Study illustrates shifting boreal forest ecosystem in Alaska

March 2 2011

(PhysOrg.com) -- A new study released in the scientific journal *Ecology Letters* offers one of the first confirmations of a wholesale shift in the boreal forest ecosystem due to climate change.

University of Alaska Fairbanks researchers are among collaborators on the study, which compared tree-ring data to satellite images. The study found that tree growth declined across most of the current area of Alaska boreal forest but increased in a smaller area on the cold margins of the forest.

“This is one of the first extensive analyses of annual growth and climate response of black spruce in Alaska,” said Glenn Juday, professor of forest ecology at the University of Alaska Fairbanks and a co-author of the article.

Scientists at the Woods Hole Research Center and three other institutions based in Alaska and France conducted the study. UAF scientists were instrumental in the project, which involved one of the largest and most widely distributed samples of tree-ring data ever analyzed in Alaska: 839 trees, including 627 white spruce from 46 stands and 212 black spruce from 42 stands.

“The tree rings tell us for sure what’s happening on the ground, and the satellite data covers the whole region,” said Juday. “Recent temperature increases have reduced tree growth over most of central Alaska, and increased growth in places where the temperature used to be too low for

optimum growth, such as the Western Alaska tundra margin. Summer temperatures in central Interior Alaska are now almost too warm for white spruce to survive."

The study is the first time the two sets of data were compared, Juday said. "Every tree ring sample was compared to the satellite data and they mostly agreed. It's particularly impressive that the tree ring and satellite data agree so well. This gives the final piece of assurance that this is real."

According to lead author Pieter Beck, a postdoctoral fellow at Woods Hole Research Center, the results offer evidence of the biome shifting in response to climate change and indicate that some ecosystem models may be missing changes happening in the circumpolar region.

"While the findings contrast with some recent model predictions of increased high latitude vegetation productivity, they are consistent with longer-term projections of global vegetation models," Beck said.

Scott Goetz, a senior scientist at WHRC, proposed the study and co-authored the manuscript.

"Most people don't think of high-latitudes forests as being drought stressed and they are not, in the traditional sense of having soils dry up and blow away, but their growth is negatively impacted by hot dry air masses and those have increased in recent years," he said. "This paper shows those drought impacts are captured in both the satellite and the tree ring record."

Researchers from the UAF School of Natural Resources and Agricultural Sciences who worked on the project were Juday, Valerie Barber, Patricia Heiser and Emily Sousa. Claire Alix, a former affiliate with SNRAS now at the Panthéon Sorbonne Archéologie des

Amériques, Steve Winslow, former SNRAS graduate student, and Jim Herriges with the Bureau of Land Management participated in the study and co-authored the paper.

Provided by University of Alaska Fairbanks