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Interactive comment on “New molecular evidence for surface and sub-surface soil erosion controls on the composition of stream DOM during storm events” *by* Marie Denis et al.

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Thank you for your suggestions and comments to improve this manuscript. Your remarks will be considered to the next version of the manuscript. You will find below a point by point response to your comments reported into square brackets.

[In my opinion simulating the in-stream process does not add much to the manuscript]

Even if the results from the simulation of the in-stream process does not provide the principal information of this study, we think that these results could help to argue for the transition between the hypothesis of in-stream process previously proposed to explain

the modification of DOM molecular composition in stream water, and our hypothesis who involved surface and sub-surface soil erosion. Indeed, even if the previously proposed in-stream process cannot fully explained the changes of DOM molecular composition observed, it could contribute in part to the modifications observed in stream water. The simulation carried out by agitation of soil and water at an appropriate ratio have shown that the amount of DOC produced is negligible. This result thus allowed to exclude this process to explain the changes of molecular composition observed in stream water.

[P2 L 19. Give some references for these mixing analysis and isotopic studies.]

These references will be added to the text: Bazemore et al. (1994), Klaus and McDonnell (2013), Lambert et al. (2014).

* Bazemore, D.E., Eshleman, K.N., Hollenbeck, K.J., The role of soil water in stormflow generation in a forested headwater catchment: synthesis of natural tracer and hydrometric evidence, Journal of Hydrology, 162, 47-75, 1994

* Klaus, J., McDonnell, J.J., Hydrograph separation using stable isotopes: review and evaluation, Journal of Hydrology, 505, 47-64, 2013

[P4 L 8. Could the authors comment on the possible effect on the soil/water equilibrium and the associated liberated DOC that is caused by deploying a zero-tension lysimeter?]

Indeed, deploying a zero-tension lysimeter could have possible effect on soil/water equilibrium and therefore on DOC solubilization due to mechanistic soil perturbation. On the Kervidy-Naizin catchment, lysimeters were implemented for long-term sampling experimentation during the summer of 2013. The dataset used in this study is composed of samples sampled in these lysimeters between October 2014 and June 2016. Therefore we could consider that the time laps between the summer of 2013 and October 2014 has been enough to allow the restructuration of the soil around the zero-tension lysimeters.

[P4 L 15. Why was the soil only sampled in the riparian transect? Is there no difference expected with the slope soils in molecular composition?]

The DOM of soil solutions and stream water were compared to SOM of soils collected at different depth, only in the riparian area of the transect. We chose to compare the molecular composition of DOM with SOM from the riparian area of the transect because all the soil solutions were sampled in this riparian area. As vegetation, hydrology and soil characteristics are different between the riparian area and the slope, we can indeed expect changes in soil molecular composition.

[P5 L23-25. This sentence does not really belong in the methods section.]

This sentence will be modified in order to better fit with the methods section.

[P5 L31. This should be Jeanneau et al. (2014). "Jeanneau, L., Jaffrezic, A., Pierson- Wickmann, A.-C., Gruau, G., Lambert, T., and Petitjean, P.: Constraints on the Sources and Production Mechanisms of Dissolved Organic Matter in Soils from Molecular Biomarkers, Vadose Zone J., 13, 2014"]

There is in fact a reference error. This reference will be modified in the text and added in the bibliography.

[P5 L29. The method used here is developed for soils (Jeanneau et al., 2014). How are you taking phytoplankton fatty acids into account? These are generally polyunsaturated long-chain compounds, did you find any of these? Would it be beneficial to use ratios between specific biomarkers for plants, bacteria, possibly fungi and phytoplankton biomass?]

The method used here was applied for soils but also for stream water and soil DOM by Jeanneau et al. (2014), and could therefore be applied to our dataset. Among all the fatty acids identified using THM-GC-MS, no polyunsaturated long-chain fatty acids were identified in our samples, which does not mean that they are not present

in our samples. These fatty acids could be present but undetectable because they are present in concentrations below the limit of detection. The use of ratios between specific fatty acids biomarkers could be used to assess the impact of the flood events on the microbial activity. However, other methods like PLFA analysis are more suitable than THM-GC-MS to identify the specific fatty acids biomarkers.

[P6 L20. I'm surprised that it is possible to use the values on the PC axes to calculate the relative contribution of the sources. Could you provide a reference that supports this approach?]

We choose to calculate the relative contribution of the sources using PCA to represent the maximum of variance from the three variables (chlorides, nitrates and sulphates) on a single 2D plot. Using the two principal components allow to represents 87.3% of the variance, with 58.3% and 29.0% for PC1 and PC2 respectively. The DOC concentrations estimated from these contributions fits with the DOC concentrations measured in stream water. Even if this method is not the most widely used, these results seems to confirm that this is an appropriate method to determine the relative contribution of the sources.

[P6 L20. Why are the axes called F1 and F2 instead of PC1 and PC2 (principal component). That would make the figures more intuitive to read as well.]

The names of the axis will be changed into PC1 and PC2 in the text and on the figures.

[P6 L24. The coordinates 'were'.]

This sentence will be modified.

[P8 L10. How do you determine that an event is significantly different based on a PCA? Did you use a statistical test? How much of the variance is explained by the first two principal components? This determines how well the ordination space reflects the complete variance between the compounds, and how reliable a statement such as 'significantly different' is.]

The differences between two events were determined using Dunn's test. This statistical test is applied on the coordinate on PC1 axis from the PCA. The results of these tests are given in Figures 5 by the letters added on the top of the box-plots. If two box-plots do not share the same letter, this indicates significant differences between the two datasets. The percentage of the variance explained by the PC1 is 37.4% for LIG, 62.0% for CAR and 39.0% for FA. These informations will be added on Figure 5.

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