Atmos. Chem. Phys. Discuss., 14, C7447–C7450, 2014
www.atmos-chem-phys-discuss.net/14/C7447/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Iodine chemistry in the troposphere and its effect on ozone" *by* A. Saiz-Lopez et al.

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Received and published: 26 September 2014

Saiz-Lopez et al. investigate the global effect of tropospheric iodine chemistry. The study is very interesting and I recommend publication in ACP after considering some suggestions as described below.

My only major criticism is that the manuscript is based on a model version which has not been described in detail in the literature yet. For the chemical mechanism, 5 different papers are cited (Emmons et al., 2010, Kinnison et al., 2007, Wegner et al., 2013, Ordóñez et al., 2012, Fernandez et al., 2014). To fully understand the chemistry calculations, the reader has to combine the reactions from these publications and add the new iodine reactions as well. A couple of further points regarding the model are

also unclear to me:

- Page 19990, lines 21-23: "VSL oceanic sources of CH2I2 , CH2ICl and CH2IBr are based on parameterizations of chlorophyll a satellite maps"
  How do these parameterizations work? Can you provide the data files that were used?
- Page 19991, lines 1-2: "For the emissions of most VSL iodocarbons we follow a solar diurnal profile"
  What function is used for the diurnal profile? A sine function, a bell shape, or something else?
- Page 19991, lines 7-8: Emissions are given in Tg/yr. I assume that the emissions are injected into the lowest model layer. Thus, the concentration change critically depends on the height of this layer. What is the height of the lowest model layer?
- Page 19991, lines 8-9: "The global modelled emissions [. . .] depend on the deposition of tropospheric ozone to the ocean surface, the sea surface temperature and the wind speed."
  What functions were chosen to describe these dependencies?
- Page 19992, line 7: "Sea-salt heterogeneous recycling reactions for HOI, IONO and IONO2 are also included in the chemical mechanism"
  These reactions depend on the available aerosol surface. Can you describe (or plot) the model-calculated sea-salt aerosol distribution?
- Page 19992, line 18: "scavenging in water and ice clouds"
  These reactions depend on the availability of clouds. Can you describe (or plot) the model-calculated cloud distribution?
- I noticed that the reaction OIO + OH (Plane et al, 2006) is not included. Is it not important?

- CAM-Chem, on which the current study is based, is a community model. Is the new iodine code also available to the research community?

To add a full model description into this manuscript would probably increase the size of the paper too much. In my opinion, the best solution would be to provide a full model description in a specialized journal (e.g., Geoscientific Model Development) and then describe only the different sensitivity studies (base, J_{IxOy}, ...) in this manuscript.

Minor comments

- According to the IUPAC Recommendations (page 1387 of Schwartz & Warneck "Units for use in atmospheric chemistry", Pure & Appl. Chem., 67(8/9), 1377-1406, 1995, http://www.iupac.org/publications/pac/67/8/1377/pdf) the usage of "ppbv" and "pptv" is discouraged for several reasons. Instead, "nmol/mol" and "pmol/mol" should be used for gas-phase mole fractions. I suggest to replace the obsolete units.
- Abstract, lines 17-20: "IOxLoss cycles, without and with IxOy photolysis, represent approximately (17-27) %, (8-14) % and (11-27) % of the tropical annual ozone loss for the marine boundary layer (MBL), free troposphere (FT) and upper troposphere (UT), respectively."
  I find this sentence very confusing and hard to read. It tries to describe a 2×3 matrix of two model runs and three altitude ranges. I think for the abstract, it would be sufficient to present only the upper limits, i.e., the results of the runs with IxOy photolysis.
- Page 19988, lines 15-17: "Photochemical [...] and global modeling studies"
  Please rephrase. Global models are also photochemical. Maybe you want to refer to "box and global model studies"?

- Page 19992, line 20: Change "Absorption x-sections" to "Absorption cross sections".
- Page 19996, line 11: "CH_2ICl is the di-halogen iodocarbon with the longest lifetime"
  This is probably true for the species that are included in the model but are you sure that the lifetime is also longer than that of CH_2FI?
- Page 20006, lines 28-29: You attribute the top-hat shape to the reduced photodissociation of IO radicals during sunrise and sunset. Is this the only cause? I think that the increased loss of IO by reaction with HO_2 at noon could also play a significant role.
- Page 20008, lines 16-18: Is "Brasseur and Solomon (2006)" correct, or should it be 2005? Also, I'm not sure if this is the best reference for the family concept. As far as I know, it was introduced by Crutzen & Schmailzl (Planet. Space Sci., 31, 1009-1032, 1983).
- Page 20011, line 8: "annual average I/IO ratios of ≈ 3 are modelled"
  Is this a noontime average? Please explain how this value was calculated.
- Page 20011, line 12: What is "Arrhenius behavior"? Wouldn't it be sufficient to write "temperature dependence" here?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 19985, 2014.