This reviewer finds the topic of the work very interesting and offers a favorable review of this work. There are a few general and specific comments by the reviewer (many of which parallel comments from Reviewer 1). Here, we present short versions of these comments followed directly by our response and (when appropriate) notes on how the manuscript text is changed.

The title is misleading…
This has been changed per Reviewer 1 comment and the title is now:
The relationship between subsurface hydrology and dissolved carbon fluxes for a sub-arctic catchment

You discuss the reaction of your system under future climate changes ... you should mention how you possibly could include the effect of climate change in your model concept in order to give estimates for the future.
We have expanded the discussion to include this in the section entitled "On the potential effects of changes to flow pathways in the sub-arctic". With respect to the modeling concept presented in this study, the flow in deeper pathways due to thawing has the potential to be slower as hydraulic conductivity in Swedish soil-rock systems typically decreases with depth into the subsurface profile. This will likely change the advective travel times through the catchment. Such changes could be represented in the current modeling conceptualization by allowing deeper subsurface flow pathways to shift the advective travel time distribution from the present-day distribution towards a distribution that includes the longer travel times associated with the deeper and slower flow. In addition, physically-based models (e.g., Grimm and Painter, 2009; Destouni et al., 2010) could allow for more explicit accounting of changes in flow pathways and associated advective travel times due to permafrost thawing.

p. 1682: You mention long-term hydrograph separation: How is it done? Please give formula.
Rather than give another formula (there were originally 11 equations), we give reference to some key literature on hydrograph separation. Specifically, we reference to Sklash and Farvolden (1979) and Buttle and McDonnell (2004). We feel this suffices for the current study.

p. 1682: "We can compare … with the product of …" Please describe how you do it (formula?)
The section of the text has been improved considerably in response to Reviewer 1 comments.
Formula (4) and (5) are very similar. Please describe the underlying concept only once. Formulas (9)-(11) are also not necessary. Please shorten this paragraph
We agree and these sections have been clarified with respect to Reviewer 1 comments and made much more concise.

p. 1686: "… we can separate …", the methodology is not described in your text.
See response above and response to Reviewer 1 comments to changes made in this section.

p. 1687: "we can use the estimated aquifer thicknesses from Eqs (1) and (2)… I do not understand how you derived qsh and qd?
This has been more thoroughly presented and describe in the revised text (per Review 1 comments)

p. 1687: "These estimated advective travels times…" how you derived travel times?

The methods used to compute advective travel times in this study have been clarified and improved.

p. 1688: very short description
The section pertaining to DOC and DIC observations and flux estimates has been expanded in the revised text.

p. 1692 Where is the (conceptual) link of this paragraph to your approach. Please give at least ideas how to include thawing of permafrost.
See response above to the conceptual link and potential methodology for included permafrost thaw.

References

Buttle, J., and McDonnell J.J.: Isotope tracers in catchment hydrology in the humid tropics, in Forest-Water-People in the Humid Tropics, edited by M. Bonell and L. A. Bruijnzeel, Cambridge University Press, New York, 770-789, 2004.

Destouni G., Painter S.L., and Lyon S.W.: Permafrost hydrology under seasonal variability and climate change, Geophysical Research Letters, in press.

Grimm R.E. and Painter S.L.: On the secular evolution of groundwater on Mars, Geophysical Research Letters, 36, L24803, 2009.

Sklash M.G. and Farvolden R.N.: The role of groundwater in storm runoff, Journal of Hydrology, 43, 45-65, 1979.