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**Abstract**

**Detecting Tundra Ecosystem Change Using Remote Sensing**

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High northern latitudes are undergoing dramatic changes in climate. The tundra ecosystem is expected to be particularly responsive to climate change, and these changes may result in climate feedbacks with global implications. There are a number of ways in which higher temperatures may affect the tundra ecosystem. Warming may increase rates of vegetation growth and thus remove more carbon dioxide from the atmosphere. It may also cause thawing of permafrost affecting soil microbial activity, nutrient cycles, and soil moisture which determine ecosystem respiration, returning greenhouse gasses such as carbon dioxide and methane to the atmosphere from the large amount of carbon stored in the soil.

The remoteness of most tundra sites makes it difficult to directly measure the carbon exchange of tundra landscapes, indicating the importance of using data from remote sensing satellites to monitor this system. The studies described in this talk involve research linking measurements of the light reflected from the tundra with the exchange of carbon between the ecosystem and atmosphere to develop robust approaches to using satellite data. These measurements were collected in sites near Barrow, AK, looking at different spatial scales: plot scale at about 1 square meter, tower scale at 100's to 1000's of square meters, and satellite scales from a few square kilometers up to the entire arctic tundra. These studies show: warming increases both photosynthesis and respiration, and that the exact balance depends on the water table status; increases in vegetation growth due to warming are detectable using remote sensing; and tundra ecosystem carbon uptake can be estimated using remote sensing.

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