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Press Release

The International Ozone Commission, on the 36th anniversary of the Montreal Protocol, reports successes and new milestones for progressing toward ozone layer recovery

September 16th is the International Day for the Preservation of the Ozone Layer, celebrating the anniversary of the 1987 signing of the Montreal Protocol on Substances that Deplete the Ozone Layer. The Montreal Protocol is the globally ratified treaty that controls the production and consumption of ozone depleting substances (ODSs) and many replacements for these substances.

The theme of the International Day for the Preservation of the Ozone Layer is: "Montreal Protocol: fixing the ozone layer and mitigating climate change". It highlights the projected impact of the Protocol on climate change through its Kigali Amendment in phasing down HFCs - potent greenhouse gasses - and the adoption of green cooling technologies. Since 1985, the international ozone and climate communities have strongly collaborated under the Vienna Convention for the Protection of the Ozone Layer. The Convention mandates a worldwide ozone research effort to evaluate and measure the Earth's critically important ozone layer.

The Antarctic ozone hole has reappeared in 2023. The ozone hole is caused by the still high levels of the human-produced and long-lived ODS in our atmosphere. The ozone hole has occurred every year since the early 1980s. The ozone hole severity stopped increasing in the 1990-2010 period and has shown a slight improvement over the last decade, consistent with theory and model simulations with the declining ODS levels.

Atmospheric ODS concentrations are decreasing, but are still at the levels that can cause significant polar spring-time ozone destruction. Thanks to the Montreal Protocol, this ODS decrease is causing the Antarctic ozone hole and ozone depletion at global scale to slowly decrease. The ozone hole is projected to return to 1980 levels in the 2060-2070 period.

The January 2022 Hunga Tonga-Hunga Ha'apai (HTHH) eruption injected an unprecedented amount of water vapour into the stratosphere, on top of volcanic aerosols. This water vapor plume was carried into the Antarctic vortex in early spring 2023 (as seen by the NASA Aura satellite's Microwave Limb Sounder), and this may have an impact on the 2023 ozone hole. The HTHH volcanic eruption illustrates that the ozone hole's year-to-year variability can be enhanced by unexpected events. Large variability of Antarctic and Arctic ozone depletion in recent years demonstrates the need for continuous monitoring of the ozone layer and ozone depleting substances (ODS) to assess global compliance to the Montreal Protocol.

Arctic ozone depletion is generally much weaker than its Antarctic counterpart, and it was again moderate in the spring of 2023. Arctic depletion is typically caused by a combination of factors that require strong polar vortices especially through the March period accompanied by unusually weak

dynamical processes over the winter period. Typically, these processes drive movements of ozone-rich air through the polar vortex.

Our ability to monitor and understand ozone and the stratosphere is crucially dependent on satellite, balloon, and ground-based ozone observing systems. The coming demise of long-term satellites (e.g., NASA's Aura, Aqua, and Terra) will limit scientific monitoring of both ozone layer health and levels of anthropogenically produced ODSs. As noted above, the HTHH eruption is having a significant impact on climate, ozone, and the stratosphere. Without continuous global monitoring, it would be difficult to monitor and understand this event. The recent findings of unexpected CFC-11 emissions further remind the science community of the Vienna Convention's Article 3 that requests "systematic observation of the state of the ozone layer and other relevant parameters. " Similarly, the associated path to recovery for the UV-B exposure levels has additional uncertainties from changes in cloudiness and aerosols related to manmade climate change. This is why it is recommended that the usual precautionary measures to protect from excess exposure of humans to solar UV-B radiation should continue to apply in the decades to come.

The Montreal Protocol is a binding, pioneering agreement that solved a global atmospheric pollution problem. The science challenges of ozone depletion have led to a substantial increase of our understanding since the signing of the Montreal Protocol, and this increase has enabled policies that control ODS consumption and production. The Protocol provides a successful blueprint for development of global science-policy dialogue on environmental issues.

After a fully remote QOS in 2021 due to Covid restrictions, the next 2024 Quadrennial Ozone Symposium will be held in Boulder, USA on 15-19 July 2024.

This text was last reviewed by the IO3C members on September 14th 2023

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- *IO3C: http://www.io3c.org*
- *United Nations Environment Program's Ozone Secretariat World Ozone Day 2020: https://ozone.unep.org/ozone-day/ozone-life-35-years-ozone-layer-protection*
- *WMO Northern Hemisphere Ozone Mapping Center: http://lap.physics.auth.gr/ozonemaps*
- *World Ozone and Ultraviolet Data Center: http://www.woudc.org*
- *O3 Global: http://www.temis.nl/protocols/O3global.html*
- *TEMIS Ozone and UV forecast: http://www.temis.nl/protocols/o3hole*
- *Ozone Hole Watch: http://ozonewatch.gsfc.nasa.gov*
- *World Meteorological Organization (WMO), Scientific Assessment of Ozone Depletion: 2022, GAW Report No. 278, 509 pp., WMO: Geneva, Switzerland, 2022. http://ozone.unep.org/science/assessment/sap https://csl.noaa.gov/assessments/ozone/2022/*
- *NOAA Global Monitoring Laboratory South Pole ozone hole page: https://gml.noaa.gov/dv/spo_oz*