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Comment on acp-2021-310

Jennifer G. Murphy (Editor)

Editor comment on "Urban inland wintertime N_2O_5 and $ClNO_2$ influenced by snow-covered ground, air turbulence, and precipitation" by Kathryn D. Kulju et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-310-EC1, 2021

I am confident that this manuscript presents a novel set of observations, as the results reported in McNamara et al., 2020, from the same field campaign are focused on manipulation studies, not ambient observations.

However, in general, the reviews identify some useful areas of improvement for the manuscript. In addition, I provide some points the authors may want to consider while revising their manuscript:

I suggest replacing Figure 1 with Figure S2 so that it's clear that the majority of the analyses use the full dataset and not just the case studies used for the scavenging calculations.

Given the importance of scavenging during rainfall, fog (and to a lesser extent snowfall) should those conditions be excluded from the examination of the impacts of turbulence?

The titration of O3 and NO3 by NO is invoked as an explanation for the relationship between N2O5 and turbulence – are there NOx measurements to support this hypothesis?

As one reviewer points out, advection may be an important term in the local budget of these pollutants (indeed this connects to the point above). Can the authors provide evidence that the impacts of locally measured ground cover and turbulence dominate over (possibly correlated) advection, for example based on wind direction analysis? Additional evidence could be provided from a back-of-the-envelope calculation of the area over which the locally measured vertical exchange/surface chemistry processes would need to occur in order to meaningfully influence the budgets of N2O5 and ClNO2.