If You Don’t Like The New England Weather, Wait A Hundred Years

UNH Scientist’s Unique Climate Model Predicts Big Changes for the Region’s Weather and Plant Life

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DURHAM, N.H. -- New England’s weather is so mercurial that, it has often been noted, if you don’t like it, wait a minute.

These days, in the era of climate change and global warming, waiting a bit longer – like a few score decades – will bring not only a modest shift in the region’s weather but a wholesale redefinition of New England’s signature climate and vegetation. Think American dogwood trees, balmy winters, and periods of torrential rain followed by drought conditions.

University of New Hampshire research scientist Ming Chen has developed a one-of-a-kind regional climate model that predicts a progressive migration of current, indigenous vegetation types northward during the 21st century, as well as an increase in heavy precipitation events – with increased periods of drying and flooding across not just New England but most of the U.S. These predictions assume that levels of carbon dioxide in the Earth’s atmosphere will be double those of today as projected from current trends.

Chen, from the Climate Change Research Center at UNH’s Institute for the Study of Earth, Oceans, and Space, presented her findings at last month’s 12,000-strong annual meeting of the American Geophysical Union in San Francisco. Her work is funded by the National Oceanic and Atmospheric Administration and the U.S. Environmental Protection Agency.

Explains Chen, “We know that climate is the most important driving force for vegetation growth and distribution. With more and more greenhouse gases in the atmosphere interwoven with natural climate variability, they’ll work together to change climate in the future, and this will affect vegetation.”

What’s more, as vegetation changes so will the natural “biogenic” emissions from trees and other plants creating a feedback that will force further changes in regional climate and air quality.

Chen adds, “Our model results show that with the climate change scenario where CO_2 will be doubled, higher latitude areas, northern parts of the hemisphere, become warmer and wetter. Mid- and lower-latitude areas will experience more precipitation and vegetation will migrate systematically northward.”

For example, under this climate scenario, today’s largely treeless expanse around Hudson Bay, Canada will be forested with conifers.

Unlike global-scale climate models, which give big-picture views, Chen’s regional model uses a much finer spatial scale and takes into account more physical and biological details that play into the complex atmospheric processes leading to climate change.

Says Robert Talbot, director of the Climate Change Research Center, “This is one of the very few regional models that has a coupled feedback between atmospheric processes, land surface physics, and biospheric interactions. Ming's model not only predicts physical climate – temperature, precipitation, and circulation patterns, for example – but includes the evolving land surfaces and changing vegetation-plant communities.”

After putting in the necessary parameters, for example, soil physics, land use/land cover type, carbon dioxide, and large-scale forcing, etc., Chen's model simulated present and future climate. The present-day results were compared to actual data and agreed very well. Says Chen, “This gives us confidence in the ability of the model to simulate complex processes and provides a basis for believable future predictions.”

Is a model a sure thing, confident in its results or not? No, says Chen.

“We can't use a model to precisely regenerate what really is going on in the atmosphere, and that's why people always ask how high a level of confidence you have in your model. There are lots of uncertainties in a model system, which is caused by the complex interactions and feedbacks that we don't understand completely – but we are working on it."