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Author: Prof. Jeanne Holm
City of Los Angeles, United States, jholm@ucla.edu

MANAGING HEALTH DISASTERS WITH SPACE DATA

Abstract

Beyond the traditional uses of satellite data for disaster management, more sophisticated uses have emerged with direct affects on human health and outcomes. Poor air quality is a persistent challenge to human health, and a constant struggle for governments to effectively measure and regulate. This challenge has been exacerbated by the COVID pandemic. With 7,000,000 deaths and 700+ million cases of COVID (including many with long haul COVID), the numbers of those affected by poor air quality are dramatically increasing from those traditionally affected such as asthma sufferers.

Predicting What We Breathe is a multi-year NASA-funded project at the City of Los Angeles that uses machine learning combining ground and space datasets to measure and predict air quality. It also creates a direct tie to policy changes and interventions at the City and regionally to improving or worsening air quality outcomes. The algorithms and data behind this are provided via open source by the research team at the California State University, Los Angeles and OpenAQ. The ground truth comes from several non-traditional but calibrated sources: neighborhood/citizen science sensor networks, a city's internet of things sensors, and regional ground sensors. Interventions vary but can include traffic regulation, gasoline regulation, pollution limits from manufacturers, green spaces and tree planting, and ensuring employers encouraging carpools and telework.

An interesting aspect of this is a program of "sister cities" – 50 cities around the globe that are provided support, workshops, training, and data during this program to be able to do the same in their cities. From Freetown to London, from Durban to Mexico City, these cities are creating a digital twin of the key factors that affect air quality in their cities and applying the predictive, machine-learning algorithms to understand the effect of local actions and legislation. Predicting What We Breathe provides the framework for this twinning effort, already incorporating factors such as wildfires, urban heat, particulate matter, ozone, smoke, wind, geography, and traffic. This digital twinning allows one city to quickly learn from another and to find similar attributes (say wildfires in Sydney and Los Angeles) that pairs cities in one or more characteristics. This project is funded through NASA's Advanced Information Systems Technology Program.