Atmos. Chem. Phys. Discuss., 11, C13975–C13977, 2012
www.atmos-chem-phys-discuss.net/11/C13975/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Bromine and iodine chemistry in a global chemistry-climate model: description and evaluation of very short-lived oceanic sources" *by* C. Ordóñez et al.

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Received and published: 9 January 2012

Short comment by Lucy J. Carpenter

SC: Short comments - AR: Author replies

I enjoyed reading this manuscript – it is excellent to see this progress towards global modelling of VSL halocarbons. I have just a couple of comments:

We thank Lucy Carpenter for her encouraging comments and for her suggestions.

SC1: The model underestimates the observations of CH2I2. What is the vertical resolution of the model at the surface? CH2I2 will obviously have a strong vertical profile so

vertical resolution/mixing issues will effect the model-measured agreement. In Jones et al., (2010), the 1D MISTRA model successfully simulated day-time atmospheric observations of CH2I2 and CH2ICl.

AR1: As discussed in Section 5.3 of the manuscript, the model underestimates the observations of CH2I2 if oceanic emissions of this species are considered to follow a Gaussian diurnal profile. This is corrected if a flatter emission profile is introduced, but we recognise that the shape of such a diurnal variation is uncertain.

We have used CAM-Chem with a horizontal resolution of 1.9° (latitude) x 2.5° (longitude) and 26 hybrid vertical levels. The depth of the lowest model layer is around 125 m, and it increases with altitude for the remaining 25 vertical levels. As expected the shape of the vertical profile of this species is rather strong in CAM-Chem, with most of the CH2I2 amounts concentrated in a few hundreds of meters close to surface, depending on location and time of the year. Both the vertical and horizontal resolution of any global model like CAM-Chem are very coarse compared to those of a 1-dimensional model such as MISTRA or THAMO, which introduces an additional difficulty in the modelling of such short-lived species. At the end of the first paragraph in Section 5.3 we already highlighted the issue of the coarse horizontal resolution, and now we also mention the importance of the vertical resolution.

SC2: The assumed CH3I global budget of around 300 Gg yr-1 (from Bell et al., 2002) is on the low side, according to a more recent assessment (e.g. Butler et al., 2007) which is around double that estimate.

AR2: Emissions of this species in the model are taken from the top-down inventory of Bell et al. (2002). They include a major oceanic source (213 Gg yr-1) as well as some land-based sources (91Gg yr-1), yielding a global CH3I flux of 304 Gg yr-1. As pointed out by Lucy Carpenter, field data from seven cruises across the Atlantic, Pacific, and Southern Oceans suggest a global oceanic source of $\sim$610 Gg (CH3I) yr-1 (Butler et al., 2007).

The discrepancies between the above emission estimates are now indicated in the revised version of the manuscript. However, our first sensitivity tests suggest that a potentially small source of CH3I in the model is not the only reason for the underestimation of CH3I in the UTLS. We mention that we are investigating the impact of the emission strength and distribution as well as of the parameterisations of convection and photochemistry on the modelling of CH3I. There are some additional comments on this in the replies to the first referee (see RC2).

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 27421, 2011.