The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2019-173-RC2, 2019

The Cryosphere Discussions

Interactive comment on "GPS Interferometric Reflectometry measurements of ground surface elevation changes in permafrost areas in northern Canada" *by* Jiahua Zhang et al.

Anonymous Referee #2

Received and published: 26 December 2019

GPS-IR has been used in many terrestrial parameter inverses. The determination of permafrost surface elevation changes via GPS-IR is an interest research. The theory and method of measuring the elevation is the universal method in snow depth and water elevation inverses proposed by Larson. The main work of the manuscript is to filter out a large number of stations that meet the conditions and select the GPS data that can be used in elevation measure. So, this manuscript is unacceptable in its present form and need to add more innovative work. The following questions should be answered:

1. According to the description in the manuscript, the ground of the GPS is buried

deep in the permafrost layer and will not change with the settlement of the active layer. The settlement results obtained are also sub-centimeter level, but the movement of the Earth's plate is vertical to the GPS receiver. The effect of displacement cannot be ignored. It is necessary to consider whether the spatial coordinates of the GPS antenna are constant, so that the ground subsidence can be measured with the GPS antenna as a reference.

2. The photos of the stations showed the surrounding environment are still relatively complicated. The reflected SNR oscillation obtained by this environment should be disordered. The measured reflection SNR sequence diagrams and spectrum analysis results of several stations should be given.

3. The noise of SNR measurement is relatively large, which results in the accuracy of snow thickness measurement with approximate specular reflection being only 0-5cm. The surface of the bare soil is rougher, and the error of height measurement will be larger, but the result is sub-centimeter, how to explain it.

4. The researches of Chew and Small (2014, 2016) showed that vegetation will affect the reflection signal. How to process the influence of vegetation on the reflection signal and height measurement needs to be explained in the manuscript.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2019-173, 2019.