We thank the referee for taking the time to assess our manuscript and for the provision of helpful comments. In the following we list the referee's comment (black) our reply (blue) and indicate what changes have been made to the manuscript (green).

Referee Comment RC1

Türk et al. describe a compact cavity ring-down spectrometer for quantification of NO_3 and N_2O_5. In spite of its compactness, the instrument achieves excellent limits of detection and good accuracy. Sample ambient air measurements are presented.

Numerous such instruments have been described in the literature, including by the authors. While the manuscript is written well, the authors need to revise the discussion and explain what they would consider novel or different in their approach. Essentially, the manuscript requires a section comparing this new instrument with existing methods (include a Table summarizing these) as well as a critical discussion of this instrument's performance, advantages and disadvantages compared to existing methods.

We have added text (new Section 3.8) and a Table that compares the instrument with existing setups from this laboratory as well as CRDS and BBCEAS instruments from other research groups.

3.8 Comparison with field-deployable cavity enhanced instruments for NO_3.

During the last few decades, several instruments using cavity-enhanced absorption spectroscopy have been developed for ambient measurement of NO3 (and N2O5). Table 2 lists those instruments that have been described in the literature which were designed or used for field-deployment. The Table includes instrumental parameters such as LOD (for both NO3 and N2O5) and the footprint, where this information is available.

While some of the first instruments, e.g. (Brown et al., 2001), used large pulsed lasers and were mounted on optical tables, the availability of laser diodes has reduced the cost and size requirements. The most commonly deployed modern detection methods are BBCEAS and CRDS, the best of which ((Brown et al., 2001; Brown et al., 2002a; Dubé et al., 2006; Wagner et al., 2011; Sobanski et al., 2016a)) achieve < 1 pptv limits of detection within one second of integration time, as does the present instrument. Note that all of these are CRDS instruments, with BBCEAS-based methods having slightly poorer LODs. The two features of the present instrument that set it aside from most others is the small footprint and ease of mirror-adjustment / cleaning and optical stability.

The vertical alignment of the cavities in our system result in the smallest footprint among those instruments that achieve sub-pptv performance at 1 second integration time. Compared to our present instrument (Sobanski et al., 2016a), and previous versions (Schuster et al., 2009) we have greatly reduced the footprint (factor > 2) and weight (factor 2), which together allow easier transport and enhances the possibility of measurements in confined spaces such as tower-elevators. While it is not possible to compare the "ease of optical adjustment" and optimization of ring-down times with instruments that do not stem from our group, the mirror-tilting mechanism in our latest instrument and its (lack of) response to e.g. mechanical and thermal stress is superior to the use of commercial optical mounts (Sobanski et al., 2016a) as is the ease of mirror removal, cleaning and replacement. These attributes make deployment of the present instrument in confined spaces and non-laboratory environments easier to achieve than our previous setups.

Table 2: Comparison of NO_3 and/or N_2O_5 instruments using optical cavities and designed for field deployment.

Reference	Method	NO_3 limit [1]	N_2O_5 limit [1]	Footprint (cm × cm)	Height (cm)
Brown et al. (2001)	CRDS	< 1 pptv (1σ 50s)	-	61 × 122 × 122 [2]	
Brown et al. (2002b)	CRDS	< 1 pptv (2σ 5s)	< 1 pptv (2σ 5s)	122 × 61	-
Simpson (2003)	CRDS	-	2.4 pptv (2σ 25s)	20 × 30 × 122 [2]	
Ball et al. (2004)	BBCEAS	2.5 pptv (1σ 516s)	-	-	-
Bitter et al. (2005)	BBCEAS	1 pptv (1σ 100s)	-	300 × 120	-
Ayers et al. (2005)	CRDS	1.4 pptv (2σ 4.6s)	-	-	-
Dubé et al. (2006)	CRDS	< 1 pptv (1σ 1s)	1 pptv (1σ 1s)	110 × 52.5	-
Langridge et al. (2008)	BBCEAS	< 1 pptv (1σ 10s)	-	-	-
Schuster et al. (2009)	CRDS	2 pptv (1σ 5s)		110 × 40 [3]	110 [3]
Kennedy et al. (2011)	BBCEAS	< 1 pptv (1σ 2s)	< 1 pptv (1σ 2s)	110 × 55 [4]	130 [4]
Wagner et al. (2011)	CRDS	< 1 pptv (1σ 1s)	< 1 pptv (1σ 1s)	110 × 55 [4]	-
Odame-Ankrah and Osthoff (2011)	CRDS	1.5 pptv (1σ 10s)	2.2 pptv (1σ 10s)	74 × 53	85
Wang et al. (2015)	CRDS	3.2 pptv (2σ 10s)	-	-	-
Sobanski et al. (2016a)	CRDS	< 1 pptv (1σ 1s)	2 pptv (1σ 1s)	130 × 60 [3]	155 [3]
Wang et al. (2017)	BBCEAS	2.4 pptv (1σ 1s)	2.7 pptv (1σ 1s)	90 × 40 × 25 [2]	
Li et al. (2018)	CRDS	2.3 pptv (1σ 2.5s)	3.1 pptv (1σ 2.5s)	110 × 40 × 35 [2]	
Nam et al. (2022)	BBCEAS	1.4 pptv (1σ 1s)	-	-	-
This work	CRDS	< 1pptv (1σ 1s)	< 2pptv (1σ 1s)	55 × 55	150

Notes: [1] LOD or precision (typically reported for BBCEAS). [2] Stated as reported, but the optical path is likely horizontally aligned, which increases the footprint. [3] Value based on personal communication. [4] Value based on visual estimation.