

Interactive comment on “Development and characterization of the CU ground MAX-DOAS instrument: lowering RMS noise and first measurements of BrO, IO, and CHOCHO near Pensacola, FL” by S. Coburn et al.

Anonymous Referee #2

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Manuscript “Development and Characterization of the CU Ground MAX-DOAS Instrument: lowering RMS noise and first measurements of BrO, IO, and CHOCHO near Pensacola, FL” by Coburn et al. provides a detailed description on development of ground-based MAX-DOAS system capable of achieving low RMS values often necessary for detection of trace gases that are present in very low concentrations in the boundary layer. In addition, this paper presents a brief description on measurements of IO, BrO, Glyoxal, HCHO and NO₂ at the Florida coast.

The topic of the paper fits into the scope of AMT. It is well-written and contains appro-

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priate figures.

Presented study on factors affecting the magnitude of RMS of the residual spectrum is very thorough, and definitely of interest for scientific community. However, I was disappointed by the lack of interpretation for measurements also presented in this manuscript.

I recommend publication of this paper if comments below are addressed.

Specific comments:

Section 3.1 shows results of temperature sensitivity test. Why the five test temperatures in the range between 27°C and 40°C were selected? Were other, more extreme temperature values evaluated? Being a field instrument, MAX-DOAS can easily be exposed to a wider temperature range. Have you tested at lower temperatures, for example 5°C, or 15°C or 20°C?

Page 261, line 24-25 – Please clarify if Ring spectrum was calculated for each analyzed spectrum, or single Ring spectrum was used.

Page 261, line 19, through Page 262, line 25 - This description is rather lengthily and confusing. I think that this information (or a big part of it) can be much better relayed in a table format.

Page 263, line 22 through Page 265, line 27 (Section 4.2):

Please provide detection limits for all measured species.

Provide wavelength regions used for all trace gas spectral evaluation.

What were NO_x levels at the times of measurements? What are the highest NO_x levels at which BrO and IO were observed?

Why elevation viewing angles of 25° and 155° degrees were chosen to estimate trace gas average daytime VCDs? For species located close to the surface, especially one

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like IO, lower elevation viewing angles would serve better. Can you do better than to use geometric AMF?

Based on values and shapes of dSCD curves for different trace gases and O₄, please expand discussion on spatial distribution of observed trace gases, especially IO, BrO and CHOCHO.

Figure 8:

-Figure 8 captions state that IO analyzed in 425–438 nm spectral range, but IO analysis example in this figure shows range of 415-438 nm.

Figure 9:

-It is very difficult to see anything on this figure. It might be better to make it into two figures and/or omit some viewing angles.

-Show error bars

-Legend on Figure 9 lists 90° elevation viewing angle. Is this a mistake? Usually 90° is used as a Fraunhofer reference.

-Based on the data presented in this figure, BrO was only measured above detection limit at high SZA. Were there other days (not shown in Figure 9) when BrO was detected at lower SZA?

Table 1 is missing two MAX-DOAS instruments which have been used for halogen oxides detection. Below are the references:

1. Pikelnaya et al. (2007), Intercomparison of multi-axis and long-path differential optical absorption spectroscopy measurements in the marine boundary layer, JGR, Vol. 112, Issue D10, doi:10.1029/2006JD007727.

2. Carlson et al. (2010), A low power automated MAX-DOAS instrument for the Arctic and other remote unmanned locations, AMT, Vol. 3, Issue 2, pp 429 -439.

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Technical comments:

Page 256, lines 23-26 - Rewrite this sentence.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 247, 2011.

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