The Ohio State University
Department of Geography
Colloquium Series 2013-2014

Arthur Robinson Cartography Colloquium

Characterizing the Sensitivity of Temperate Forest Growing Season Dynamics to Climate Change

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In temperature and photoperiod-limited ecosystems such as those found in the Northeastern United States, phenology is one of the most important pathways of climate-biosphere interactions, and phenological events (e.g., spring leaf emergence and autumn senescence) are known to be sensitive to changes in the climate system. While numerous studies have identified long-term trends in the timing of spring and fall phenology, estimates regarding the magnitude of past changes and predictions of future changes are highly variable. He will report results from research that uses time series of remote sensing data and ground-based measurements to characterize the response and quantify the sensitivity of northeastern temperate forest phenology to climate change. To quantify the sensitivity of springtime phenology to projected increases in regional temperatures, we examined the relationship between anomalies in thermal forcing (measured in units of growing degree days) and corresponding anomalies in the timing of leaf emergence. Despite differences in both spatial scale and the methods used to quantify the timing of leaf emergence, estimates for the sensitivity of spring leaf development to temperature changes were remarkably consistent across the different data sets examined. Specifically, the results show linear sensitivity to thermal forcing of 10 to 14 days/100 growing degree days. Current climate forecasts for the Northeastern United States indicate that mean annual temperatures will rise by 3-5 C by the end of the century. Our analysis suggests that warming of this magnitude will result in earlier leaf development in spring by at least 3 weeks, with significant likelihood of even larger changes.

April 4, 2014
Derby Hall Room 1080
3:30-5:00 P.M.

GEOGRAPHY

The Geography Colloquium series is funded in part through the John Nelson Endowment and the alumni, faculty, and friends of the Ohio State Geography endowment