

## ***Interactive comment on “GEM/POPs: a global 3-D dynamic model for semi-volatile persistent organic pollutants – Part 2: Global transports and budgets of PCBs” by P. Huang et al.***

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It is useful to see the application of a 3D-Dynamic meteorological model to PCBs and this study represents a significant amount of work with the construction of the air-surface exchange modules (soil and water) required to simulate the transport and fate of semi-volatile chemicals. This paper highlights the equations governing air-surface exchange fluxes, atmospheric removal processes (deposition and degradation) as well as gas-particle partitioning and provides an evaluation of predicted boundary layer concentrations/behaviour with observed data taken from monitoring sites across the northern hemisphere. The paper will be of interest to the POPs scientific community

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and represents one of only a handful of studies to apply high spatial and temporal resolution modelling techniques to POPs.

#### Corrections/clarifications

1) The latter part of the title should be altered to: “1. Model description and evaluation of air concentrations”, as currently only the air concentrations are evaluated and not the deposition or exchange fluxes as presented in the model description.

2) It is not clear whether the emission data utilised in the GEM/POPs model and described in section 3.2, refer solely to emissions to the atmosphere or emissions to other media (i.e water).

3) This is a global model, yet most of the focus is on the Northern Hemisphere. While this is OK, given that the paper evaluates model data against observed data from the Northern Hemisphere, Figure 1 (soil concentrations) should be extended to represent the globe (akin to Fig. 5)

4) Table 1 presents soil concentrations from China. Where do these data come from re: reference. Furthermore, they are also very precise (thousandth of a ng!). Is this correct/necessary?

5) Section 4.1 What do the authors mean when they state that only gaseous PCBs were statistically significant in the comparisons between modelled and observed data at Alert? I suspect that the observed particle-bound concentrations are below method detection limits or are too erratic to allow for a meaningful comparison to the modelled results. Could the authors clarify this statement re: statistical significance?

#### Discussion points.

1) Figure 3 is very useful and highlights similarities/differences between modelled and observed data and also provides information on the seasonal profile for three PCB congeners. In general, the model performs well and reflects the seasonal profile observed at these sites. However, there are some notable exceptions, namely Rorvik and Alert

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(PCB-28 in particular). At Rorvik, the atmospheric profile is almost the exact opposite to that modelled at Alert, with a notable decrease in concentrations during the summer months. Indeed, Rorvik appears to be the only site that shows this behaviour. Is this also the case for other sites at ~50-60°N in the model domain and what features within the model result in this profile, which is neither modelled or observed further south (i.e. IADN sites) or further north (i.e. Arctic sites)?

2) The authors may want to consider evaluating their modelled PCB air data against the air concentrations derived from passive samplers that have been deployed at numerous sites around the globe. The authors should examine recent papers by Pozo, Harner et al.

Minor.

P3399, Line 5: into a few climate zones

P3399, line 9: have been proven

Equation 10: Font size of 'Cp' needs increasing (numerator on right hand side)

P3406: 3.2 Metrological data

P3409, line 23 simulated atmosphere PCBs

Line 25 reflects that the ability

P3410 line 14: easily be engaged

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