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Interactive comment on "Impact of the regional climate and substance properties on the fate and atmospheric long-range transport of persistent organic pollutants – examples of DDT and γ-HCH" *by* V. S. Semeena et al.

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Temperature dependence of sorption of DDT and gamma;-HCH to particulate matter: The sorption capacity of aerosols to organochlorines is larger than adsorption alone could explain. Obviously, absorptive contributions into an organic phase are significant (e.g. Finizio et al., 1997; Goss, 2004). Absorption is strongly dependent on the chemical composition of the particulate matter. As particles often are of shell-like structure, it is the particle's composition at the surface rather than the bulk composition which is

relevant. At present, no adequate data basis exists to describe the temperature dependent sorption process on atmospheric particulate matter nor even the isothermal sorption process. More studies are needed using reference materials for various types of atmospheric particulate matter. Degradation of semivolatile organics in the sorbed state should considered in models as soon as possible. Here, we assumed a lower estimate for degradability by neglecting degradation in the sorbed state. The sensitivity of environmental levels and lifetimes to this assumption is studied in on-going and future model experiments.

Substance transformation in air: Reaction rates with other radicals than OH, such as NO3 and Cl, have not been determined. Kinetic data describing the degradation of semivolatile organics in the sorbed state are in particular scarce due to experimental challenges. Whether adsorption is possibly enhancing or decreasing the reactivity with regard to OH attack is currently inconclusive (Behnke et al., 1988; Oh and Andino, 2000; Oh and Andino, 2002; Souml;rensen et al., 2002). The influence of catalysts on sorbed DDT or gamma;-HCH reactivity has not been studied.

Methodology and comparison of the model with other models: The key feature of POPs and long-lived semivolatile substances with regard to their cycling is their potential to re-volatilise from ocean and land surfaces, delayed upon atmospheric deposition. The model used here is a general circulation model (GCM) while the other available models (Koziol and Pudykiewicz, 2001; Hansen et al., 2004; Malanichev et al., 2004) are Eulerian atmospheric transport and chemistry models (CTMs). CTMs use assimilated meteorological fields to drive the transports, while GCMs generate meteorology and climate. Although simulating the transports closer to the real, historic weather, the physics is not totally consistent in CTMs, while it is totally consistent in GCMs. Furthermore, GCMs describe sub-grid scale transport, removal by precipitation, various types of hydrometeors and precipitation and many more features in a consistent way. The representation of SOCs cycling in models differs with respect to the number and detail of the description of environmental compartments covered, their dimensionality, and

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the process resolution. The number of compartments covered is 3-4 for most models. The atmospheric compartment is most comprehensively described in GCMs. We use a dynamic aerosol model (HAM; Stier et al., 2005), which covers primary and secondary particle source and sink processes differentiated for four particle size modes and both natural and anthropogenic aerosol types. Therefore, the model setup has a unique potential to study the influence of aerosols on the long-range transport of SOCs. Not the entire potential of the setup has been exploited in this study. Model experiments which address the significance of aerosols on long-range transport and overall persistence of SOCs are under way.

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