

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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Thanks for your valuable comments Michel.

As for the heat island effect (HIE) at Mohe County northernmost, China, it undoubtedly exists even with no data to prove that by now. But we use the information documented by reference (Hinkel et al. 2003) to prove the existing of HIE at Mohe County indirectly.

The reference mentioned that the village of Barrow, Alaska, is the northernmost settlement in the USA. The population has grown from about 300 residents in 1900 to more than 4600 in 2000. The field data demonstrate the existence of a strong urban heat island (UHI) during winter. The urban area averaged 2.2 °C warmer than the hinterland. The strength of the UHI increased as the wind velocity decreased, reaching an average

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value of 3.2 °C under calm ($<2 \text{ m s}^{-1}$) conditions and maximum single-day magnitude of 6 °C. UHI magnitude generally increased with decreasing air temperature in winter, reflecting the input of anthropogenic heat to maintain interior building temperatures.

The area and population in Mohe County are much larger than Barrow. The urban population in Mohe county was 25 000 in 1992. It increased to 41 420 in 2011. The urban area was 5.74 km² in 1987. The urban area was reconstructed because of the devastating fire disaster in 1987. The urban area increased to 8.74 km² after the reconstructing. Most of the time, the wind speed is smaller than 2.0 m s⁻¹. Burning coal and wood is the main way of heating and cooking. So comparing the conditions of Barrow and Mohe, we believe that the HIE exists in Mohe. Our coming project will install the observation system to observe the urban heat island of Mohe.

In fact, the current status of permafrost at the urban area of Mohe is caused by the comprehensive factors, such as the climate warming, HIE, surface disturbance by human activity during the urbanization, heating of buildings etc. Because of the temperature of inner buildings keeps over 24°C throughout the year, heat introduced into the foundation caused much larger thawing depth. Just as Michel's comments: Given the proximity of buildings to each other 3D heat transfers in the soil beneath the urban area could have the same impact. At present, we can not quantitatively figure out the effects of each factor, including the HIE.

Some samplings of cores are given in Fig 5 and Fig.9. Because this manuscript doesn't discuss the problem of the settlement and consolidation, the related data are not presented.

Other comments such as the figures, grammars etc will be addressed in the revised manuscript.

Best Regards,

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Hinkel, K.M., Nelson, F.E., Klene, A.E., and Bell, J.H.: The urban heat island in winter at Barrow, Alaska, *Int. J. Climatol.*,(23), 1889–1905, 2003.

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

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