Main comments

1. The authors misinterpreted the result shown in Figure 3 when they say that *"(…) Scenario 2 then yields the largest $\overline{\alpha}_C$ because it has the largest fraction of transport pathways with advective travel times much* longer *than τ_g* "

– This was not a misinterpretation of the result but an editing error, which has been corrected. As reviewer 3 writes, it should be "travel times much *shorter* than τ_g", not "much *longer*".

2. In the present form, the new scientific contribution is not clear and it appears as a marginal incremental step with respect to Darracq et al. 2010a,b. In their revision the authors should explain more clearly the scientific advance contained in the paper

– A main objective of the present study is to investigate and quantify the effects of heterogeneity and cross-correlation of hydraulic conductivity *K* and mass attenuation on catchment-scale mass delivery from diffuse sources. Darracq et al. 2010a,b did not investigate these effects as they only considered a single scenario of constant *K*, and they did not at all consider variability in mass attenuation rate. In the revised manuscript, the new scientific contribution of the present study is hopefully better and more clearly explained.

3. A main conclusion of the paper is that a scenario of high advection variability (as in the present scenario 2) emerges as a generally reasonable, conservative assumption. The generality of this result is, however, questionable

– In the study, we considered the *K* variability scenarios 1 (constant *K*) and 2 (spatially variable, statistically non-stationary *K*) in order to investigate some general effects of physical heterogeneity around prevailing mean conditions on mass delivery from a diffuse source. Because we have chosen to normalise all results with the specific mean characteristics of each variability and cross-correlation scenario (see also further discussion about this in point 4), the results in Figs. 3 and 4 are quite general in showing that a scenario of relatively high physical advection variability and large statistical spreading of advective travel times ***around the prevailing mean conditions*** (the present scenario 2 implies much larger such spreading around its mean conditions than does scenario 1 around its mean conditions) is a conservative assumption for estimating maximum diffuse mass loading for relatively high catchment-characteristic ***mean normalised*** attenuation rate (for this particular catchment for $\lambda\tau_g$>1). It is because of this normalised comparison of very different variability and cross-correlation cases (see also point 4) that we can state this as a general result, relevant for diffuse mass transport in different catchments and pollutant combinations. As reviewer 3 points out and we have explicitly shown in Table 2, however, the absolute mean travel time is much shorter in scenario 1 than in scenario 2, and scenario 1 therefore yields larger total mass delivery than scenario 2 for the same mass attenuation rate λ. In the revised version of the manuscript, we try to be more explicit and clear than just listing specific differences in Table 2, and more restrictive in our description of scenario 2 as a conservative assumption. We now emphasise that it is a conservative scenario only in terms of its large statistical spreading of travel times around the prevailing mean τ_g and clarify in the conclusion that:

"A conservative travel time distribution can be constructed combining the statistical spreading of travel times for a high physical advection variability scenario with the estimated mean advective travel time for a transport scenario representing relatively fast preferential pathways, as in the present scenario 1."

4. The analysis, with constant attenuation product $\lambda\tau_g$ and thereby differing attenuation rate λ between the different transport scenarios, is misleading

– The objective is here to investigate general rather than site/pollutant-specific heterogeneity effects on catchment-scale mass transport. It is then clearly useful to normalise the site/pollutant-characteristic mean attenuation rate λ by the catchment-characteristic mean travel time τ_g. If the study objective had been to estimate the transport of a specific substance at a specific site, it would have been reasonable to compare the mass delivery for the same substance-specific λ in different advective travel time scenarios. With the information on λ and τ_g given explicitly in Table 2, we in fact here do both. To clarify this, we now explain in section 3.2 that:
"Results are shown for normalised attenuation rate $\lambda\tau_g$ in order to isolate and distinguish general effects of uncertainty with regard to variability around τ_g, and to facilitate understanding and comparison of these effects in different catchments with different characteristic τ_g. As a complement to this general quantification, Table 2 also clarifies and quantifies that, and how, a normalised attenuation rate $\lambda\tau_g$ will differ between different specific τ_g scenarios for a given estimated mass attenuation rate λ of a specific pollutant of interest."

5. Illustrate $\alpha_c(<\tau)$ instead of $\overline{\alpha_c} = \alpha_c(<\infty)$
– This is a matter of result presentation preference in relation to the manuscript focus and scope, and not a matter of scientific soundness. As no one of the other reviewers has made any similar suggestion, we prefer to stay with the dimensionless presentation of $\overline{\alpha_c} = \alpha_c(<\infty)$ for different normalised attenuation rates $\lambda\tau_g$, which we find more informative, general and relevant in the framework of this paper (see also response to point 4).