Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2017-52-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigating Diesel Engines as an Atmospheric Source of Isocyanic Acid in Urban Areas" *by* Shantanu H. Jathar et al.

Anonymous Referee #2

Received and published: 27 March 2017

This manuscript concerns the potential for diesel engines to be a source of isocyanic acid (HNCO), particularly when they are used with urea selective catalytic reduction (SCR) systems. The study is of relevance as HNCO has been mooted as a potential driver of negative health outcomes.

The work is in two parts: 1) laboratory experiments to determine the emissions of HNCO from a test engine fitted with an SCR system, with different treatments of urea (the reducing agent), and running the engine at different loads; and 2) regional chemical transport model (CTM) simulations to probe the expected ambient HNCO concentrations arising from transport sources, given the emission factors determined in part 1 (over California).

For part 1, despite the potential for urea-SCR systems to produce HNCO, the authors

report no enhancement of HNCO in the tailpipe emissions. The authors do find, however, a base level of HNCO emission from their system, as well as an emission of an HNCO photochemical precursor (likely an amide), whose emission they are able to estimate. From the emission factors they determine, they estimate that ambient HNCO concentrations over California maximize at around 20-100 pptv (in the LA Basin), depending on assumptions related to deposition of HNCO.

Overall, I think that this study is well done, well written, and a valuable addition to the growing HNCO literature, providing an impetus to others to investigate the sources, fate and impacts of this compound further. I would be happy to recommend publication of this study after consideration of my minor points below.

Minor points/Technical corrections

General: There are lots of long paragraphs throughout. Please consider breaking them up to make reading the study less daunting!

P2, L14: Stylistic note - have used "it is clear" in two consecutive sentences

P2, L37 (and throughout): Please take care that the reactions/reagents are formatted well (i.e. not italics)

P3, L14: There are other limitations of the Young et al. study, such as assuming het chem is an irreversible sink. Consider bringing in the Barth et al. (2013) study at this point.

P6, L1: Any comment on what your emissions might be if you scaled them with HCN? (Also, I believe Young et al. effectively scaled theirs with CO for non biomass burning emissions since the HCN emissions were scaled with CO)

P7, L19: "Comparison with earlier work" (no need for "inter"?)

P7, L23: Is "ensemble" needed?

P8, L15-: For the model sections... I appreciate that this is a basic model study, but

it would be worth saying a bit more about the other uncertainties when modeling. E.g., uncertainties in emissions/chemistry of species important for OH, uncertainties in transport schemes, lack of (?) het chemistry, etc.

P8, L20: Some brief reminder of the context of the 1 ppbv value would be good here

P9, L3: Please explain the use of the benzene correlation

P10, L1: Is agriculture also a source of HNCO precursors?

P10, L4: "Using our experimentally-determined emission factors, we used a chemical..."

P13, Fig 1 caption: "The fits, which parameterize..."

P14, Fig 4 caption: Explain "low" and "high", say that Roberts et al. (2014) refers to CalNex (as per the panel), and please fix the color bars - how can LA be on the scale if the color bars stop at $\sim$50% of the color bar value? (Should there be a triangle to indicate above 10 or 100? Or perhaps a note to say that the color bar saturates)

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2017-52, 2017.