Hydrol. Earth Syst. Sci. Discuss., 6, C2841–C2845, 2009
www.hydrol-earth-syst-sci-discuss.net/6/C2841/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Forest decline caused by high soil water conditions in a permafrost region" *by* H. Iwasaki et al.

A. Hildebrandt (Referee)

hildebra@alum.mit.edu

Received and published: 8 December 2009

General Comments

This paper is an interesting account of how unusual high precipitation might negatively influence ecosystems in the taiga forest. This experimental work is useful with respect to understanding ecosystem dynamics related to unusual weather conditions as well as possible implications of climate change in the taiga forest.

This said, I believe that the text of the paper should still be improved with regard to supporting its hypothesis and results. For example, some hypotheses are stated like facts, and could be formulated more carefully. The discussion of the results lacks

unfortunately comments on how prevalent the described feature is (i.e. how much, in percent, of the forest were affected by browning and senescence?) Generally, the paper would benefit from placing more and more appropriate citations (see detailed comments), more careful (and appropriate) formulation of the conclusions.

In general, I think this paper is a valuable contribution to understanding ecosystem water relations in this important forest region.

Specific comments

Page 6088, line 13: For the understandability of the abstract it would probably be better, if no variable names were used (because there is not space to define them).

Page 6088, line 16-19: I think this statement is too strong, compared to the presented evidence in the paper. The paper shows that certain topographic features are conducive to water collection and resulting increased soil moisture, compared to the surrounding areas. In these moist areas trees suffered. It is not shown, if or how the size of these moist areas changes with precipitation. The expected expansion of forest degradation should therefore be formulated more like a possible implication, not a necessary one.

Page 6089, line 13 For readers, who are less familiar with the area, it would be nice to have a literature reference after your statement that "water stress is a major limiting factor to tree growth“.

Page 6090, lines 14-19 This sentence is rather long and difficult to follow through. Could you split it up in two?

Also, I think the placement of the reference (Epron et al., 1999) is a little un-lucky. Your statement is in present tense, suggesting that it is a fact that the emission of CO2 to the atmosphere was increased in Yakutsk in 2007. You support this statement with a reference (Epron et al., 1999). However, the reference concerns an ecosystem in France (where indeed CO2 emissions were increased in dry soils). It would be

HESSD

6, C2841–C2845, 2009

necessary to distinguish the motivation (the observation of increased CO2 efflux in correlation with lower soil moisture in a beech forest in France) from your hypothesis (that this might also have been the case in the larch forest in Yakutsk in 2007).

Page 6090 site description It would be interesting to state here, how prevalent was the browning of larch trees in this area? On the picture it looks like this was an occasional feature?

Page 6090, line 10 I find it unusual that such an old, undisturbed forest (160 years) would have no age structure (i.e. all trees having the same age). Could you explain more about why this is the case? Could you indicate, how this age was obtained, and why all the trees are of the same age? I tried to find more information on this in the reference (Lopez et al., 2007) you give to support this fact, but also there, the age is simply stated, without reference to when and how this was measured, or if this is a valid assumption based on independent information. Could you explore?

Also, erase the “C” after “Lopez”.

Page 6090, line 23 "core samples were saturated by capillarity“ I do not understand this sentence well. I have not encountered this description before, and also an online search did not help further. Maybe use an equivalent expression?

Page 6090, line 26 From the context I understand that each soil sample was classified? If yes, maybe say "Each soil sample“ or "All soil samples“ here.

Page 6091, line 1 "Soil water retention curves were developed for each soil type using ... “ Is it correct that you measured soil water retention for one soil sample per soil type (i.e. 3 of roughly 40 samples)? If this was the case, did you apply a certain rule to select the sample of your choice? Do you expect some variation of the soil parameters within your specified soil classes? Could you explore somewhat more on these points?

How was the spatial distribution of the soil classes along your transect? Was there a relation between soil class and location (sill versus slope)? I am asking this, because

HESSD

6, C2841–C2845, 2009

you use the derived parameter (b – one value for each soil classification) to compute the ratio Dp/Do and compare the values between slope and sill.

Could you add a comment on how your derived b-values relate to the b-values for the same soils published in the literature?

Page 6091, line 5 Maybe consider renaming this heading into "Derived Variables“ since "Calculations“ is rather general.

Page 6093, line 4 I would split up the sentence between "content“ and "which“ Also, I think that the second part of the sentence needs to be formulated more carefully, as in replace "which had a destructive“ with "which seemed to have a destructive“. This is, because the conclusions are drawn based on indirect measurements and hence are not entirely certain.

Page 6034, line 24 - Page 6094, line 2 I do understand why you draw this conclusion, but I think it needs some more support. For example, is it certain that such an event could not have taken place within the last 160 years? Is there no chance that the trees will recover, if conditions are favourable during the following years? Could you tell us more, why you think that no such event could have taken place before?

Page 6094, line 26 I think this conclusion needs to be formulated more carefully. There is no research on how far this feature can spread around the taiga. Your own research indicates that it is tied to particular micro-topography; hence only certain areas are potentially affected. Thus, concluding, "forest decline must spread and affect the global carbon cycle“ is still far fetched.

Page 6095, line 9 "caused by an elevated soil moisture“ - erase "an“

Page 6095, line 11 "These results implied the possibility that climate“ maybe reword to "These results imply that climate change“

Page 6102, Figure 2(a) I think the x - coordinate should be "log (s)”.

HESSD

6, C2841–C2845, 2009

References Epron, D., Farque, L., Lucot, E., and Badot, P. M.: Soil CO2 efflux in a beech forest: the contribution of root respiration, Ann. For. Sci., 56, 289–295, 1999.

Lopez C, M. L., Saito, H., Kobayashi, Y., Shirota, T., Iwahana, G., Maximov, T. C., and Fukuda, M.: Intreannual environmental-soil thawing rate variation and its control on transpiration from Larix cajanderi, central Yakutia, eastern Siberia, J. Hydrol., 338, 251–260, 2007.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6087, 2009.