

Nonlin. Processes Geophys. Discuss., author comment AC3  
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## Reply on CC1

Guilherme L. Torres Mendonça et al.

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Author comment on "Identification of linear response functions from arbitrary perturbation experiments in the presence of noise – Part 1: Method development and toy model demonstration" by Guilherme L. Torres Mendonça et al., Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2021-9-AC3>, 2021

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Dear Prof. Lucarini,

We appreciate your comments. We fully agree with your remark that our Eq. (8) assumes real relaxation times  $\tau$  and thereby rules out oscillatory behaviour. We point out this limitation in the discussions section, L822-824. Also referee #2 asked us to make the assumptions underlying our approach more transparent. Following that suggestion we will mention in the introduction and also when introducing Eq. (8) that the respective eigenvalues are assumed to be real. This indeed introduces an important limitation, namely to the class of overdamped systems to which presumably the global carbon cycle belongs, which is our main application in Part II of this study. We emphasize however that, as discussed in L804-824, Eq. (8) is not essential for our RFI method, so that by dropping this assumption (thus recovering the response function pointwise) one could in principle still apply the method to more general systems.

Nevertheless, as also discussed in L804-824, assuming Eq. (8) has some advantages over recovering the response function pointwise. Therefore it would be nice to be able apply our RFI method by extending this assumption to include complex eigenvalues. But at the moment it is not clear to us how this could be done.

Best regards,

Guilherme L. Torres Mendonça, Julia Pongratz and Christian H. Reick