Comments from Referee #2

We appreciate insightful and supportive comments from the referee #2. We listed below our plan to revise the manuscript, incorporating the updates and additions suggested by the referee in the following manner.

1- Much of the text needs improvements in grammatical structure and style of writing.

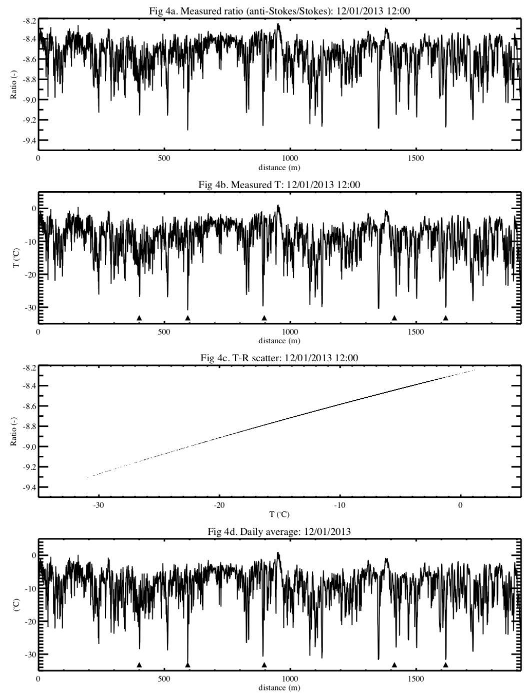
We will carefully check the clarity of the texts, and revise them following the suggestions (including those shown in the pdf file) given by the reviewer.

2- Scientific rigor of the manuscript needs improvement.

We will improve the manuscript and figures, incorporating the comments and suggestions raised by the reviewer (please also see the replies to the issues #3-7 below).

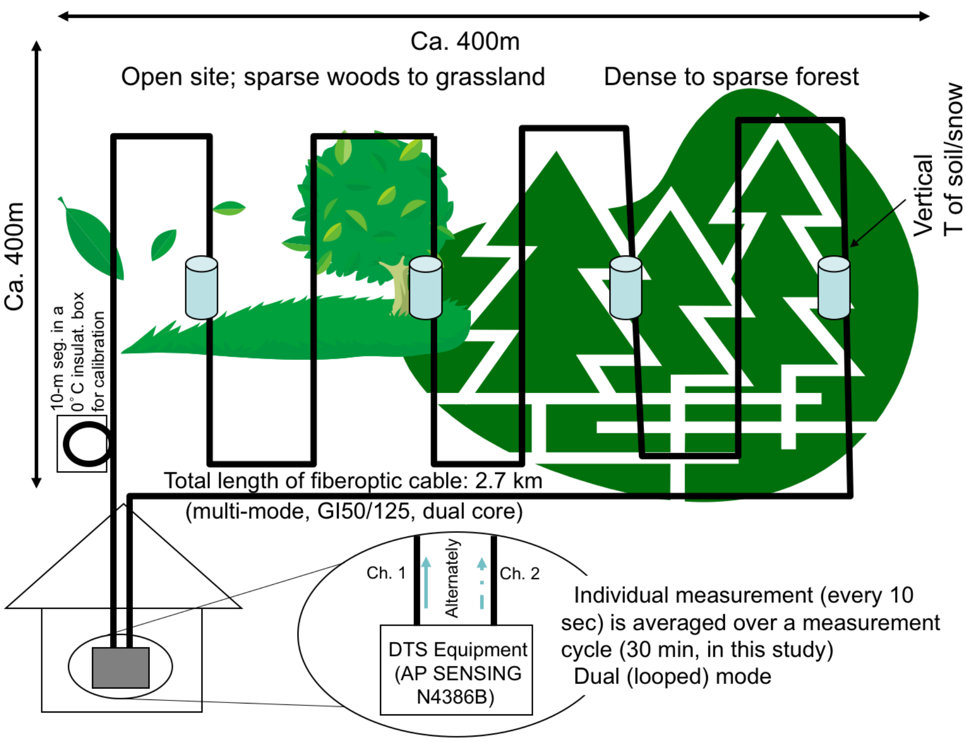
3- Figure 3 is elementary. It should be substituted with a figure showing real spectra of the anti-stokes component.

