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The Cryosphere Discussions

Interactive comment on "The influence of climate and hydrological variables on opposite anomaly in active layer thickness between Eurasian and North American watersheds" *by* H. Park et al.

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Dear Dr. T. Zhang, Thank you very much for your valuable comments that should help to improve our manuscript. Our answers to your comments and suggestions are described at the below.

1. Line 1 Abstract: The expression '. . . permafrost active layer thickness (ALT)' is changed to '. . . active layer thickness (ALT) in permafrost'.

2. Line 3 Page 2539: That was corrected to '. . .; Bekryaev et al., 2010).'.

3. Line 25 Page 2544: This model includes both vegetation dynamic model and carbon

budget model, which can simulate the dynamics of soil organic carbon every time step. Therefore, our model adopted the use of the dynamical soil organic carbon simulated by the model itself, instead of the prescribed input data. In the current version of our model, the simulated soil organic carbon is stored within the soil depth of 1.8m. The lumped soil organic carbon is vertically distributed using an algorithm (Lawrence et al., 2008) that the surface soil layer (approximately 1–30 cm) is a higher organic layer and the organic content of the underlying layers sharply decreases with soil depth. Page 2542 Line 20–26 has already describing concerning on the simulation of soil organic carbon.

4. The soil depth of the lower boundary is 30.5 m, describing in Line 13–14 Page 2542.

5. Our model estimated that at ïijđ45oN, permafrost regions occupy about 17.72×106 km2. The number can't directly be compared with 22.79×106 km2 estimated by Zhang et al. (1999), because the regions that the two studies considered were different. A description concerning on the comparison of permafrost extent between this study and Zhang et al. (1999) is added on Line 16 Page 2546, as 'The model simulated that permafrost regions occupy approximately 17.72×106 km2, which is less than 22.79×106 km2 in the Northern Hemisphere estimated by Zhang et al. (1999). The difference is likely due to the different two study regions.'

6. Line 1 Page 2547: As you suggested, the sentence is changed as 'Meanwhile, the decrease in ALT is found . . .'.

7. In Discussion: As you suggested, descriptions concerning on the surface deformation are added to Line 16 Page 2556 as 'The deepened ALT likely thaws ice-rich permafrost near the permafrost table, forming saturated surface and deforming the surface. In reality, the surface deformation caused by the deepened ALT had found in Siberia (Iijima et al., 2010) and on the North Slope of Alaska (Liu et al., 2010, 2012).'

8. We also agree that the paper, you recommended, could support our conclusion. The paper is referred in Discussion section.

TCD
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Interactive comment on The Cryosphere Discuss., 6, 2537, 2012.

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