The predicted impact of VOC emissions from *Cannabis spp.* cultivation facilities on ozone concentrations in Denver, CO.

Chi-tsan Wang[1], Christine Wiedinmyer[2], Kirsti Ashworth[3], John Ortega[4], Peter Harley, William Vizuete[*1]

1. Department of Environmental Science and Engineering, UNC Chapel Hill, NC, U.S.

2. Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO, U.S.

3. Lancaster Environment Centre, Lancaster University, U.K.

4. National Center for Atmospheric Research, Boulder, CO, U.S.

Colorado was the first US state to legalize the industrial-scale cultivation of *Cannabis spp.* for recreational purposes. There are now around 600 cannabis cultivation facilities (CCFs) in operation in the greater Denver area with an estimated 550,000 mature plants (higher than 8 inches) under cultivation at the end of 2017. We hypothesize that emissions of volatile organic compounds (VOC) from these plants may have an impact on the local and regional ozone formation. To investigate this, we calculated basal emission rates (BER) of VOC emitted from common *Cannabis spp.* clones by sampling the air from whole plant enclosures. Measured Dry-weight normalized VOC emission rates were as high as 10 $\mu g\ g^{-1}\ hr^{-1}$ and consisted mainly of myrcene (21-61%) and eucalyptol (17-40%). BER and VOC composition varied among the four different clones that were studied. We then applied the Comprehensive Air Quality Model with Extensions (CAMx) to a regulatory model protocol developed for the Western Air Quality Study (WAQS) to predict the impact of additional CCF emissions on simulated ozone formation. This is the first study to predict VOC emissions from CCFs using the new emission factor data and the latest public cannabis tracking system data from state agencies in Colorado and Washington for estimating the plant count and dry plant weight. Model simulations were performed to assess the sensitivity of model outcomes to uncertainties in emission factors and plant biomass. The projected changes in VOC emissions and ozone concentrations in Denver due to the introduction of CCFs in the model simulations indicate that this rapidly expanding industry may increase the number of exceedances of regulatory ozone standards. The model results show that daily maximum 8-hour average ozone concentrations could increase by 0.1-1.0 ppb on days when those levels exceed 75 ppb (termed by the EPA as ozone exceedance days).