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***Interactive comment on* “The spatial distribution of the reactive iodine species IO from simultaneous active and passive DOAS observations” by K. Seitz et al.**

Anonymous Referee #3

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This paper describes a comprehensive DOAS study of iodine chemistry at Mace Head, Ireland. A long-path DOAS using a near-field path over the intertidal zone, and a longer path over the ocean, confirms the conclusion of Saiz-Lopez et al. (2006) that the observed iodine oxides (at this location) are localized to the intertidal zone. A MAX-DOAS was employed to gain information about the vertical extent of the IO, and shows that the IO is confined to the base of the boundary layer. This is therefore a valuable study, particularly the MAX-DOAS information about the vertical profile which is amongst the first such measurements (in contrast, the horizontal inhomogeneity of IO in coastal regions has recently been confirmed by DOAS and LIF measurements at the RHaMBLe experiment in Roscoff (France)).

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However, more could have been made of the MAX-DOAS measurements. Considering the title is 'The spatial distribution [...]', the MAX-DOAS measurements should have played a bigger role in the interpretation of the data. For instance, an example of a spectroscopic fit for the MAX-data is not provided, nor is there a discussion of visibility with the help of O4 slant columns. Did the authors check the influence of the water Ring on the retrievals, since reflection from the surface is considered as one explanation for the large IO columns? Do the authors expect to observe OIO and I2, both highly photolabile species, with the MAX-DOAS technique?

LP-DOAS fit: What do the authors gain from fitting the 4th line just after the gap in the wavelength window? This line is the most poorly fitted one. In the region of this fourth line, water and O4 have strong absorption features as well. Why are those spectra not included in the fit? What about glyoxal? I'm puzzled by the drift in base line of the LP-data, which seems to be about 10 ppt over 5 days. What do the authors mean when stating that the light is not as well mixed with the new fibre (p. 21381, l. 14)? Since the individual spectra are normalised by lamp spectra, shouldn't that remove instrumental features such as drifts over time?

Why is the detection limit estimated from the statistical errors and not from the residual of the fit (p. 21377, l.14)?

The polynomial in the DOAS fit does not only account for broad band structures due to scattering, but also due to broad band absorption and broad band instrumental features (p. 21377, l. 12).

The references are not up to date, e.g. Dixneuf et al. (2009), Mahajan et al. (2009), Read et al. (2008), Schönhardt et al. (2008), Rhamble special issue in ACPD as well now. It is not appropriate to cite a paper from 2005 (Peters et al) for an overview of measurements made hitherto considering the progress over the last few years in our knowledge of iodine chemistry.

References that need to be added: p. 21373, l. 18: should reference one of Carpenter's

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papers p. 21373, l. 23: should reference Saiz-Lopez and Plane (2004), who made the first reported atmospheric observations of I₂ (at Mace Head!). p. 21374, l. 5. Saiz-Lopez et al. (2006a) also deduced this from modeling the OIO/IO ratio and comparing with DOAS observations at Mace Head. p. 21380, l 10: cite Mahajan (2009) as well as Peters p. 21380, l 20: Saiz-Lopez et al. (2006a) deduced these levels over the intertidal zone at Mace Head. p. 21382, l. 13: Laminaria Hyperborea [...] which is a very strong emitter of iodine precursors p. 21382, l. 16: need to state here that this is in contrast to Saiz-Lopez and Plane (2004), who reported OIO at night and I₂ at low tides during both day and night. p.21382, l. 25: add Saiz-Lopez et al., 2006a

The authors cite a number of Heidelberg Master and PhD theses whereas many of these are irrelevant for this study, e.g. Stein; Martin.

Figures 1 and 7 need more explanations. Is the green shaded area in fig 1 the area that is covered with seaweed or is that the area that falls dry during lowest tide?

Figure 5 needs O₄ SCs to further investigate diurnal variations.

Minor typographical corrections: p. 21373, l. 24: hitherto p. 21374, l. 8: just crossed the intertidal p. 21376, l. 9: been the object of

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