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IGPPS Center Science of Signatures Seminar Series

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Subarctic Forest Advance - Empirical-Based Results *vs.* Modeled Predictions

Wednesday, January 28, 2015

1:00 - 2:00 PM

Research Park, 2nd Floor, 203A Conference Room

Abstract: The subarctic forest is expected to move northward in response to global warming. As a result, a larger proportion of the earth's surface area may become darker and thus absorb more heat. Through feedback mechanisms, change of this nature could have a major impact on global climate. The predominant assumption is that a warmer climate will cause the forest-tundra ecotone (FTE) to advance steadily northward. Empirical-based results, however, do not confirm such an assumption outright.

The FTE location corresponds to a combination of 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. FTE is diverse and complex, and cannot be expected to respond in a homogeneous manner throughout geographical regions. During the past years and decades 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 and elevational forest advance. A detailed circumpolar analysis awaits further results, but at a coarse global scale far from all study sites show recent advance. Responsiveness is linked to both the structure of FTE and its geoclimatic location. Advance appears to prevail in some areas and regions affected by moist air masses but not all, while some FTE regions dominated by dry arctic air show stationary or retreating behavior. Large herbivores such as reindeer can dominate the dynamics of FTE at region- and species-specific levels by modifying recruitment, survival and growth of trees. Herbivore-driven or other disturbance-driven modification of expected climate-driven tree expansion emphasizes the need to consider changes in grazing regimes and other perturbations (e.g. tundra- and forest fires, wind, insects, permafrost alternation) along with climate change, to avoid misleading interpretations regarding rates of climate-driven encroachment.

Biography: Annika Hofgaard is a Senior Scientist at the Norwegian Institute for Nature Research (NINA). Annika is a leading figure in the International Arctic vegetation science community. She obtained her PhD in Forest Vegetation Ecology from the Swedish University of Agricultural Sciences, Uppsala, Sweden, after which her interest in Northern regions and Arctic vegetation lead her to take a post-doctoral position from the Canadian National Science Research Council at University of Quebec in Montreal. Currently, her main research interests include impacts of changing climate on vegetation, focusing on Arctic ecology at the tree line. She has led and coordinated numerous international projects and initiatives on impacts of climate change, and sustainability of the Arctic region both in Europe and North America. She serves as leader and coordinator of the International Polar Year core project "PPS Arctic" involving 9 countries and more than 150 scientists and graduate students and a pan-European Strategic Institute Project for enhancing the resilience capacity of sensitive forest ecosystems. She is a member of the steering committee of the North American Treeline Network and contributes to the international community by reviewing both IPCC, Intergovernmental panel on Climate Change, and ACIA, Arctic Climate Impact Assessment, reports as well as serving on the advisory boards for several scientific steering committees in Scandinavia including Royal Swedish Academy of Sciences.

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