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Atmospheric Measurement Techniques Discussions

Interactive comment on "A cavity ring-down spectroscopy sensor for measurements of gaseous elemental mercury – Part 1: Development for high time resolution measurements in ambient air" *by* A. Pierce et al.

Anonymous Referee #2

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The paper discusses a cavity ring-down spectroscopy sensor to measure gaseous elemental mercury. The ultimate goal is to develop a sensor with faster time resolution than the available standard – 2.5 min – and thus enable new observations (e.g., mercury cycling.)

Refinements to a laboratory prototype were made (e.g., improved line locking) and the system was integrated into a field portable laboratory container. Ambient air tests were performed which included inter-comparisons with other sensors.

The paper clearly describes the instrument improvements over the previous prototype. It was well-written, the scientific methods and assumptions were valid, and the experiments were sufficient to support conclusions. However it hard to say that "substantial" conclusions were reached. More work is needed to stabilize the instrument and deal with ozone, which is a major interference. It is unclear why the ambient air measurements are to be fully discussed in a part 2 of the paper (i.e, only preliminary data was shown).

Specific Comments

(1) The authors should reference the laser-based fast-time-response mercury sensor development work done at Sandia National Laboratories in 2007-2008. A few references are listed below but more detailed literature search could be done.

http://www.sandia.gov/remote-sensing/applications-caseStudies/mercury.php

http://144.206.159.178/ft/CONF/16410985/16411002.pdf

Alexandra A. Hoops, Thomas A. Reichardt, Dahv. A. V. Kliner, Jeffrey P. Koplow, and Sean W. Moore, Detection of mercuric chloride by photofragment emission using a frequency-converted fiber amplifier, Applied Optics, Vol. 46, Issue 19, pp. 4008-4014 (2007) http://dx.doi.org/10.1364/AO.46.004008

(2) In addition to high-time resolution, the goal is to create an instrument capable of continuous and automated measurements of GEM in ambient air. The authors should discuss how this could be achieved – or on what time scales – with a flash-lamp pumped Nd:YAG and dye laser system. Beyond a demonstration of the proof-of-principal, this laser system could not be fully automated and run continuously for a month (e.g. technical personnel would needed for bi-monthly flash-lamp changes at 50Hz, dye lifetime would need to be considered, etc.)

(3) In this referee's option – incremental improvement to the prototype was demonstrated but substantial progress over what is in the literature was not shown.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8995, 2012.