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David Sims

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UNH Scientists to Study How Climate Change Will Affect Regional Air Quality
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Contact: David Sims
603-862-5369
Science Writer
Institute for the Study of Earth, Oceans, and Space

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DURHAM, N.H. - A team of scientists from the University of New Hampshire's Institute for the Study of Earth, Oceans, and Space (EOS) has been awarded a three-year, $750,000 grant from the U.S. Environmental Protection Agency (EPA) to study how regional climate change would influence air quality in the Northeast.

The group, led by Huiting Mao of the Climate Change Research Center (CCRC) at EOS, will study how the dynamics of a changing climate might influence natural or “biogenic” emissions and how this, in turn, will affect levels of pollutants like ozone, carbon monoxide, nitrogen oxides and particulate matter.

Biogenic emissions are chemical compounds released by living organisms or biological processes as opposed to those derived by manmade or “anthropogenic” sources.

“Biogenic emissions are greatly influenced by climatic conditions like temperature, moisture and the intensity of solar radiation,” says Mao. She adds that the dominant vegetation types of a particular region can be both sensitive to and influence the extent of local climate change.

Some studies indicate that as global warming continues, and carbon dioxide levels double from pre-industrial levels by the year 2075, the climate of New England could become more like that of Richmond, Va. Should that come to pass, the maples so prevalent in the region would die off - possibly “migrating” or establishing a foothold only in more northern, colder climes. This change in species would change the character of regional biogenic emissions, which would further affect regional air quality and climate.

To assess future air quality, scientists do field measurements and use computer models that process a host of complex mathematical variables, from atmospheric conditions and chemistry to land-based factors (soil moisture, industrial and natural emissions) and ocean-related influences.

One of three models Mao's group will work with is called SMOKE for “Sparse Matrix Operator Kernel Emissions” Modeling System, which works with emissions data. The model, however, currently does not have biogenic emissions data for a host of chemical compounds that are critical components of air quality. These chemicals include specific volatile organic compounds or VOCs (such as the gas-phase compounds emitted from trees) and primary organic aerosols or POAs (for example, minute leaf debris from tree leaves).
Says Mao, “Since SMOKE doesn't have the specific VOC or any POA emission information, if we can provide that it will be a major step forward” because without this the models cannot accurately develop future scenarios or calculate how VOCs and POAs change in relation to one of many climatic variables.

For example, says Mao, “Wind speed is one of the climatic variables that will affect POA concentration” which will affect air quality. Of this approach to regional climate modeling Mao adds, “This will be very new and this is how you link the concentration of POAs with climate change.”

Other UNH/EOS project researchers include Robert Talbot, Robert Griffin, Barkley Sive, and Ming Chen of CCRC, and Ruth Varner of the Complex Systems Research Center.