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Atmospheric Measurement Techniques Discussions

Interactive comment on "Laser induced fluorescence based detection of atmospheric nitrogen dioxide and comparison of different techniques during the PARADE 2011 field campaign" *by* Umar Javed et al.

Anonymous Referee #1

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General comments:
This manuscript describes a new laser induced fluorescence instrument developed for ground-based and aircraft measurements of NO2. The authors report the instruments characteristics, laboratory tests, an extensive description of the calibration system, and the first results of a field campaign in 2011, where they carried out an intercomparison with other systems that measured NO2 using different techniques.

The manuscript is generally well written, and the main results of the intercomparison

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Discussion paper

and the description of a new LIF system characteristics, which uses a CW laser is of a certain importance for future developer of NO2 systems and for the all community working on NOx measurements. In my opinion it fits with AMT scopes and I recommend publication, after the authors address the following questions and comments.

Specific comments:
lines 52-67: Since the aim of the manuscript is to describe a new NO2 instruments, and because there are different techniques to measure NO and NO2, I would limit the review of the measurements techniques to those for NO2 observation, omitting those for NO detection.
Line 150-155: I suggest to describe with more details the time-resolved florescence signal detection, trigger system, synchronization, how to take care of laser power fluctuation and so on, since this is the key part of the system that may be managed carefully using a CW laser.
Line 157-265: The calibration system that uses the NO tritation by O3 to produce NO2 is described and used in different ground-based instruments (i.e. Ryarson et al, 2000, Matsumoto et al., 2000, Osthoff et al., 2006). In my opinion it is a good approach that can be a system for periodical laboratory check of the instrument performance and of the possible NO2 cylinder degradation, but according also to figure 7 it is the bigger part of the system and includes many components not so compact such us the ozone generator and the ozone analyser. The use of this calibration system seems not easy on ground-based field campaign and really complicated on aircraft.

Technical corrections:
Line 52: It is quite rare but sometimes NO2 can be more than 100 ppb so I would replace '100' with 'hundreds'. Line 73: Add 'the' between 'in' and 'past'.
Line 74: remove the subscript to the 'v' of pptv.
Line 79: The reference reported (Dari-Salisburgo et al, 2009) describes the first

ground-based system developed by that group, I suggest to substitute this reference with the work of the same group (Di Carlo et al., 2013) that reports the evolution of their TD-LIF for aircraft measurements that has better sensitivity and performances.
Line 182: Remove 'Figure 3'
Line 710 (Table 1): I would include the evolution of the instrument described by Dari-Salisburgo et al, 2009, used also for aircraft measurements, because it uses another laser a Nd:YVO4 pulse laser, and has better performance in terms of LOD compared with that described in Dari-Salisburgo et al, 2009, more details can be found in Di Carlo et al., 2013.

Reference

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