

# Keep Your Eye on the Particle: Visualization Tools Enhance Pollution Research

## ✦ The Issue

Fine particles—such as pollen, dust, ash and pollutants—are constantly whirling through the air we breathe. But which particles are harmful, and in what concentrations? Government agencies responsible for safeguarding the health of humans and the environment must set emission standards and other regulations based on what they know about the properties of fine particles and how these particles disperse through the air.

Although our understanding of particulate matter has greatly increased over the past decades, models that more accurately reflect the complex behavior of fine particles would help us better predict whether emissions from a particular source or event are likely to accumulate to harmful levels. With funding from NASA, researchers at the UNC Institute for the Environment are using satellite and ground-based data to improve models of particulate matter dispersion and to inform air quality regulation decisions.

## ✦ The RENCi Project

RENCi teamed with scientists from the Institute for the Environment to deploy a visual framework for analyzing particulate matter models and data. The framework enables researchers to visualize the complex chemistry, microphysics and atmospheric transport processes of particulate matter as a composite animation—a significant improvement over previous tools that only allowed researchers to analyze one pollutant at a time.

Modeling the behavior of populations of fine particles requires highly complex computations. RENCi's visualization tool allows users to interactively track the pathways of plumes of particulate matter across geographic areas while examining how their properties change as they disperse outward from power plant stacks and other emission sources.

Researchers import data from computer models into the visualization tool to “see” how the properties of multidimensional pollutant particles—their number, surface area and concentration, for example—change over time. In addition, the tool allows users to overlay actual data from field instruments over model visualizations, enabling researchers to evaluate the accuracy of their models.

## ✦ The Expertise

RENCi applies its broad expertise in visualization and data management to provide a comprehensive, interactive visualization tool for the researchers. RENCi also supports the project through its unique, state-of-the-art infrastructure and equipment.

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## ✦ The Partners

**Institute for the Environment at UNC  
Chapel Hill**

## ✦ The Impact

Government agency personnel regularly evaluate what metrics need to be considered when determining fine particle emission standards to protect public health. RENCi's visualization tool for analyzing particulate matter will allow them—for the first time—to see animated visualizations of some of these metrics. The tool is expected to provide a more effective means to understand which properties of particulate matter are responsible for adverse health effects and predict how fine particles will travel through the air, helping to inform policy decisions.

Ultimately, the visualization tool will be made available to researchers and decision makers in government agencies and planning organizations via a Web-based system called Visibility Information Exchange Web System (VIEWS). VIEWS will feature a variety of tools and data to help users assess and implement emission standards and improve air quality decision-making.