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Atmospheric Measurement Techniques Discussions



# *Interactive comment on* "Direct-sun total ozone data from a Bentham spectroradiometer: methodology and comparison with satellite observations" *by* M. Antón et al.

**Anonymous Referee #1**

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This reviewer finds the paper by Anton et al of interest to the community. It is not a paper accomplishing ground-breaking research, but does show interesting comparisons with satellite measurements. Those comparisons need to be explained in more detail than is given in this version of the paper mainly due to satellite footprint size and the resulting spatial averaging of sources that occurs over that footprint – the 3 satellites mentioned have very different footprints – should those measurements agree or disagree with the line-of-sight spatial average of the direct sun measurements. General Comments: âĂć (1) There needs to be an expanded description of the instrument used – e.g., it is a double, but is it scanned or does it have a CCD type detector with a large



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intermediate slit? Spectral resolution is confused in the text. What is the detector? Focal length? Is there scattered light in the UV region from longer wavelengths even in the double? Is there a filter in place to limit longer wavelength radiation scattering onto the detector? If scanned, how long does it take to make a scan (i.e. how many spectra taken in the 15-min observation period)? What, if any, has been the effects of fiber optic feeds on the instrument performance? What is unique about the instrument? âĂć (2) The authors continually refer to the Bentham spectrometer and, e.g., in the conclusions state that other Bentham systems could do similar work. Why is this data specific to the Bentham system? One is measuring an atmospheric parameter (TOC) and surely it should be instrument-independent if the measurement is made correctly. The authors never make any argument about the uniqueness of their particular system – is there any uniqueness to the Bentham system? âĂć (3) The authors need to state what is new using their technique – why not just purchase a double Brewer, for example? âĂć (4) The authors have compared their TOC values with satellite values from OMI, Scia, and GOME. As pointed out by the authors, these satellites all have a different footprint over the observation location. The ground data are clearly influenced by local urban conditions, as pointed out by the authors. But there is no discussion of several important points: o (4a) What is the effect of the different spatial footprints on the comparison since clearly GOME, Scia, and OMI are very different in footprint size and thus in the spatial regions they sample regionally. GOME does far more averaging than OMI, for example. What effect does this have on the comparison? Does one expect agreement with these large differences over the observing site? Given the differences in spatial observational scales of these satellite instruments and the presence of tropospheric ozone some of which comes from urban areas, would one expect the satellite data to agree and serve as a standard of comparison for the ground instrument? o (4b)The authors do not discuss the relative vertical sensitivity of the various satellite instruments to ozone – their averaging kernels. None of these instruments when used in the uv sees to the surface of the earth due to increased scattering from N2/O2. So the satellite sensitivity to surface ozone is not very good. What effect does this have on



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the comparison of the ground data with the satellite data, and the different averaging kernels between the 3 satellite instruments?

Specific Comments: âĂć (1) Please remove “Bentham” from the title of the paper – what spectrometer is used does not need to be in the title âĂć (2) 8132/26 – to say that ozone has a substantial influence over the weather and climate on regional to global spatial scales is a gross exaggeration unless one is referring to the entire ozone layer in the stratosphere and even then the effect is not especially large. The authors are talking in the context of greenhouse gases and greenhouse gas changes, and the ozone contribution to the greenhouse effect is fairly small ($\sim$<10%). âĂć (3) 8133/7 – should specifically mention the global Dobson network and why it is not sufficient for this application âĂć (4) 8134/1 – not clear what “this specific issue” is? Do the authors refer to a system that records the entire spectrum as the Bentham does from 280-600nm simultaneously or by scanning (not specified at this point in the paper), as opposed to, e.g., the Brewer system which looks only at specific wavelengths? If a multiplexing detector is used, is the spectrograph an imaging one, or does the image quality (i.e. spectral resolution) vary significantly across the detector? The instruments mentioned on 8133 all look at the sun. The paragraph on top of page 8134 is very unclear – are the authors referring only to measurements by Bentham type instruments, which seems peculiar since TOC should not depend on type of instrument used. âĂć (5) 8135/5 – resolution is specified as 0.48nm and then FWHM of a spectral line is given as 1.05nm. If the FWHM of a laser line is 1.05nm, then the spectral resolution of the instrument in the given application is 1.05nm, not 0.48nm. What exactly does the 0.48nm refer to? âĂć (6) 8135/7 – what is the response of the diffuser used for global irradiance? Should be a cosine-like angular dependence. What is the effect of the use of fibre optics – what type is used, what are special characteristics, what effect does, e.g., movement of the fibres have on the measured direct solar irradiance. The global diffuser system is not mentioned anywhere later in the paper and its discussion should be removed from the paper – it is irrelevant to the discussion. âĂć (7) 8135/22 – the use of a triangular slit function implies a scanning system – is this a scanner? Being



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a double system it likely is, but not necessarily (the intermediate slit could be quite large to accommodate a multiplexing detector) âĂć (8) 8135/24 – what is an “expanded uncertainty”? Why does the pointing of the collimator tube combined with the fibre optic depend on solar zenith angle (i.e. pointing angle of the telescope)? This would seem to only be true for a global diffuser, not a simple open collimator with an embedded diffuser âĂć (9) 8136 – see comments on the applicability of the various satellite data in the first section of this review – these are important points the authors need to consider âĂć (10) 8142/8 – the value 0.410 should be 0.41? due to significant figures? âĂć (11) 8142/22 – please expand on the problems with, e.g., chemical changes in atmospheric ozone and the applicability of the Langley method to determine ETC. What is meant by “atmospheric disturbances”? Chemical changes will not be random. âĂć (12) 8144/20 – monotonic âĂć (13) 8144/21 – the 50-60DU increase is explained as local pollution, but the satellite averaging kernels are very small at the surface, so how does this urban increase compute with comparisons to satellite data? Please discuss the interplay of satellite sensitivity to ozone vs altitude and the line of sight measurements made by the ground instrument. âĂć (14) 8146/4 – the authors average the ground data from 11-13h for comparison with the satellite data, but, e.g., OMI overpasses are typically between 13:30 and 14:00h. Why not use the ground measurements for comparison at the appropriate satellite overpass time? âĂć (15) 8158/fig2 – mention the half days at AM

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Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8131, 2012.