Geophysical Research Abstracts
Vol. 16, EGU2014-12031, 2014
EGU General Assembly 2014

A story of the permafrost small-scale collapse at the deciduous shrub patches in the northeast Siberian tundra

Bingxi Li (1), Monique Heijmans (1), Ute Sass-Klaassen (2), and Frank Berendse (1)

(1) nature conservation and plant ecology group, Wageningen university, Wageningen,the Netherlands (bingxi.li@wur.nl), (2) forest ecology and forest management group, Wageningen university, Wageningen, the Netherlands

The recent climate change is believed to accelerate the permafrost degradation in the arctic tundra. It also, meanwhile, drove the greening of the arctic (the expansion of the deciduous shrubs). The switch of the vegetation type might largely affect the local permafrost dynamics. Previous research indicated that the cover of deciduous shrubs mitigates the local permafrost degradation. From our observations, the active layer of permafrost at the deciduous shrub patch is normally the thinnest during the growing season. However, at our northeast Siberian tundra research site we also observed the drowning of shrubs due to small-scale permafrost collapse which happened in the shrub patches. This phenomenon is still far from understood. In this study we tried to explore the reasons that triggered these events. We hypothesized that the shrub cover can no longer protect the permafrost if dying of the oldest deciduous shrubs starts. Without sufficient shrub protection, the small-scale collapse of permafrost happens. Thus, we expected that the oldest deciduous shrub (in our study is dwarf birch Betula nana) individuals existed at small-scale permafrost collapse sites and the more younger stems appeared at the margin, compared with those at the center of the patches. The lack of long-term monitoring record increased the difficulties of the study. To achieve this target, a dendrochoronolgical method was implemented in this study, helping us measuring the shrub ages precisely. From the results of the study, we concluded that the dynamics of these patches were more complicated than our original hypotheses. Although there were some evidence supporting our expectation, the other results were against that. The vegetation dynamics of the B. nana patch probably was not the main reason of the local small-scale permafrost collapse. It was further implied that the local permafrost dynamics probably play a vital role on the patch dynamics in turn.