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東シベリアの地表面状態はどの様に変化し，その変化が水循環に小渡の様に影響しているか?

How are the land surface conditions changing in eastern Siberia? And how does the change affect hydrological processes?

太田 岳史[1*]，小谷 亜由美[1]，吉田 恵[1]，飯島 慈裕[2]，中井太郎[3]，マキシモフ トロフィーム[4]

Takeshi Ohta[1*], Ayumi Kotani[1], Megumi Yoshida[1], Yoshihiro Iijima[2], Taro Nakai[3], Trofim C Maximov[4]

[1]名古屋大学, [2]海洋研究開発機構, [3]アラスカ大学, [4]北方圏生物問題研究所

[1]Nagoya University, [2]JAMSTEC, [3]University of Alaska, Fairbanks, [4]IBPC, RAS

Climate changes are projected to result in extreme ambient conditions in many terrestrial ecosystems, including severe drought, rainfall, heat and cold. Vegetation has developed under many surrounding conditions. However, under rapid climate change, some vegetation may not be able to adjust to the new conditions and may decline and eventually perish.
Among potential extreme conditions, drought is a major concern in the tropic and temperate climates, as well as Amazon (Betts, et al., 2008), and Europe (Ciacis et al., 2005). In contrast, some Siberian forests have experienced extremely wet soil moisture conditions for the last 4?5 years in the middle reaches of Lena River basin (Ohta et al., 2008; Iijima et al., in press). We examined the effects of such unusually high soil water content (SWC) on evapotranspiration and surface conductance using in situ data sets obtained at the Spasskaya Pad Experimental Forest located in the middle reaches of the Lena River, eastern Siberia. Evapotranspiration and surface conductance for the whole ecosystem and for the understorey vegetation were obtained by the eddy covariance method and ambient conditions (i.e., atmospheric conditions and SWC). The results show that both overstorey and understorey vegetation have changed in the last few years. Several larch trees died in 2007, representing ~8% mortality in the third year from the onset of high SWC. In the understorey, several grass species with high tolerance to wet soil invaded the observation site. Evapotranspiration rates for the whole ecosystem dropped in the summers of 200 7 and 2008, although we found no significant change in atmospheric demand for evaporation and no decrease of understorey evapotranspiration. For the whole ecosystem, both evapotranspiration normalised by potential evaporation and surface conductance decreased in summers of 2007 and 2 008, even though SWC has maintained high values since 2005. SWC and surface conductance for the whole ecosystem showed a positive relationship in July and August during 1998?2006, but this relationship turned to be clearly negative for the 2005 - 2008 period; however, surface conductance for understory showed constant values or decreased slightly with SWC during 2005 - 2008. These tendencies imply that only the overstorey vegetation suffered severe damage due to the extremely high SWC because, unlike the understorey, the overstorey cannot rapidly adapt to wet conditions. We propose a conceptual model of elastic and plastic stresses for evaluating the tolerance and/or tipping point of vegetation to unexpected ambient conditions, based on the results obtained by in situ observation.
Forest damage mentioned as above seems not to occur in the southern part of Lena River although it is more rainy area there, comparing with the middle reaches of Lena River basin. This tendency

suggests that not only amount of precipitation but also soil physical properties might be an important factor affecting forest damages due to extreme wetness and/or drought.

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