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Atmospheric Measurement Techniques Discussions

Interactive comment on "A low power automated MAX-DOAS instrument for the Arctic and other remote unmanned locations" *by* D. Carlson et al.

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Comments/Changes, Referee #1:

We thank the reviewer for the comments on this manuscript. These comments clear up some ambiguities in our text and enhance the manuscript. These comments have been addressed in the following ways.

Abstract: The new instrument is specified as "passive" in the abstract.

P2349, line 2: OIO was added to the list of detectable species in the UV/Visible wavelength region.

P2349, line 10: The sentence describing subtraction of a reference spectrum was split into two sentences.

P2350, line 29: The Simpson, 2009b reference was corrected in the reference list.

P2351, line 1: The spelling of SCIAMACHY was corrected.

P2351, line 9: The statement regarding resolution of satellite BrO observations was modified. The spatial resolution of satellite observations is not stated to be a limitation. However, satellite can only make observations during an overpass, which is one or two times per day. This temporal resolution is very course compared to the sub hourly observations of the MAX-DOAS technique. BrO and ozone concentrations can change drastically on the timescale of a day, through either reactive chemistry or advection processes, which implies that the temporal resolution of satellite observations is indeed a limitation in observing diurnal patterns.

P2351, line 25: The Galle et al., 2002 reference was corrected in the reference list.

P2352, line 10: The spectrometer is passively temperature stabilized by placing it either in the sea water, deep in the sea ice, or possibly in the ground as a heat reservoir. This stabilization causes all temperature fluctuations to very slow (annual cycling) such that the zenith and all low elevation spectra are within fractions of a degree Kelvin of each other. We discuss this further below and left the phrase "passively temperature stabilized" here.

P2352, line 14: The title of section 2 was changed from "Instrumental" to "Instrument"

P2353 line 1 and P2354 line 19: Statements have been added to better indicate how this new MAX-DOAS scan head is unique to past instruments.

P2354, line 6: The LED wavelength specified in the text was corrected to match the value shown in Figure 3. The wavelength listed earlier was the nominal wavelength of the LED that was ordered; however the output wavelength slightly varies LED to LED and with temperature.

P2355, line 8: Weidner et al., 2005 is referenced as a previous DOAS instrument which utilized the Ocean Optics HR2000 spectrometer.

P2355, line 13: BrO and OClO were added to the list of species detectable by the Ocean Optics HR2000 spectrometer.

P2355, line 21: A brief discussion of the spectral drift with respect to changes in temperature was added.

P2356, line 4: It is specified that the tilt meter is powered off in between measurements to save power. The buoy is frozen into the sea ice and only varies its tilt very seldom (when the ice shifts). If the buoy were to go into open water, the operation mode would be shifted to actively stabilize the view angle.

Section 4.2 Polarization effects: The fiber optic acts as a depolarizer, although not a perfect one; therefore we tested how well the fiber depolarized the light and reported the result. We agree that these features are mostly likely low frequency signals that probably don't interfere with BrO's spectrally narrow lines. We added text stating that a depolarizer could be added to improve the performance.

P2360, line 4: The maximum instrument operational time was stated vary widely depending on instrument use and battery capacity. It was acknowledged that multi-year data sets are possible.

P2360, line 8: The absorption cross sections used have been specified in section 4.4. The Donohoue et al. (in preparation) reference describes the exact fitting procedure used in this study, which is why it the predominant reference when discussing spectral fitting (section 4.4). The Donohoue et al. method essentially relies on the Aliwell et al. (2002) intercomparision, which is highly referenced in this section as the source of the method.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 2347, 2009.