

Interactive comment on “Response of dissolved and particulate organic carbon and nitrogen in runoff to monsoon storm events in two watersheds of different tree species composition” by Mi-Hee Lee et al.

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General comments The manuscript presented very useful information on forms and flows of carbon and nitrogen in an upland fluvial system. The planning and coverage of sampling and parameters are good. The results will improve our understanding of material flows in terrestrial fluvial systems based on nature of tree types and water flows. The results deserve to be published but not in the present form. The basic problem is with the presentation and the way they dealt with scientific and technical issues. I recommend encouraging the authors for submitting a revised version after

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they work on some of the issues mentioned and improve the presentation for clarity.

Specific Comments Title: manuscript is not really studying the ‘response of carbon and nitrogen components IN RUNOFF to storm events’ but addresses the influence of storms on carbon and nitrogen components in runoff. The appropriate title for the manuscript seems to be (from lines 32-33 on page 2): Influence of tree species and episodic discharges on the fluxes of dissolved and particulate carbon and nitrogen from two watersheds OR Changes in fluxes of dissolved and particulate carbon and nitrogen from two watersheds of different tree types during heavy discharge periods.

Page 3: Lines 4-5 – The sentence ‘the annual air temperature ranges from 10-15oC with -6oC in January and 26oC in August’ does not make sense to me.

Page 3: Line 7 –Is the 47% broadleaved forest ‘the deciduous’? Here the comparison is between deciduous and mixed types and so appropriate type to be named than the description (broadleaved).

Page 3: Lines 12-14 – Are the slopes at two sampling points MC and MD oriented in different directions in the mixed watershed? If they are oriented in one direction then fluxes from the upper can definitely influence the other during floods. This question also pertains to slope comparisons between two watershed sampling points. Figure 1 and info on page 3 shows that deciduous sampling point is at a higher altitude than that in the mixed watershed. What if both the watersheds (and hence the sampling points) slope in the same direction? If yes, the flow from deciduous sampling point would influence the composition at MC and MD!! This is quite possible as the two watersheds are nearby. The authors should clarify on this issue of slopes and possible interference between sampling points.

Page 4: Line 5 – ‘were collected after each storm event’: maximal flows/fluxes must have occurred during the peak flow. When the maximal speeds subsided the original peak signals (of concentrations/fluxes) of the flood may have been lost!! This can be exemplified using the data in Table 2 for deciduous station. On July 8 (say first flood

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studied) DOC, DON, POC, PON values are higher than the following flood event on 14 July. Obviously, the first flood water carried more C & N than the second one since the first/fresh rain/flood can dissolve/scoop more of materials accumulated during the preceding dry or intervening periods in the soils. This was also noticed by the authors on Page 6 Line 15.

Page 4: Line 5 – ‘runoff samples were collected every 1 or 2 h in the weir’ – were these also collected after the storm events (coinciding with throughfall, forest floor leachate and soil solution sampling) or during the event or both? This information is crucial for making the right comparisons and assessing changes.

Page 6: line 3 – In the absence of clear definitions of Oi, Oe and Oa it is hard to understand the significance of percentages of these fractions, as also in relevant Figures.

Page 6: Lines 17-21 – I am not convinced of the ‘threshold value’ since there are not enough data points to show a consistent increase in concentrations. Relatively higher concentrations in POC and PON are found (Fig 2d,e) RANDOMLY during discharges from ~1 to 9 mm/h.

Page 6: Lines 22-23 – DOC rise with increasing flood and fall with decreasing flood is convincing and is, indeed a good observation.

Page 8: in the entire page of this discussion, the authors did not seem to have paid much attention to (a) nature of litter, (b) altitude and (c) substratum of the two watersheds. I understood that the deciduous watershed was at higher altitude with hard rock below 40 cm whereas that of mixed was at lower height laden with soils upto or below 50 cm. Presumably the hard rock might have occurred deeper in the mixed watershed. The nature off litter (seasonally fallen parts of the trees) would be relatively freshly fallen in the deciduous watershed that could easily be broken/decomposed by physical/microbial activities that could leach more DOC or dissolvable OM. This fresh DOM can be easily be flushed by flowing water. The hard substratum and high altitude facilitate flow of water at higher speeds (as it cannot seep deep) in the deciduous wa-

tershed than in the mixed watershed. The rapidly draining flood facilitates easy mixing of forest floor and soil solutions with surface runoff.

Although logical in their statement of “i) In the deciduous litter layer the leaves are overlapping and are partly impermeable which may cause more surface near flow (lines 23-25)” this does support their observation that ‘a larger proportion of the DOC in runoff results from forest floor leachates at the deciduous (lines 17-18)’. If the top layer is impermeable how would one explain high DOC in runoff to have come from mixing with forest floor leachates? It is also possible for high DOC formation at the surface itself as the fresher litter is weathered or decomposed on the floor of the deciduous watershed.

Page 9: Lines 2-8 – higher DOC/DON ratio at deciduous basin is possible when organic matter with less or no nitrogen but rich in carbon is weathered and is leached. Nitrogen compounds are perhaps enriched in litter or particulates. However, Fig 2 depicts lower PON than DON, in general in both watersheds, implying that nitrogen might be remaining with the deposited litter in the watersheds!

Page 9: Statements in lines 11-13 (‘Substantial fluxes of NO₃-N and the dominance of NO₃-N over DON in runoff are likely due to a certain degree of N-saturation (N supply > N demand) of these forested watersheds (Aber et al., 1998; Compton et al., 2003)’) and lines 20-21 (‘Overall, it seems that a larger N uptake by the deciduous trees at the deciduous watershed could explain the differences in NO₃-N fluxes’) are arbitrary and not supported by any data.

Technical Comments Page 3: Lines 11 and 21 – Are the latitude and longitude positions accurate to the decimals mentioned?

Page 3: Line 30: Does ‘throughfall’ refer to precipitation or rainwater?

Page 4: Line 13 – define Oi, Oe and Oa.

Page 4: Lines 26-27 – ‘The storm events during monsoon season were identified from

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the start to the end of precipitation with more than a day interval between each storm event'. The storm events should be identified based on meteorological observations of wind and rainfall. However, one should keep in mind that the present study is made in summer monsoon. During monsoon season the rainfall may not be continuous on all days but with intermittent gaps (breaks) or spells of rain. I guess the authors are referring to these spells, or at the most the episodic rainfall events (which are normal during summer monsoon) of variable duration as 'storms'. This requires authors clarification for what they meant by 'storm'. This point, however, was rightly stated by the authors on page 8 line 4 – 'four heavy rainfall events of the monsoon season at both watersheds' but not elsewhere in the manuscript.

Page 5: Lines 4 and 8 – (i) unmatched DOC and POC cutoff limits! (ii) 0.7 micron cutoff limit for POC is quite on higher side since most of the fine sized particulate materials are lost through the filter paper.

Page 5: Line 6 – was nitrite in water analysed? It should be included in mineral-N.

Fig 2 – what are FPOC/FPON in Fig. 2f?

Fig. 3. Upper panel in the left column – DON and PON should be corrected to DOC and POC.

Figures 5 & 6: Alphabets (a, b, ...) need to be explained in more detail. For instance what does it mean by ab or abcd. In the captions it is mentioned "Different alphabet letters indicate the significant difference between groups". I could not understand what is the difference and what are the groups mentioned.

Fig. 6 – DTN is dissolved total nitrogen?

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