**Prediction of ozone data using machine learning with a metal oxide sensor**

Tofigh Sayahi, Alicia Garff, Timothy Quah, Katrina Le, Thomas Becnel, Pierre-Emmanuel Gaillardon, Kody Powell, Anthony Butterfield, Kerry Kelly

Ozone is a strong oxidant that can increase hospital admissions, exacerbate respiratory disease, and increase mortality. This study evaluated a low-cost metal oxide (MO) sensor to measure ozone concentration. This sensor could complement the sparsely distributed state monitoring stations and provide better spatial estimates of ozone concentration, which is especially important in remote areas where monitoring with traditional facilities is infeasible. The University of Utah has a low-cost air quality sensor network that primarily collects particulate matter concentration across Salt Lake City valley using a sensor package called AirU. In addition to the PM measurements, the AirU package includes an inexpensive MO sensor ($8) designed to detect oxidizing and reducing species. This study evaluated the MO sensor’s ability to measure ozone in the laboratory and in the field by deploying 8 AirU packages at two state monitoring stations for one year. The field data from 6 sensors were used to develop long-term ordinary least squares (OLS) and artificial neural network (machine learning, ANN) calibration models to predict ozone concentrations. The data gathered from the other two sensors were used to evaluate the effectiveness of the calibration models in estimating ozone concentrations of other sensors of the same type. The results demonstrated that the Langmuir isotherm model worked well to estimate the ozone concentrations under controlled conditions of the laboratory settings (R2>0.9), however, it failed to perform well under real-world conditions in the field (R2<0.2). The calibration results also indicated that the ANN model (R2>0.75) outperformed the OLS model (R2<0.61) in capturing the ozone concentration trends in the field.