Anonymous Referee #1

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Reply: We would like to thank the reviewer for providing these valuable comments that helped us to significantly improve the quality of our publication.

General comment: In this study, the dynamics of a young pingo in the Canadian Arctic was analyzed by high-resolution InSAR together with other documents and models. Generally, the significance of this work is moderate, particularly constainted by the narrow scope by investigating a single pingo.

Reply: For the first time we demonstrate here that the feature that morphologically does not necessarily look like a pingo (it is not a steep sided conical hill) can be distinguished within a complex landscape due to the ability of technology to resolve pingo like movements. The ground uplift of such large magnitude and spatial extent is observed only at a single location in this 20x20 km area (covering hundreds of known pingos). Therefore, this signal is extraordinary and deserves special attention. Previously changes of pingo heights were determined based on annual or semi-annual bench mark field observations. This is the first time that an unknown pingo was identified and its growth was measured by satellite DInSAR at high spatial and temporal resolution. In addition, various data sets were collected and three different types of modeling were performed to confirm our findings. We believe the novelty of the technique, leading to the discovery of a large uplifting feature, otherwise not clearly discernable as a pingo, deserves attention and publication. In a similar way we often study individual earthquakes and volcanic eruptions using DInSAR methodology because concentrating on a single feature allows better understanding details of its dynamic processes. Such detailed analysis cannot be achieved for many features in a single study.

Specific comments The inconsistence bettween InSAR observations and modelled results needs more clarifications. More pingos covered by the swath of R2 SAR data need to be studied to indicate the evolution of pingos in this area as well as to highlight the interaction between permafrost, pingo ice and non-pingo scenarios.

Reply: We have pondered about the inconsistency between DInSAR observed and modeled growth rates of the pingo. Just as Mackay (1977, 1978) indicated and we cited in section 1: "Pingo growth rates can vary significantly through time in response to changes in: 1) rates of ground water flow to the sub-pingo water lens, 2) release of pressurized water along hydraulic fractures and 3) variation in rates of downward freezing". We added some sentences in the discussion section about these points. We agree that many pingos are within the study area and we have shown them in a figure. However, comparing to the growth of the identified young pingo, the DInSAR deformation at other pingo sites is not significant. At this time we cannot conclude whether deformation processes do not occur at other pingos or our monitoring

technique is not able to detect it. The latter can be, for example, due to the large flat shape of the studied feature, in comparison to most other pingos that are steep sided conical hills, and also due to various sources of noise contaminating interferograms, including decorrelation caused by seasonal changes and snow cover, atmospheric disturbances and residual orbital ramps. As indicated in the discussion we will collect better DEM for more detailed studies in the future.

More references linked to the permafrost monitoring by InSAR techniques are required, such as:

1)Liu, L., Zhang, T., & Wahr, J. (2010). InSAR measurements of surface deformation over permafrost on the North Slope of Alaska. Journal of Geophysical Research - Earth Surface, 115, F03023, http://dx.doi.org/10.1029/2009JF001547.

2)Chen F. L., Lin H., Zhou W., Hong T.H., Wang G., Surface deformation detected by ALOS PALSAR small baseline SAR interferometry over permafrost environment of Beiluhe section, Ti- bet Plateau, China, Remote Sensing of Environment, 138: 10-18, 2013.

3)Chen F. L., Lin H., Li Z., Chen Q. and Zhou J.M., Interaction between permafrost and infrastructure along the Qinghai-Tibet Railway detected via jointly analysis of C- and L-band small baseline SAR interferometry, Remote Sensing of Environment, 123: 532-540,2012

Reply: We are happy to add these references (in introduction, section 1) – thank you very much for pointing them out.