Climate sensitivity greater than previously believed

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Many of the particles in the atmosphere are produced by the natural world, and it is possible that plants have in recent decades reduced the effects of the greenhouse gases to which human activity has given rise. One consequence of this is that the climate may be more sensitive to emissions caused by human activity than we have previously believed. Scientists at the University of Gothenburg (Sweden) have collected new data that may lead to better climate models.

"Emissions by plants to the atmosphere are influenced by climate change – higher temperatures can increase the rate of the biological processes that control the emissions. If natural emissions increase as the temperature rises, this in turn increases the amount of particles that are formed", says Kent Salo of the Department of Chemistry at the University of Gothenburg

The interactions between particles and the climate constitute a very complex web of processes. The particles in the atmosphere consist to a large part of organic substances, which may arise from incomplete combustion in engines or boilers. Such substances may also arise from plant growth. Emissions from plants occur as gases, and are greater than emissions from other sources, in a global perspective.

Once released into the atmosphere, the gases from plants are converted by many chemical processes, such that they can eventually condense and form particles. The particles that are formed in chemical reactions in the atmosphere are known as "secondary organic aerosols" (abbreviated to

"SOA"), and consist of a complex mixture of organic substances. The particles age and change with time, and this process influences the effects that the particles have on human health and on the climate.

"Particles in the atmosphere basically have a cooling effect on the Earth, and they affect cloud formation. The greater the number of particles in the air, the greater will be the number of cloud droplets. This affects the lifetime of the clouds and the amounts of precipitation, and consequently, the climate. Today, we do not have a fundamental understanding of how SOA particles are formed and the properties they have, despite them being an important component of, for example, climate models."

Kent Salo has studied organic substances that are known to be components of particles in the atmosphere and how their physical properties can be used in models to understand the complicated systems that the SOAs constitute, and the effect they have on the climate.

In order to study these processes, Kent Salo has developed a special instrument that measures the degree to which the particles evaporate when they are heated. He has carried out experiments at several major research facilities in Europe using this instrument.

Provided by University of Gothenburg