

Interactive comment on “A conceptual model of organochlorine fate from a combined analysis of spatial and mid/long-term trends of surface and ground water contamination in tropical areas (FWI)” by Philippe Cattan et al.

Anonymous Referee #2

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The manuscript (HESS-18-377) entitled ‘A conceptual model of organochlorine fate from a combined analysis of spatial and mid/long-term trends of surface and ground water contamination in tropical areas (FWI)’ reports Chlordecon contamination in surface and groundwaters in the Martinique Island and proposed a conceptual approach to investigate the persistence of Chlordecon by using one reported degradation product chlordecone-5b24 hydro (5bCLD) as a tracer of on going degradation processes. This topic is important and would naturally be of interest to readers of the HESS.

However, key conceptual assumptions have to be thoroughly discussed and signifi-

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cantly improved to consider publication in HESS.

First, using a transformation product (TPs) 5bCLD as a tracer of degradation extent and associated persistence is a valuable idea, but the degradation of the TP itself is never discussed. Similarly the model seems to consider as a perfect tracer 5bCLD, i.e. without degradation. This main assumption can significantly alter the assessment of persistence done and this point is never discussed. Do you have access to CLD/5bCLD ratio in soil to have an idea of the initiale signature over time to decipher soil degradation process to those associated to surface and groundwater flowpaths? Second, residence time is used to explain the spatial variability of the ratio compounds/TPs. To support the discussion, the authors should provide existing reported information/simulation of these residence times: - to discuss spatially contrasted compounds/TPs ratio delivery by soil to ground water - to address the question of degradation of the TP itself (especially for long residence time)

Third, if the sampling effort, statistical analyses and conceptual development provided a coherent approach for groundwater (slow flowpath), I have many questions on the surface water component. The representativeness of the sampling (low frequency mainly during based-flow, if I well understood the database characteristics) is not discussed taking into account percentage of Chlordecon exported during storm event associated to tropical climat. With a large Koc, the question of Chlordecon released from soil to river by erosion during runoff event is never discussed. How these pulses can contribute to spatial and temporal patterns of chlordecon in surface water? For surface water, it could be relevant to know if the CLD concentrations correspond only to the dissolved phase or if it is a “total” concentration. Information on the filtration and purification steps are not provided in the M&M section. Can contaminated sediments in river potentially be remobilized by event and alter trend assessment in surface water? In the conceptual model, the surface runoff and the surface water to groundwater seem not considered. The choice targeting mainly leaching and not the other off-site transport is never discussed. The authors mentioned “hope for pollution mitigation” based

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on statistical model, but I wonder how fast flow in river can modify this assessment.

In my opinion, the paper can't be published without strengthening of these points.

Specific remarks: L324 GW, as well as in SW fed by it. And vice et versa ? L323 The age of the main geological units was used as an indicator of hydrogeology and notably residence time in the aquifers. Could you provide evidence ? Residence time assessment from others studies ? L57 and L60, 1993 or 1992, I guess banned in 1992 but used until 1993. Please explain. L121 "they are intergrades" ? L134 unweathered formations, to several decades for old weathered formations (provide range for "Old") L139 routine basis with CLD. For (double space before For) L150 5bCLD is the main CLD co- and alteration product of CLD: what do you mean by alteration product ? Transformation / degradation product ? Please clarify ? L151 "Reference standards for CLD and 5bCLD were purchased" : provide purity degree L149 Between sampling and analysis, no information is provided on the filtration (raw water/filtered water?) , purification ?, please add L181 was not detected (i.e. 0.001 for LDA26 or 0.003 $\mu\text{g L}^{-1}$ for BRGM), and an intermediate value of 0.006 $\mu\text{g L}^{-1}$: why is different of value provided in L177 0.003 $\mu\text{g L}^{-1}$? Please clarify L184 double space the 5bCLD L183 Factors. Not clear for me, how heterogeneity of upstream catchment for SW or drainage area for GW were integrated in metrics ? L204. For GW, double space Fig. 1. I suggest to modify this figure to add sampling point distribution (the different zoom levels can be significantly reduced)

L248 Kendall (MK) test. We calculated Sen trends, Sen trend ? Not defined, Instead to use Sen trend in the text, I suggest to explain the information underlined by this metric (to improve understanding for the reader) The section 3.2.1. looks like a figure caption (modify and interpret directly in this section) L300 "areas since 1970, i.e. during CLD application. Surprisingly, SW and GW contamination occurred outside these banana areas" Explanation ? other dissipation Processes ? Are the contaminated areas are downstream of banana areas ?

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Fig3. Legend can not be read (too small). Fig4. two small, I suggest to merge some of them or provide in SI

L308 contamination level. For example, the CLD content of hydrographic subsector 1 (see Figure 3 left for locations) was different from hydrographic subsector 2 even though the points in each zone had the same contamination level. It is very descriptive, please provide explanation

L 320 "This statistically confirmed"/ Missing word ?

Figure 4. provide full name under the figure Ferr_And, Nit_And...

L375 : "duration of pollution": persistance of pollution ?

Fig 7. Legend is hiding some point: modify. I suggest to redesign the figure 7 to improve understanding of key message for the reader (add sectors/types and assessment indicator)

Fig 8. time unit ? Years... As discussed in the main comments, all the model predictions seem to be dependant of persistence of the 5bCLD, how the results could be altered by considering TPs degradation.

L437 0.1 $\mu\text{g L}^{-1}$ 437 during baseflow periods (flood flow periods being rarely sampled) given a current concentration of 0.5 $\mu\text{g L}^{-1}$ 438 on average. I don't understand your assumption?

L499 "catchment scale", you used watershed during all the manuscript why changed now? "The residence time - estimated by the water apparent age: not discussed or characterized before?

L388 "they should lie": sentence ?