Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-398-SC1, 2017

Atmospheric Measurement Techniques Discussions
Open Access

Interactive comment on "Evaluation of the accuracy of thermal dissociation CRDS and LIF techniques for atmospheric measurement of reactive nitrogen species" *by* Caroline C. Womack et al.

H. Osthoff

hosthoff@ucalgary.ca

Received and published: 13 February 2017

Womack et al. evaluated the conversion of dinitrogen pentoxide, nitric acid, ammonia, and ammonium nitrate in heated quartz inlets in two thermal dissociation instruments, the NOAA TD-CRDS and the Berkeley TD-LIF. They characterized the conversion of nitric acid as functions of flow rate, set temperature, relative humidity, and in the presence of O3, CO, propane, and a VOC mixture. The measurements are novel and of great interest to users of TD instruments, of which there are now a handful (Paul et al., 2009;Thieser et al., 2016;Sadanaga et al., 2016;Day et al., 2002;Wild et al., 2014), and

complements nicely the recent work by the Crowley group (Sobanski et al., 2016).

I read this paper with great interest since my group has worked on the measurement of nitrogen oxides by TD-CRDS for some time. There is a lot of interesting information in this paper which are quite useful.

Below I would like to pass on some notes that I made reading this and will hopefully help improve this manuscript in its final version.

Title. The title seems a bit broad given that not all of the major NOy species were tested (e.g., PAN was not). Also, since measurement accuracy was not actually stated (e.g.," the measurements of .... are accurate to +/-x%" or something to that effect) , perhaps the title should be "Evaluation of interferences of ..."?

pg 1, line 27. The paper that should be cited for detection of ClNO2 by CRDS is (Thaler et al., 2011).

pg 3, line 27. TD-CIMS instruments do not quantify ANs. They are usually quantified by clustering reactions with iodide and do not utilize a TD inlet.

pg 7, line 3. Typo (Marrin)

pg 9, lines 21-22, and all figure captions. Please specify which instrument was used to monitor NO2. It was not always obvious.

pg 10, line 27. Sobanski (2016) is not listed in the reference section.

pg 11, line 25. "The Berkeley group has found the HNO3 conversion to be oven dependent even for identical pressure and flow conditions indicating some but not all ovens have impurities at the walls that effectively catalyze HNO3 decomposition." This statement has major implications and should perhaps be featured more prominently (maybe repeated in the conclusion section). Can the authors speculate as to what these impurities might be? How permanent are these effects? Could they, for example, occur between inlet characterizations in the field and compromise results?

pg 15, line 20. NH4NO2 – typo

pg 18, line 27. Slusher et al. 2004 is not a suitable reference as CIMS quantifies PAN and N2O5 at different masses and no corrections are necessary.

Figure S7. Not sure what is meant by 0 nm sized particles – maybe it should be "no particles"? âĂČ References Day, D. A., Wooldridge, P. J., Dillon, M. B., Thornton, J. A., and Cohen, R. C.: A thermal dissociation laser-induced fluorescence instrument for in situ detection of NO2, peroxy nitrates, alkyl nitrates, and HNO3, J. Geophys. Res., 107, D6, 4046, 10.1029/2001JD000779, 2002. Paul, D., Furgeson, A., and Osthoff, H. D.: Measurement of total alkyl and peroxy nitrates by thermal decomposition cavity ring-down spectroscopy, Rev. Sci. Instrum., 80, 114101, 10.1063/1.3258204 2009. Sadanaga, Y., Takaji, R., Ishiyama, A., Nakajima, K., Matsuki, A., and Bandow, H.: Thermal dissociation cavity attenuated phase shift spectroscopy for continuous measurement of total peroxy and organic nitrates in the clean atmosphere, Rev. Sci. Instrum., 87, 074102, 10.1063/1.4958167, 2016. Sobanski, N., Schuladen, J., Schuster, G., Lelieveld, J., and Crowley, J. N.: A five-channel cavity ring-down spectrometer for the detection of NO2, NO3, N2O5, total peroxy nitrates and total alkyl nitrates, Atmos. Meas. Tech., 9, 5103-5118, 10.5194/amt-9-5103-2016, 2016. Thaler, R. D., Mielke, L. H., and Osthoff, H. D.: Quantification of Nitryl Chloride at Part Per Trillion Mixing Ratios by Thermal Dissociation Cavity Ring-Down Spectroscopy, Anal. Chem., 83, 2761-2766, 10.1021/ac200055z, 2011. Thieser, J., Schuster, G., Schuladen, J., Phillips, G. J., Reiffs, A., Parchatka, U., Pöhler, D., Lelieveld, J., and Crowley, J. N.: A two-channel thermal dissociation cavity ring-down spectrometer for the detection of ambient NO2, RO2NO2 and RONO2, Atmos. Meas. Tech., 9, 553-576, 10.5194/amt-9-553-2016, 2016. Wild, R. J., Edwards, P. M., Dube, W. P., Baumann, K., Edgerton, E. S., Quinn, P. K., Roberts, J. M., Rollins, A. W., Veres, P. R., Warneke, C., Williams, E. J., Yuan, B., and Brown, S. S.: A Measurement of Total Reactive Nitrogen, NOy, together with NO2, NO, and O3 via Cavity Ring-down Spectroscopy, Environm. Sci. Technol., 48, 9609-9615, 10.1021/es501896w, 2014.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-398, 2016.