

Review of manuscript soil-2018-13 entitled “**Phosphorus transport in lateral subsurface flow at forested hillslopes by Sohrt et al.**”

This study involves the automated temporal collection of lateral flow (flux) of inter and intra rainfall events from three sites over 6-9 months which was used to estimate total Phosphorus and EC of collected water. Authors also measured soil moisture separately from these 3 sites. Later on authors used this information to develop multiple linear models for total P dynamics in relation to intra- and inter-flow events. The topic is interesting and focuses on the phosphorus transport along the hillslopes in the forested soils. Authors have introduced the topic very well and included the related recent works to show the need of the present research. However, the methodology is not clearly defined and results and discussion are poorly described. There is no mention what are the modelling parameters, how Authors obtained these and how model respond to the soil, precipitation, vegetation variables at different sites. In fact the study lacks in generating appropriate soil, climate and vegetation parameters to draw any suitable relation between the soluble phosphorus dynamics along the forested hillslope. I do not see any novel contribution in the paper apart from automated collection of temporal lateral flow which is already published elsewhere.

1. How authors selected the location for the flow monitoring at three sites, what criteria adopted and how their measurements are related to hillslope or soil texture or rainfall amount/intensity/duration or vegetation at different sites?
2. Authors must clarify how they segregated overland flow from the subsurface lateral flow? Probably, subsurface lateral flow generation and P concentration also depends on the soil texture, clay content, water holding capacity, soil heterogeneity as well as the extent of organic matter in the soils. Authors are invited to explain how their measures are related to these soil characteristics?
3. Authors didn't describe how soil moisture was estimated (L148-150), how often and why it was measured at 2m upslope (L116) only?
4. Authors mention (L118) the collection of samples at 2 and 3 weeks intervals for total P measurements but it is not clarified how they estimated intra and inter-event P concentration from these measurements?
5. It is not clear how authors constructed the linear models, must elaborate and include the linear mathematical equations. How authors interpolated P concentration for each intra and inter-events? How P contents are related to flow volume or EC or air temperature, seems doubtful. Additionally, the estimation of flow events based on subsurface lateral flow volume is doubtful. If there was no relation between different measures (L197-198), how authors developed linear relationship between P concentration and other measures (L152-153). How a precipitation event of 1mm (L174) can generate measurable flow which is generally ignored while estimating effective rainfall?
6. There was opportunity to measure other soluble nutrients, why authors restricted themselves to measure only the total P concentration while they could have done much more from the collected flow samples.

Other comments

L148 what was the relevance of measuring air temperature?

L173 not leafs but leaves

L177 among (at?)?

L185-86 how these event were separated from the follow generation events?

L 213 what was the most measureable precipitation event?

L217 coincide with

L224-29 Did authors measured hydrophobicity of organic matter? Seems irrelevant justification. Rather authors should have estimated the soil texture, soil heterogeneity, vertical and horizontal hydraulic conductivity, amount of organic matter etc. which could have more valid relation with the measured data.

L251 I'm unable to see R2 and Adj R2 in Table 2, how authors estimated the adjusted R2 values and why?

L255 what is AIC, authors must explain their model and input parameters.

L259 where is the data to substantiate this conclusion. I do not see any such relation in the Figs. 2, 3 or 4. I'm unable to see the model parameters. What authors mean by significant association here, did they applied any statistical test on their data?

Table 1 If organic layer thickness was only 8cm at MIT then why the measurements were made between 10-25 cm soil depth?

Table 3 there is lot of confusion in the models here and Fig 3. How authors estimated model P concentration? I'm unable to see what inputs required for both models, how they obtained? How authors estimated the data shown in Table 3. Why log values for flow rate and other parameters shown here?

Fig 1 I do not see the soil moisture axis in any of the Figs, what you mean by precipitation vol and lateral ow? Why soil moisture decreases as the precipitation increases over the time in (a) and (c)?

Fig. 2 what authors mean by exemplary flow here? If P estimation was made on biweekly or triweekly basis (L118-121) then how authors obtained intra-event P concentration.