The insides of clouds may be the key to climate change

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As climate change scientists develop ever more sophisticated climate models to project an expected path of temperature change, it is becoming increasingly important to include the effects of aerosols on clouds, according to Joyce E. Penner, a leading atmospheric scientist at the University of Michigan.

That's because aerosols, fine particles such as smoke and dust that form droplets in clouds and change cloud thickness, affect how much sun is able to pass through the cloud to Earth, as well as the amount of moisture that's returned to Earth. Both moisture and sunlight play significant roles in climate change.

"Think of it as having two clouds--one made of cotton and the other of Styrofoam," Penner said. "More sunlight and moisture will pass through a cloud of cotton as opposed to the denser cloud of Styrofoam. This difference is becoming more critical in terms of modeling future changes in the climate as we continue to produce more and more aerosols that form thicker and thicker clouds." Penner will present a talk on this topic, "Aerosol-Cloud Interactions and Climate Projections" during panel at a meeting of the American Association for the Advancement of Science in San Francisco on Feb. 17.

By comparing the observed temperature change record since 1850 with two different climate models, one that has low climate sensitivity and small amounts of aerosols and one that has high climate sensitivity and high amounts of aerosols, Penner's group showed that both models

follow almost identical predictive paths in the past, but diverge significantly when predicting the temperature in the future

Penner's presentation also looks at the predictive capability of three climate models, a US NCAR-Oslo model, a French model and a Japanese model, and shows that differences are large, especially when the models predict both aerosols and their cloud effects in the assumed level of aerosols at the time, significantly changes the results. The differences are large partly because these models do not have high enough resolution to reproduce observations.

"We know that aerosol effects on clouds need to be included in climate models," Penner said, "but we need more research to reach optimum predictive properties for climate models."

Source: University of Michigan