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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling atmospheric transport of persistent organic pollutants in the Northern Hemisphere with a 3-D dynamical model: DEHM-POP" *by* K. M. Hansen et al.

K. M. Hansen et al.

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The authors would like to thank the anonymous referee for the useful comments on the paper. Below follow reactions to the individual comments made by the referee.

Referee:

(1) The paper title uses a rather general term POPs, while it only focuses on a-HCH. For other POPs, more processes would be included. See point (2) and (3) below.

Answer:

The title of the paper will be changed to: "Modelling atmospheric transport of alpha-hexachlorocyclohexane in the Northern Hemisphere with a 3-d dynamical model: DEHM-POP". See also comment (3) below.

Referee:

(2) The dry deposition of any POPs in the model was not discussed at all and definitely not included. Is this process an important sink for POPs? For some semi-volatile POPs it is demonstrated an important process for both gas and particle-bound species. Need an explanation!

Answer:

As particles are disregarded in this paper (see comment (3) below) dry deposition of particles are not included in the model. Dry deposition of gaseous phase alpha-HCH to the surface is included in the air-surface gas exchange fluxes described in section 2.3.1 on page 1346 lines 17-20 and section 2.3.2 on page 1347 lines 25-26. To our best knowledge there are no indications that settling of gaseous phase POPs through the atmosphere is of any importance, and we have not seen it included in other models used to study the environmental fate of POPs.

Referee:

(3) For any semi-volatile POPs, the partitioning of POPs between gas phase and aerosol phase has to be included. The paper so presented can only apply to volatile species. ThatŠs why a generalized term POPs may not be appropriate in the current content.

Answer:

As mentioned on page 1344, line14-17, the fraction of alpha-HCH sorbed onto particles in air is negligible even at very low temperatures. We have therefore chosen to disregard particles in the model when studying alpha-HCH. We are fully aware that this is a special case for the POPs. We will emphasise this in the relevant sections and expand the section at the end of the paper discussing the needed model developments to study other POPs as follows: "... There is thus a need for investigating the role of the omitted surface characteristics such as vegetation, snow, ocean currents, and sea

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ice on the fate of POPs. To study POPs in general there is also a need for describing the partitioning between the gas phase and the aerosol phase. We are currently developing the model further by considering these issues".

Referee:

(4) The ocean water module is over-simplified by assuming a well mixed layer. How about the advection of POPs by prevailing ocean currents, e.g. from tropic to the Arctic?

Answer:

The aim of this study is to investigate the possibility of studying the environmental fate of alpha-hch with a dynamic atmospheric transport model. Although advection of POPs by ocean currents may be of importance on longer time scales (decades) it is believed to be of secondary importance in the present study, and as a first approximation it is therefore disregarded. The importance of advection of POPs by ocean currents will be studied in future model improvements, see comment above.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 1339, 2004.