The DTS equipment used in the study (Instrument type: N4386B) only provides the logarithmic ratio between the Stokes and anti-Stokes components, as well as the value converted to temperature. Therefore, we will provide new panels in Figure 4 to show the logarithmic ratio r (new Figure 4a) and the temperature values T (new Figure 4b) of an instantaneous measurement (made at 12:00 on December 1, 2013), as well as the T-r scatter plot for the measurements (new Figure 4c), in addition to the original daily average (new Figure 4d).



4- Include schematic illustrations of instrument layout and experimental setup.

We will add the following schematic illustrations of instrument layout as new Figure 3.



5- Include details of instrumental response for actual field conditions and calibration procedures.

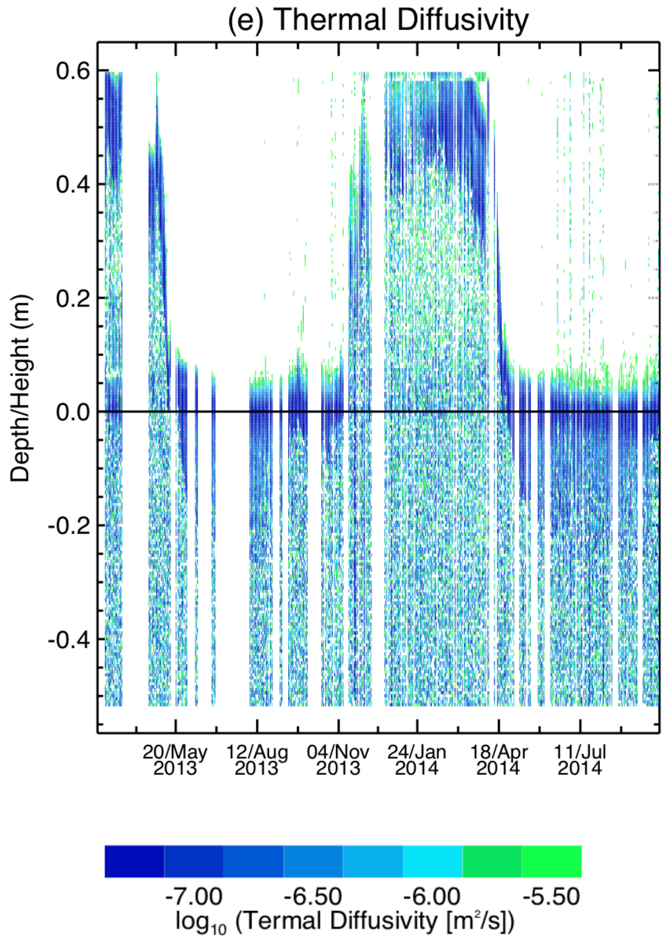
We will add the following explanations after the current description as "Calibration was performed at 0º C using a 10-m segment of the cable. The segment was coiled and kept in an insulated box filled with well-mixed crashed ice and water during the calibration process for about two hours." (p. 4, ll. 11-12), and noted in the new Figure 3.

6- The results presented demonstrate the usefulness of DTS system for surface temperature measurements but have only limited relevance for geophysical problems such as climate change, subsurface thermal conditions, hydrological processes, etc.

Validations, calibrations and improvements of land surface process models (e.g., snow pack dynamics with metamorphosis, frozen ground dynamics, as well as models for energy-water-material budget) are important parts of geophysical studies dealing with the problems such as climate change, subsurface thermal conditions, and hydrological processes. Information and understanding obtained from the DTS system can contribution to the geophysical studies. Results shown in old Figure 6 exemplify the impacts of land surface types on diurnal variations of surface temperature which drives, control or modify the amount and timing of energy partition at the surface, transport of energy into the ground, and activities of the forest-floor vegetations. We will also add the thermal diffusivity analysis (please see also our reply on #7 below), which will serve to calibration and improvement of snow and freezing/thawing processes in the relevant models.

7- It is useful to include quantitative analysis temperature variations associated with changes in vegetation type, permafrost thickness and snow cover.

We believe Figures 6 and 7 show the impacts of vegetation types and snow cover on temperature variations on the daily (figures 6 and 7b) and seasonal (Figure 7a) scales. We will add an analysis of thermal diffusivity changes in snow and soil layers (new Figure 8e; p. 7, ll. 12-25) to incorporate the issues #6 and #7.



(e) Thermal Diffusivity
0.6
0.4
0.2
0.0
-0.2
-0.4
Depth/Height (m)
20/May 2013
12/Aug 2013
04/Nov 2013
24/Jan 2014
18/Apr 2014
11/Jul 2014
-7.00
-6.50
-6.00
-5.50
log10 (Termal Diffusivity [m²/s])