Decadal Changes of Phenological Patterns over Arctic Tundra Biome

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**The northern high latitudes have experienced a continuous and accelerated trend of warming during the past 30 years, with most recent decade ranks the warmest years since 1850. Warmer springs are especially evident throughout the Arctic. Meanwhile, Arctic sea ice declined rapidly to unprecedented low extents in all months, with late summer experiences the most significant declining. Warming in the north is also evident from observations of early melting of snow and reducing snow cover. There were detectable changes in phenological pattern over tundra biome in past two decades. Increases of vegetation greenness were observed in most of the summer periods in low arctic and mid-summer in high arctic. Peak greenness appeared earlier in high arctic and declined slower after peak in low arctic. Tundra plants were having longer and stronger photosynthesis activities, and therefore increased annual greenness.**

**The key changes in arctic tundra seasonality are likely related to retreat/accumulate dates of sea ice and length of ice free period over several case areas (e.g. nearshore ice), to melt/accumulate dates of snow cover and length of snow free period over bioclimate gradients. Changes in seasonality of tundra biome have important implications by altering surface albedo and heat budget, modifying plant photosynthesis/respiration and soil microbial activities, and even changing hydrological patterns in the arctic.**

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