Cloud seeds and ozone holes

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New findings on the growth of ice clusters in Polar Stratospheric Clouds could help clarify the process of ozone depletion in the atmosphere.

The destruction of atmospheric ozone can take place within newly forming Polar Stratospheric Clouds (PSCs), which serve as the battleground for manmade chlorofluorocarbons (CFCs) to attack and destroy ozone. These clouds form when clusters of frozen water "pick up" other atmospheric molecules such as methane, nitrogen oxides, and water molecules, similar to the way a snowball's girth increases as it rolls down a mountainside. Most previously established atmospheric models have assumed that a straightforward measurement, a geometrical cross section, of the ice particles is sufficient to understandthe particle formation process. However, an international team of scientists has uncovered new evidence that these clusters can attract and capture molecules from a much larger volume than the space the clusters physically occupy. The work is presented in a paper accepted to the AIP's The Journal of Chemical Physics.

Researchers discovered this discrepancy in expected size by mimicking the growth process of cloud seeds in laboratory experiments performed at the J. Heyrovský Institute of Physical Chemistry, part of the Academy of Sciences of the Czech Republic in Prague. A beam of water clusters was sent through a chamber filled with a typical atmospheric gas such as methane or water vapor, and the team measured how many molecules the clusters picked up as they passed. They found that the clusters were able to pick up molecules even when those molecules did not collide directly with the clusters. Theoretical studies supported these results.

The researchers hope their findings will allow for more accurate models to predict the dynamics of ice particle formation in PSCs, which will in turn impact scientists' understanding of atmospheric chemistry processes such as ozone depletion, which increases the amount of harmful ultraviolet light entering the Earth's atmosphere from the Sun.

More information: "Uptake of atmospheric molecules by ice nanoparticles: Pickup cross sections" is published in *The Journal of Chemical Physics*. jcp.aip.org/resource/1/jcpsa6/v137/i3/p034304_s1

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