

COMPARISON OF AIR QUALITY DATA DURING THE COVID-19 PANDEMIC BETWEEN ZARAGOZA AND YORK TO PREDICT FUTURE ATMOSPHERIC CHANGES.

The number of premature deaths due to air pollution is increasing, reaching more than 7 million annually in 2018 (WHO, 2018). This alarming number has led to the implementation of different measures to limit pollutant emissions which will affect the current atmospheric conditions. The study of future new atmospheric situations is of great importance to understand the consequences that it could have.

In March 2020, the disease caused by the SARS-CoV-2 virus was recognized as a pandemic by the World Health Organisation and many measures were taken to prevent its spread. People were asked to stay at home and not to travel unless for essential reasons, which lead to a significant reduction of traffic. These measures provided an ideal natural scenario for studying the effects of reduced air pollution emissions in the atmosphere to aid in predictions of future changes.

This project will focus on the comparison of atmospheric variations during 2020 and 2021 in response to the coronavirus mitigation strategies employed in two different cities: Zaragoza (Spain) and York (England). A detailed study of these two locations will be beneficial as the local factors (such as climate, meteorology and emissions sources) can be explored in more detail. This project is conceived within the wider research theme of Environmental Sustainability and Resilience, with links to chemistry in the environment, human health and environmental change.

To assess the pandemics' effect on the two cities Business as Usual scenarios (BAU) will be modelled; a prediction of what atmospheric conditions would have been like if lockdown restrictions had not been in place. There are two common methods for achieving this: historical average of the data from the 5 years before lockdown ([Lee, 2020](#)), or meteorological normalisation via machine learning ([Grange, 2020](#)).

The main reason for creating a detailed BAU scenario is to take account of differences in meteorology. The historical average aims to achieve this by smoothing out fluctuations over longer time scales but sacrifices temporal resolution. Whereas the meteorological normalisation method takes into account the measured meteorology on a given day, based on cross-correlations carried out in previous, non-pandemic years. Both methods will be explored in this project.

These BAU predictions will then be compared with the data from the air monitoring networks to see how the atmosphere was affected by the pandemic in both cities. The project will not only produce detailed insight into the response of air quality in the two cities and improve understanding of future changes in activity on pollution levels, but also provide the opportunity to develop many skills such as data handling or programming among many other research competences.

I will be fully supported and supervised by Dr Will Drysdale and Professor James Lee from the Chemistry Department at York. Regarding timescales, listed below is an estimation of what will be done in the 5-6 weeks of the Scholarship:

- Week 1-2: Training on accessing and analysing air quality data, possible visits to air monitoring sites that the group operates.
- Weeks 3-4: Analysis of data obtained and creation of BAU scenarios.

- Weeks 5-6: Comparison of both data sets, conclusions, write up of findings and production of presentations.

The project can be carried out remotely if required.