Scientists study how water condenses to form clouds

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Cloud in Nepali sky. Credit: Wikipedia

Researchers at the University of Bristol with collaborators from ETH-Zurich have shown that the rate of condensation of water on organic aerosol particles in the atmosphere can be very slow, taking many hours for a particle to change in size. This could have significant consequences for understanding how clouds are formed, affecting climate.

The influence of aerosols (small particles less than 1 micrometre in diameter) and clouds (liquid droplets 1 - 1000 micrometres diameter) represents one of the largest uncertainties in our understanding of trends in past global climate and predicting future climate change, as recognised by the 2007 report of the Intergovernmental Panel on Climate Change.

One of the most significant 'known unknowns' is how quickly water can condense on the small aerosol particles to grow and become cloud droplets, influencing the albedo (reflectivity) of clouds and cloud lifetime (precipitation).

In a study published today in *PNAS*, Professor Jonathan Reid of the University of Bristol and colleagues show that the rate of cloud droplet growth can be strongly dependent on the composition of the aerosol.

For aerosol particles that have high viscosity (equivalent to saying they behave like treacle or even bitumen), water evaporation and condensation can be very slow, taking many hours.

For particles that are much less viscous (more like olive oil or even water), evaporation and condensation can be very fast: less than 1 second.

Professor Reid said: "Although not providing all the answers, this work helps us better understand the 'known unknowns'. Most importantly, it demonstrates that better understanding the rate at which water condenses on particles in the atmosphere is crucial for understanding clouds."

More information: Comparing the mechanism of water condensation and evaporation in glassy aerosol, by David Bones, Jonathan Reid, Daniel Lienhard and Ulrich Krieger is published in *PNAS*.

Provided by University of Bristol