Press Release: Friday, September 9, 2022

Substantial contribution of iodine to Arctic ozone destruction

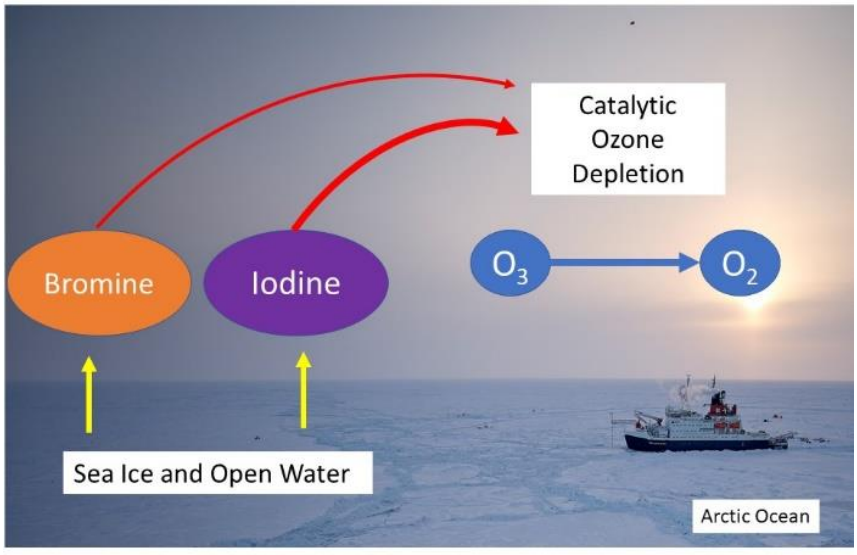
Note: Embargo lifts on 15 September 2022 at 16:00 (London time), 15 September 2022 at 11:00 (US Eastern time), and 15 September 2022 at 20:30 (India time).

Iodine chemistry plays a major role in controlling tropospheric ozone over the Arctic, according to a study published in the journal *Nature Geosciences,* carried out during the ship-based Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition.

Stratospheric ozone depletion, especially in the Antarctic, has been well reported. The main driver for this is the anthropogenic emissions of chlorofluorocarbons (CFCs). However, similar, but shorter-lived, ozone depletion events are seen close to the surface of the Earth. During these depletion events, ozone concentrations drop to nearly zero. Until recently, these surface depletion events were thought to occur mainly because of catalytic depletion by a single type of halogen - bromine, which is emitted into the atmosphere from the sea-ice region.

Unlike bromine, the effect of another halogen species, iodine, was not well understood or quantified. Researchers from various countries conducted observations from March to October 2020 on a ship in the high Arctic region and showed that iodine enhances springtime tropospheric ozone depletion. Indeed, using a chemical model, they showed that the chemical reactions between iodine and ozone are the second highest contributor to the loss of surface ozone, after the loss initiated by ozone photolysis, and ahead of bromine. This changes the decades-old paradigm on the drivers of Arctic photochemical ozone loss.

Their research also suggests that the atmospheric increase in iodine loading due to enhanced anthropogenic ozone-induced ocean iodine emissions, as well as the thinning and shrinking of Arctic sea-ice expected in the near future, will probably lead to increases in iodine emissions. These results indicate that iodine chemistry could play an increasingly important role in the future and must be considered for accurate quantification of the ozone budget in the Arctic.



The study is part of an international collaboration that made observations during the MOSAiC expedition. It was the largest polar expedition in history, conducted on the German research icebreaker Polarstern, which set sail from Norway, to spend a year drifting through the Arctic Ocean - trapped in ice. The goal of the MOSAiC expedition was to take the closest look ever at the Arctic as the epicenter of global warming and to gain fundamental insights that are key to better understand global climate change. Hundreds of researchers from 20 countries were involved in this exceptional endeavor.

This study resulted from close collaboration between the following institutions:

1. Indian Institute of Tropical Meteorology, Ministry of Earth Sciences, Pune, India.
2. Department of Atmospheric Chemistry and Climate, Institute of Physical Chemistry Rocasolano, CSIC, Madrid, Spain.
3. Extreme Environments Research Laboratory, École Polytechnique Fédérale de Lausanne Valais Wallis, Sion, Switzerland.
4. Institute for Atmospheric and Earth System Research, INAR – Physics, University of Helsinki, Helsinki, Finland.
5. The Cyprus Institute, Aglantzia, Cyprus.
6. Institute of Environmental Physics, University of Bremen, Bremen, Germany.
7. Institute for Interdisciplinary Science, National Research Council, FCEN-UNCuyo, Mendoza, Argentina.
8. Department of Environmental Science, iClimate, Aarhus University, Roskilde, Denmark.
9. Department of Marine Sciences, University of Gothenburg, Gothenburg, Sweden.
10. Department of Meteorology and Geophysics, University of Vienna, Vienna, Austria.
11. Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO, USA.
12. NOAA Physical Sciences Laboratory, Boulder, CO, USA.
13. Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO, USA.
14. Bigelow Laboratory for Ocean Sciences, Boothbay, ME, USA.
15. Institute for Geosciences and Environmental Research (IGE), University Grenoble Alpes/CNRS/Grenoble INP/IRD, Grenoble, France.
16. Paul Scherrer Institute, Villigen, Switzerland.
17. Boulder AIR, Boulder, CO, USA.
18. JH Atmospheric Instrument Design, Boulder, CO, USA

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Reference:

Benavent et al., Substantial contribution of iodine to Arctic ozone destruction, Nature Geosciences, 2022, 10.1038/s41561-022-01018-w
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