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Interactive comment on “Biannual cycles of organochlorine pesticide enantiomers in arctic air suggest changing sources and pathways” by T. F. Bidleman et al.

Anonymous Referee #2

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Review of “Biannual cycles of organochlorine pesticide enantiomers in arctic air suggest changing sources and pathways”

This is a very interesting work, well written, and the result of an impressive experimental work. To find and describe time trends of EFs with such a small variation can only be achieved if the analytical work is extremely careful, as done in this work. My impression is that this is a nice and important contribution and can be published in Atmospheric Chemistry and physics after the minor-moderate modifications commented below.

Specific comments

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- Introduction. Line 13. It is possible that the temperature increase associated to climate change can induce an increase of emissions, but this is a complex phenomena with many positive and negative feedbacks. Climate change can also lead to more ice-free soils, an increase of vegetation cover, and an increase of surface sequestration of POPs (see Cabrerizo et al. EST 2013). There are other potential feedbacks.

- Figures 1-3. Even though not important, usually the A panel is the upper panel, and the B panel is the lower panel, here the opposite is shown. In addition, I would introduce the time trend of concentrations as a third panel in addition to EFs.

- Table 1. I suggest to enlarge this table to include either the mean for the summer-fall and winter spring of all parameters for each years, or maybe better the upper and lower limit of the range.

- To correlate with ice cover is ok, but this variable may be related to many others. For example, Stanley et al. J. Marine Systems 2014, shows that years with different ice cover induce different respiration and primary production fluxes. It is possible that different respiration activity from bacteria, could lead to different EFs. I guess that there are many variables that could be related to ice cover, and that indirectly could affect the remobilization and degradation (EFs) of these chemicals. Some comments could be included in the text.

- I don't know if there are time series available for bacterial abundance or activity (secondary production) in Arctic seawater, or soils, or snow/ice, but if available, it would be nice to correlate them with the time series of EFs.

- A small variation of EF are often compared, and statements are made on whether there are differences, but it is not always clear that these statements are supported by statistical tests.

- A 11% contribution from marine volatilization is not a big figure. It is possible that there is volatilization of HCHs in the Canadian Archipelago, but I would say that a

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small modification of the gas phase EF could be achieved even if there is not a net volatilization, because anyway, even if there is air-water equilibrium, or there is a net deposition, there is always a gross volatilization term of low EF HCH that can modify the atmospheric EF.

- Conclusions. It is stated that “It is likely that the EF profiles of these and other chiral compounds will continue to change with rising contribution of secondary emission sources”. This is very interesting. Can these temporal trends be commented in the discussion EFs for CC and TC seem to be increasing over time. This is not clear for a-HCH. Do the authors have the EF from recent years at Alert, or have they been published, so they can be compared?

- Title. I’m not sure if “biannual” is right here. It means it occurs twice every year, but there just one cycle per year (increase during winter and decrease during summer). So maybe it should be “seasonal” or “annual”

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 25027, 2014.

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