abr.
24-abr.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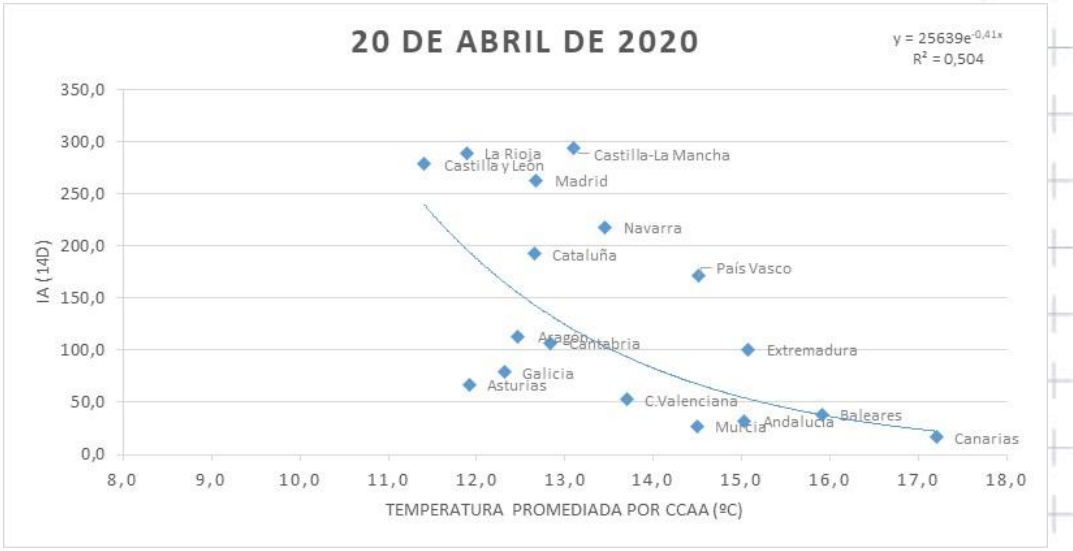
IA (14D)
TEMPERATURA PROMEDIO POR CCAA (ºC)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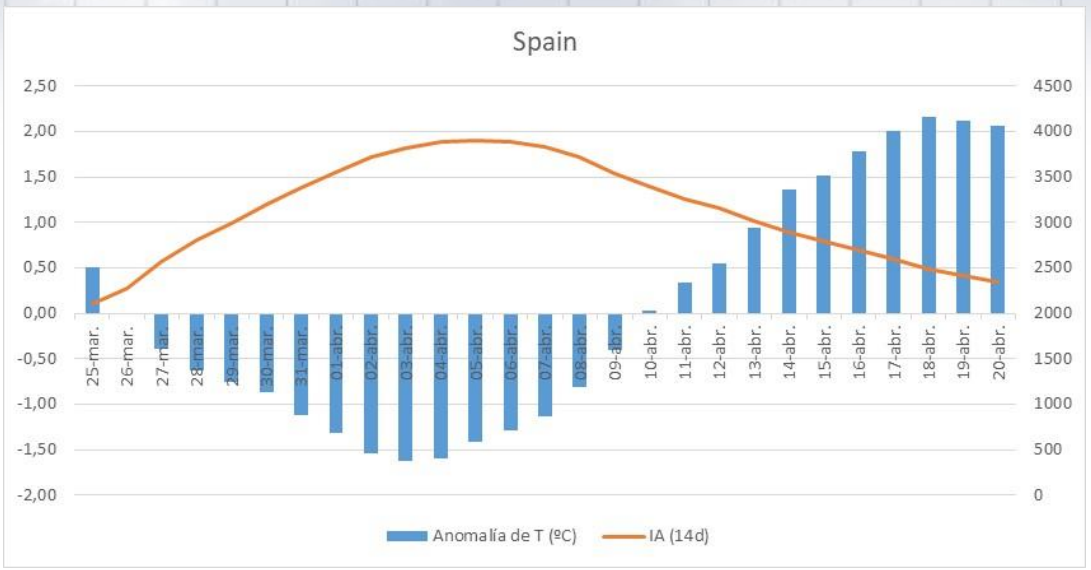
R² = 0,504
IA (14D)
TEMPERATURA PROMEDIADA POR CCAA (ºC)
La Rioja
Castilla-La Mancha
Castilla y León
Madrid
Navarra
Cataluña
País Vasco
Aragón
Cantabria
Extremadura
Galicia
Asturias
C.Valenciana
Baleares
Murcia
Andalucía
Canarias

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
16,0
14,0
12,0
10,0
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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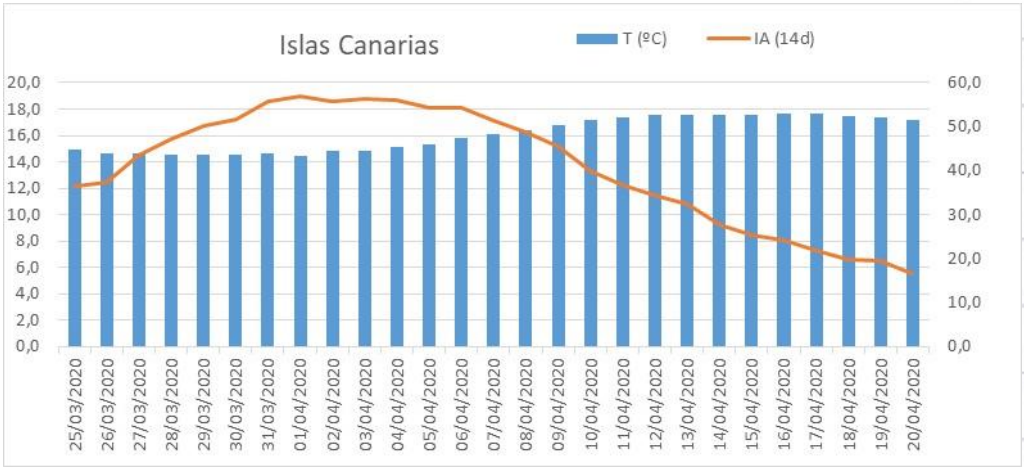
16/04/2020
18/04/2020
20/04/2020
Series1
Series2


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
04/04/2020
05/04/2020
06/04/2020
07/04/2020
08/04/2020
09/04/2020
10/04/2020
11/04/2020
12/04/2020
13/04/2020
14/04/2020
15/04/2020
16/04/2020
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 such as humidity, UV radiation and precipitation, analysing the effect of air pollution as well as the inclusion of other biological and social factors.

Muchas gracias

Muito obrigado

Thank you very much

Merci Beaucoup