

Interactive comment on “Influence of urbanization on permafrost: a case study from Mohe County, northernmost China” by W. B. Yu et al.

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General comments : The manuscript is interesting. The message is rather simple and straightforward: urbanization and urban history has lead to warmer ground temperature, deepening of the active layer and formation of a residual thaw layer. Thaw settlement has generated damages to buildings. The perched water table in the active layer was lowered, with the result that it is not available anymore as a drinking water source.

I think this is rather a note than a major paper. But this is a very good example of impact of thawing permafrost on human life. My main concern is the presence or not of a true urban heat island effect in such a small town without microclimate data to support this assertion. Given the proximity of buildings to each other 3D heat transfers

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in the soil beneath the urban area could have the same impact.

Is it possible to draw a tentative map or at least a sketch (ex. In a cross section) of permafrost conditions from natural (rural) terrain across the town to illustrate the impacts?

Given the sampling of cores that was done, it is surprising to see practically no solid geotechnical data: ice contents, thaw consolidation ratios, expected settlement, etc.

The English (style) needs to be significantly revamped.

Abstract : - Be more specific when you say “residents’ life is closely related to permafrost environment”. Why: foundations of buildings, road instability, water supply??? Or keep just the one statement at the end of the abstract. - Specify in text: depth to top of permafrost Introduction: - P. 4328. Delete Margareta (surname). Just cite as Johansson, 2011 - P.4329. line 2. Instead of the word rural I would say natural, vs urban. Rural means agricultural, unless this is the case. Later (p. 4334) you say that site F is in farmland, so rural then is OK. Please explain better the context: farmlands, natural terrain, old town, fallows, fires, reconstruction, etc. - The word undoubtedly is too strong here. According to fig. 2, the urban area is a rather small one. I am no expert, but it seems to me that urban heat islands are a characteristic feature of large cities. You cite no reference on possible UHI effects on such small town. Also the paper presents no local air or ground surface temperature records at various places within town, on the outskirts and in the natural areas outside town. Therefore the heat island effect is not documented as a factor for permafrost warming in the paper. It is likely that the 3D heat transfers in the ground from under buildings and unvegetated areas in town is a more plausible explanation for warmer ground and deeper depth to top of permafrost? Check.

- Line 11. Benson et al. (1983) is not in the bibliography at the end of the paper. - Line 16. “A certain warming trend” use more precise language - Lines 21-23. Rephrase: this study is the first one to measure permafrost degradation in the Mohe urban area.

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Is this what you mean? Site description - P. 4330. Line 8. "Most of the area" - Line 11 warms fast - Line 15 large instead of big - Line 23: did the fire in 1987 and the reconstruction in 2011 modify the ground temperature conditions?? This may be important. Is that documented? - Line 25-28: poor English. Rewrite Methodology - Page 4331, Line 2. Delete word "survey" - Line 5 replace rural by natural - Methodology section: specify lab analyses done on cores such as volumetric ice contents and water contents, stratigraphic description, grain-size analyses, thaw consolidation ratios, etc. For the GPR section state what signal velocity was obtained from the CMP to convert travel time into depths. This value should be at least in general accordance with grain-size, water content in the active layer and ice content in the permafrost.

Results and analysis A general comment here: it would be better to just present results in an orderly manner and move some interpretation elements into the discussion section. - Page 4332. Lines 3-5. Move to methodology - Line 8 thaw depth (not thawing depth) - Line 13 replace runway (for aircrafts) by alley - Line 20 stratigraphy (not strata) - Line 26; thickness of ice lenses - Line 27: the permafrost table is 3.7 m deep - Page 4333, Line 20 A seven story building - Lines 21-23 cracks in building walls and foundations and settlement are impacts. Maybe impacts should be discussed in a dedicated section of the paper. - Lines 25-26 : 16 m is very deep for thaw depth. It is rather the depth of the top of permafrost and there must be a residual thaw layer. - Page 4334 Lines 21-27; in this paragraph and in others you say the permafrost is icy. But really you do not provide good measurements of ice contents and thaw consolidation ratios. My opinion is that this is an important variable in the context to explain the scale of impacts. - Line 25: unclear what is thickness of permafrost (140-281 m). Are these values measured or a wide range of possible thickness given the imprecise downward extrapolation of temperature gradient?

Discussion and conclusions -P. 4335, Line 5, again. You need to demonstrate that this small town truly has an UHI effect. There is no convincing data to that effect. p. 4336 the conclusion in four points is OK.

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Figures: 1- Add the trend equation on the graph 2- Temperature monitoring sites (thermistor cables) and drilling sites should be indicated by dots 3- Figure 3, indicate velocity on graph 4- Figure 4, idem. Show some interpretation. This profile is not really presented and discussed in the text. It could be interesting to superpose drill hole data on top of the profile, to match both types of information 5, 6, 7, 8, 9- ok

Interactive comment on The Cryosphere Discuss., 8, 4327, 2014.

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