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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A Bayesian Approach to Infer Nitrogen Loading Rates from Crop and Landuse Types Surrounding Private Wells in the Central Valley, California" *by* Katherine M. Ransom et al.

Anonymous Referee #1

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The paper deals with a smart way of estimating nitrogen loading rates by an inference model. The topic is timely, quite original and suitable for HESS. This manuscript is a revised version of a previously submitted paper.

The manuscript requires some additional discussion on: 1. the model requires linearity of the transport processes. This is a limitation of this kind of approach that should be clearly stated. Therefore, the provided loading rates are loading rates at the groundwater surface, assuming that denitrification in the saturated zone can be neglected (probably true as discussed by the authors). All non-linear processes such as pro-

cesses linked to microbial activities in the vadose zone (denitrification, mineralization) are not taken into account. Therefore, this approach does not provide the loading rate depending on landuse and crops but depending on landuse, crops and kind of soil. The authors only addressed partly this point (see for example L5, p 11), neglecting the effects of the soil properties to nitrate propagation and transformation. 2. the definition travel time (or age) is unclear to me (eq. 1). It seems that it considers travel time in the aquifer only. What about the travel time in the unsaturated zone (which can be significant)? 3. Is it possible to distinguish effects of runoff compared to effect of storage in the vadose zone?

Minor: L 25, p. 7 Darcy's law instead of Darcy's Law. Avoid mixing units in the manuscript like feet (L25, p3) and meters (L26, p6 for example).

Therefore, I suggest moderate revision.

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