Title:

Are Trees Invading the Arctic?
Circumpolar Treeline Research During IPY

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The location of the tundra-taiga interface (TTI) zone corresponds to historic and recent climate and disturbance regimes. The zone is expected to respond rapidly to climate warming by tree and shrub advance, with ecological, socioeconomic and climatic consequences at local to global scales. However, the predicted advance is based on simple models that neglect ecological constraints and time-lags. The circumpolar TTI is diverse and complex, and cannot be expected to respond in a homogeneous manner throughout its vast geographical biome. During IPY a large number of projects have begun to reveal a varied pattern of response to recent environmental changes, challenging the assumption of a common, simplistic, rapid northward forest advance. A detailed circumpolar analysis awaits further results, but at a coarse global scale only half of the study sites show recent advance. Responsiveness is linked to both the structure of the zone and its geoclimatic location. Advance appears to prevail in alpine areas and regions affected by moist air masses, while some latitudinal treeline regions dominated by dry arctic air show stationary or even retreating behaviour. Large arctic herbivores such as reindeer/caribou can dominate TTI dynamics at region- and species specific levels by modifying e.g. recruitment, survival and growth. Herbivore-driven modification of expected climate-driven tree expansion emphasises the need to consider changes in grazing regimes and other perturbations (fire, insects etc.) along with climate change, to avoid misleading interpretations regarding rates of climate-driven encroachment. The vast area and remote location of many study sites calls for remote sensing as a monitoring tool of decadal tree cover changes. Efficient algorithms have been developed for local scales and dense forest, although difficulties remain for sparse forest and global scale mapping.

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