Inter-annual variations in ecosystem activities driven by variation in soil moisture

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East Siberian taiga is a unique ecosystem, which is established on permafrost. Climate there is extremely dry (about 250mm of annual mean precipitation). Inter-annual variations in precipitation and consequently soil moisture are very large. Soil moisture varies responding with variation in precipitation. In temperate region, variation in soil moisture storage from year to year is usually negligible, however, inter-annual variation in soil moisture in cold region may not be negligible because soil moisture can be stored as ice during winter. Various activities of ecosystem, such as photosynthesis of plants, etc., is expected to be driven by the variation in soil moisture.

Soil moisture, photosynthetic activity of plants, the amount of litter fall, etc., were observed at Spasskaya Pad experimental forest, Yakutsk, Russia. Soil moisture varied with precipitation, and excess water at the end of summer was stored as ice. Consequently, variation in soil moisture showed time-lag behind that in precipitation. Plants also showed large inter-annual variations in photosynthyetic activity, and needle production. These variations showed a time lag behind the variation in soil moisture. Therefore, 2 year time lag may be possible behind the variation in precipitation.

Variation in precipitation possibly drives carbon exchange between ecosystem and atmosphere through the variation in soil moisture with a time lag of certain period in such ecosystem under dry climate as eastern Siberian taiga.