New greenhouse gas discovered by U of T chemists has highest impact on global warming

Team detects long-lived compound in atmosphere

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Scientists from the University of Toronto have discovered a novel chemical lurking in the atmosphere that appears to be a long-lived greenhouse gas (LLGHG). The chemical – perfluorotributylamine (PFTBA) – is the most radiatively-efficient chemical found to date, breaking all other chemical records for its potential to affect climate.

There are no known processes to destroy the chemical PFTBA in the lower atmosphere; scientists say it may live for hundreds of years before being destroyed in the upper atmosphere (photo by Los Angeles Metro Transportation Library & Archive via Flickr)

Radiative efficiency describes how effectively a molecule can affect climate. This value is then multiplied by its atmospheric concentration to determine the total climate impact.

PFTBA has been in use since the mid-20th century for various applications in electrical equipment and is used in thermally and chemically stable liquids marketed for use in electronic testing and as heat transfer agents. It does not occur naturally; that is, it is produced by humans.

There are no known processes that would destroy or remove PFTBA in the lower atmosphere so it has a very long lifetime, possibly hundreds of years, and is destroyed in the upper atmosphere.

"Global warming potential is a metric used to compare the cumulative effects of different greenhouse gases on climate over a specified time period," said **Cora Young** who was part of the U of T Department of Chemistry team along with **Angela Hong** and their supervisor, Professor **Scott Mabury**.

Time is incorporated in the global warming potential metric as different compounds stay in the atmosphere for different lengths of time, which determines how long-lasting the climate impacts are.

Carbon dioxide (CO_2) is used as the baseline for comparison since it is the most important greenhouse gas responsible for human-induced climate change.

"PFTBA is extremely long-lived in the atmosphere and it has a very high radiative efficiency; the result of this is a very high global warming potential," said Hong. "Calculated over a 100-year timeframe, a single molecule of PFTBA has the equivalent climate impact as 7,100 molecules of CO_2."

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