Study of aerosols stands to improve climate models

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Clouds over the southern Indian Ocean. This image was acquired by one of the northward-viewing cameras of the Multi-angle Imaging SpectroRadiometer (MISR) instrument on NASA's polar-orbiting Terra spacecraft. Credit: NASA/JPL-Caltech

(Phys.org) —Aerosols, tiny particles in the atmosphere, play a

significant role in Earth's climate, scattering and absorbing incoming sunlight and affecting the formation and properties of clouds. Currently, the effect that these aerosols have on clouds represents the largest uncertainty among all influences on climate change.

But now researchers from Caltech and the Jet Propulsion Laboratory have provided a global observational study of the effect that changes in aerosol levels have on low-level marine clouds—the clouds that have the largest impact on the amount of incoming sunlight that Earth reflects back into space. The findings appear in the advance online version of the journal *Nature Geoscience*.

Changes in aerosol levels have two main effects—they alter the amount of clouds in the atmosphere and they change the internal properties of those clouds. Using measurements from several of NASA's Earth-monitoring satellites from August 2006 through April 2011, the researchers quantified for the first time these two effects from 7.3 million individual data points.

"If you combine these two effects, you get an aerosol influence almost twice that estimated in the latest report from the Intergovernmental Panel on Climate Change," says John Seinfeld, the Louis E. Nohl Professor and professor of chemical engineering at Caltech. "These results offer unique guidance on how warm cloud processes should be incorporated in climate models with changing aerosol levels."

More information: "Satellite-based estimate of global aerosol–cloud radiative forcing by marine warm clouds." Yi-Chun Chen, Matthew W. Christensen, Graeme L. Stephens & John H. Seinfeld. *Nature Geoscience* (2014) DOI: 10.1038/ngeo2214. Received 15 April 2014 Accepted 03 July 2014 Published online 03 August 2014