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Interactive comment on "Catchment-scale carbon exports across a subarctic landscape gradient" *by* R. Giesler et al.

Anonymous Referee #1

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Main findings of this 6 catchment study (catchments vary in size from 5.2 to 565.3 km2) is that highest DOC occurs during spring snowmelt event, DIC is a significant component of the annual aquatic C flux and highest DIC occurs during winter. Overall these are catchments characterised by very low DIC/DOC concentrations and fluxes.

Specific comments: 7954 L1 – not clear what "hydrological cycling" means in this context? 7954 L25 – what about CH4 release.... 7955 L17 – specifically active layer thickness? 7955 L26 – summer export decreased - compared to what? 7958 L17-19 – sampling frequency varies from 2/3 times per week, to weekly, to monthly. Difficult therefore to calculate meaningful flux values. 7959 L3-16 – a lot of assumptions were used to estimate flow. Have any of these been tested (e.g. area weighting)? How good were the discharge rating equations? Introduction to the manuscript is ok, although

rather too many processes and linkages are described and it would benefit from being more closely linked to the study aims. Some relevant literature on spring snowmelt C and water fluxes is omitted. E.g. papers by Buffam 2008 Sc Total Environ , Dyson et al Biogeochem 2010, Dinsmore et al 2011 Sci Total Environ. 7957-7958 Study sites – no information is provided on soils or geology. This is a major omission since one of the focusses of this manuscript is DIC. What was the % coverage of organic soils in the various study catchments? – again relevant because this is a manuscript on DOC. 7963 L1-9 – In my view P<0.10 is not a significant relationship. Annual DOC load and annual runoff are not independent variables. Why not explore relationships between discharge, DOC and DIC?? 7964 L18-20 – I disagree. Both DIC and DOC fluxes are very low in these catchments, even though the % DIC contribution to the total C flux is high. 7965 L10 – the author's interpretation of a geogenic origin may be correct, but no information at all is given in the manuscript on geology or soils. Hence this assertion cannot be evaluated by the reader. 7969 L20-25 - I think the authors are again over-exaggerating the importance of the DIC flux in these systems. The overall DIC flux values are small. Section 4.4 is very general and there is little or no evidence presented to support these far-reaching conclusions.

Table 1: I would have preferred to have seen the data area-weighted since there are huge differences in catchment area been the 6 sites. Table 2 should come before Table 1. Table 2: Is this "elevation" of the sample site? Is it mean "slope"? What is "flow pathway length"?. These terms are all rather meaningless unless they are accurately defined. Table 3: Presumably units are g C m-2 yr-1. These are all low C fluxes values compared to many boreal/northern systems. Suggest use L instead of dm-3. Table 4: Pretty meaningless table – again I don't think it worthwhile expressing P<0.10 as a significant relationship. Table 6: Omit as the relationships are predictable. Big question would seem to be - what controls DIC and DOC, not what the inter-relationship between Ca and Na are. The former is relevant to this manuscript, the latter not relevant. Fig 3: Need to know whether the trends are significant or not. Fig 4: Not sure what the authors are trying to show in this diagram? Fig 5: These Si/DIC inter-correlations

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would be expected. Why not add regression curves and R2 values? Fig 6: Mass flux and water yield will almost always show a +ve correlation – again the graph is what you would expect. Not sure what this Figure adds to the manuscript?

Overall I believe that the manuscript mis-interprets the relevance of the findings with respect to the importance of DIC. Hence it is incorrect to suggest that DIC is of greater importance in Arctic ecosystems because of this study. The catchments are low DOC systems compared to many Arctic or sub-arctic landscapes.

Interactive comment on Biogeosciences Discuss., 10, 7953, 2013.