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Interactive comment on "Potential Regional Air Quality Impacts of Cannabis Cultivation Facilities in Denver, Colorado" *by* Chi-Tsan Wang et al.

Anonymous Referee #2

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This manuscript presents a first attempt at compiling state-wide (Colorado) emissions inventory for monoterpenes from cannabis cultivation facilities (CCFs). The new emissions inventory is incorporated into a chemical transport model to evaluate the impact of CCFs on ambient ozone concentrations. The manuscript is well written and the topic is of interest to the ACP research community and the general public, as it is important to know how much CCFs can impact air quality and provide information to decision maker on whether mitigations may be necessary to reduce the impact. Given the interest in the topic, the large gap in data and information, and generally appropriate methodology and analysis, the manuscript is acceptable for publication provided some revisions are made to clarify some points and to not overstate the results.

Because of the large uncertainties in the emissions, the study carried out sensitivity

simulations, with emissions spanning a factor of 10, to evaluate the range of potential impacts on ozone. The manuscript states that the study used "realistic bounds on each parameter" for the emissions parameterization, but it does not clearly explain why the factors chosen were considered realistic. For all parameters (EC, DPW, and PC), insufficient justification was provided on why parameter values based on leaf enclosures data of Wang et al., 2018 are considered lower bounds. The statement ". . .plants studied by Wang et al., however, were not grown in the optimized conditions found in a CCF and the reported ECs could be conservative" needs support/citations. Optimal growth conditions are not necessarily correlated with magnitude of monoterpene emissions. Even if one considers EC values of Wang et al., 2018 be to lower bounds, what is the basis to say that a multiple of 10 is realistic?

Even in the sensitivity case with a factor of 10 increase in emissions, the impact of increased monoterpenes associated with CCF is less than 0.5 ppb in hourly ozone during the daytime and only $\sim$ 0.14 for maximum daily average 8-hour (MDA8) ozone. This is unsurprising because the percent increase in VOC emissions is only $\sim$3.5% for Denver County for the sensitive case that has 10x the base-case CCF emissions (1_EC). Figure 10's axis going up to 4000 ton/year is hardly meaningful as 1000 ton/year increase in Denver is nearly 30 times the base-case CCF emissions, and even then the increase is only $\sim$0.38 ppb in MDA8 ozone. Thus, "further data are urgently required regarding CCF-specific information on plant counts. . ." is overstating the urgency of needing to improve quantification of CCF terpene emissions with respective to ambient ozone.

There are 7 sensitivity simulations listed, but in reality there are only 6 sensitivity cases because simulation 6_PC is the same as simulation 4_DPW. Because the values of EC, DPW, and PC are assumed to be constants, the emission increase is uniform across the simulation domain such that: 2_EC = 5 x 1_EC, 3_EC = 10 x 1_EC, 4_DPW = 6_PC = 2 x 1_EC, 5_DPW = 3.33 x 1_EC, 7_PC = 4 x 1_EC. Really only 3 sensitive simulations (2x, 5x, and 10 x 1_EC) was needed to cover the emissions range explored by the 7 sensitivities simulations.

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