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Climate Change Implicated in Fast Tree Growth Forest Monitoring Study Reveals Effects of Climate Change

A recurrent theme in the climate change debate is whether forests are part of the solution for global warming. As trees grow they capture atmospheric carbon dioxide. Reports that attribute increased tree growth to global warming have been criticized by researchers who attribute increased tree growth to recovery from historical disturbances such as logging or agriculture, rather than to climate change. A new Smithsonian study finds that tree growth in a temperate forest has recently increased, even when natural recovery from disturbance is taken into account.

A combination of higher regional temperatures, increased atmospheric CO₂, and longer growing seasons would explain the observed increase in growth.

“Measuring the impacts of climate change on forests is not straightforward. Forests are naturally dynamic. This is one of the first results of a major, HSBC Climate Partnership-funded project to see if the trends in forest dynamics we see at tropical forest monitoring sites hold up at temperate sites,” said Stuart Davies, director of the Smithsonian’s Center for Tropical Forest Science, “By distinguishing between the effects of natural forest dynamics and the impacts of climate change, this study takes a major step toward revealing the role of temperate forests in the global carbon cycle.”

“We took advantage of a couple of unique, long-term data sets for land use, temperature, and atmospheric carbon dioxide levels that people have gathered at the Smithsonian Environmental Research Center in Maryland,” said lead author, Sean M. McMahon, a CTFS post-doctoral fellow. “We figured out what the expected growth rate of trees in 55 different plots would be based on growth measurements from the last 20 years, and then we realized that we were seeing higher than expected yearly growth rates across the sites.”

There was no evidence for increases in nutrients, changes in community structure that reflect a recovery from disturbance, or a significant response to random events, like tree-falls that could stimulate growth.

The remaining explanations are consistent with the hypothesis that increased tree growth is a result of anthropogenic carbon emissions and/or climate change. A rise in carbon dioxide at SERC during the last 17 years corroborates data from Mauna Loa, in Hawaii, a site far from polluted cities,

where the standard global carbon dioxide measurements are taken. Temperature measurements and length of the growing cycle have also increased, consistent with the idea that tree growth increases are a result of increased atmospheric carbon.

“We hope that forest ecologists will continue to compare recent census data with long term trends in regeneration from other sites,” said Davies. “Climate change has the potential to dramatically alter the functioning of forests worldwide, and this analysis tells us that it can happen relatively quickly.”

STRI, headquartered in Panama City, Panama, is a unit of the Smithsonian Institution. The institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems. Web site: www.stri.org.

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Ref. Sean M. McMahon, Geoffrey G. Parker, and Dawn R. Miller. 2010. Evidence for a recent increase in forest growth. Proceedings of the National Academy of Sciences.

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