NCAR News Release

Research Aircraft Finds Springtime Ozone Voids above Arctic Surface

BOULDER -- Data gathered last spring have revealed long swaths of the lower atmosphere nearly empty of ozone over northern latitude seas, say scientists at the National Center for Atmospheric Research (NCAR). An instrument-laden C-130 research aircraft observed the ozone loss while flying at extremely low altitudes over Hudson Bay, Baffin Bay, and parts of the Arctic Ocean. NCAR led the experiment, with participation by NASA and university researchers and funding from the National Science Foundation, NCAR's primary sponsor.

Last spring's aircraft observations were the first to document ozone loss over large areas of the sub-Arctic, including Hudson Bay. The springtime absence of surface ozone has been observed since the mid-1980s at Alert, Canada, a research station on the northern tip of Ellesmere Island.

In the stratosphere, the ozone layer protects life below by blocking out harmful solar radiation. In the troposphere (the lower six to nine miles of the atmosphere) ozone is a common pollutant that damages the human respiratory system, plants, crops, and some materials. Less ozone near the surface sounds like a good thing, but scientists are concerned.

"If there were no ozone anywhere at the surface, it would be terrible," says NCAR scientist Brian Ridley, who flew on most of the C-130 missions. Although ozone is a pollutant, it is also an important source of the OH radical, a chemical species that removes many pollutants from the earth's atmosphere with impressive efficiency. "Globally these short, shallow episodes at the Arctic are not threatening," he says, "except that they show us how much we still don't know about atmospheric chemistry."

On a research flight last April, the aircraft flew 465 miles-- an hour in the air-- through a region of almost nonexistent ozone (less than 1 part per billion) over Hudson Bay. Ozone levels in the Northern Hemisphere troposphere are normally 30-45 parts per billion. Scientists suspect these shallow ozone voids disappear quickly with the arrival of ozone-rich air from farther south or from higher altitudes.

Surface ozone loss occurs when the springtime sun returns to the Arctic, stimulating photochemical processes that have been dormant during the dark winter months. A prime suspect in the ozone-destruction mystery is bromine, whose likely source is sea salt. Satellite-borne instruments have measured extensive bromine at high latitudes, but scientists are still puzzling over what triggers and then maintains bromine production throughout the spring.

The flights were the core of an experiment called Tropospheric Ozone Production about the Spring Equinox (TOPSE). The aircraft made seven missions last spring from Broomfield, Colorado, to Churchill, Manitoba, stopping in Winnipeg for refueling. It continued on to Thule, Greenland, and then north to Alert. During each 6,000-mile round trip, the plane rose and dipped to gather data at various altitudes.

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altitudes. Scientists found ozone voids on 8 of the aircraft's 32 low-altitude flights above Hudson Bay, Lincoln Sea, Baffin Bay, and the Arctic Ocean. Because the land is consistently mountainous, low-level flights were possible only above frozen bodies of water. During flights at higher altitudes (10,000-20,000 feet), a NASA lidar instrument confirmed the existence of ozone-depleted air near the surface.

NCAR is managed by the University Corporation for Atmospheric Research, a consortium of more than 65 universities offering Ph.D.s in atmospheric and related sciences.

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The C-130 awaits its next mission at Churchill, Canada, in February 2000.

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