

Arctic chemistry may cause significant ozone loss

- International team returns from Norway
- Duration of polar vortex a key factor

Washington & London

CONDITIONS in the Arctic are ideal for significant depletion of stratospheric ozone. That is the message brought back last week from a six-week mission to Stavanger, Norway, led by the US National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA). But the expedition did not remain in the Arctic long enough to observe any stratospheric ozone loss, and the extent of any depletion will depend on how long the polar vortex holds together.

Although the mechanisms for the loss of stratospheric ozone have become increasingly clear in the Antarctic, the picture in the Arctic is more complex. Higher temperatures at the North Pole produce fewer Polar Stratospheric Clouds (PSCs) in which the normally inactive forms of chlorine (HCl and ClONO₂) are transformed into active ClO, which can destroy ozone in the presence of sunlight.

In addition, in contrast with conditions at the South Pole, the Arctic vortex typically breaks up before the sunlight necessary for ozone destruction strikes it. Despite these differences, 5 to 6 per cent decreases of total stratospheric ozone have been seen between 40 °N and 60 °N during winter, suggesting some disturbance in the Arctic atmosphere.

Beginning in early January, the Airborne Arctic Stratosphere Expedition assembled at Stavanger to make chemical measurements of the atmosphere over the pole. The campaign was coordinated by NASA and cosponsored by NOAA, the National Science Foundation and the US Chemical Manufacturers Association. The UK Meteorological Office, the UK Department of the Environment and the Norwegian Meteorological Institute provided support and researchers, as did universities in the United States, the United Kingdom, Norway and West Germany. Two specially equipped aircraft, an ER-2 capable of flying up to 19 km and a DC-8 flew 14 missions each. More data came from a network of balloon-launched sondes.

After a frustrating period in early January when the vortex was located beyond the range of the ER-2 aircraft (see *Nature* 337, 492; 1988), the expedition found two types of PSC, both apparently capable of producing the active chlorine species. The most common PSCs were those of Type I, which form at -78 °C and

are thought to contain nitric acid trihydrate. Occasionally water-ice Type II PSCs that form at -85 °C were observed.

By early February, ClO mixing ratios had reached values similar to those seen in the Antarctic, as high as 800 parts per 10¹² by volume inside the vortex, compared with values closer to 50 parts per 10¹² outside. BrO radicals were also observed at mixing ratios of 2 to 8 parts per 10¹², also similar to levels in the Antarctic vortex.

Stratospheric dehydration and denitrification, believed from Antarctic expeditions to be a necessary condition for the appearance of active chlorine species, was not seen by the Arctic expedition. Although there were localized occurrences of denitrification, these data imply that PSCs may be the crucial factor in the appearance of active chlorine compounds.

In a statement outlining its initial results, the expedition concluded that there was "no unequivocal signature of photochemical loss" of ozone during the mission. But NASA project scientist Robert Watson says that, if the vortex persists, ozone depletion of about 0.5 to 1 per cent a day could occur once the sun strikes it. When that occurs will depend on how long the vortex stays together, and how it moves. According to the UK Meteorological Office, a stratospheric warming that began on 31 January could result in the break-up of the vortex within the next week or two.

Preliminary indications of ozone depletion come from the Canadian Atmosphere and Environment Service (AES), which last week reported a 5 per cent decline in stratospheric ozone as measured from balloon sondes from the Canadian station at Alert. According to Wayne Evans of the Environment Service, PSCs were also observed from Alert. Evans says the Canadian base was not equipped to measure ClO concentrations.

Speaking at a press conference last week, Watson emphasized that the results of the expedition are strong evidence that the atmospheric chemistry in the Arctic, although not as important as in the Antarctic, plays an important and hitherto unacknowledged role in the destruction of global stratospheric ozone. He pointed out that the models used to determine restrictions on chlorofluorocarbons adopted in the Montreal Protocol did not take into account heterogeneous chemistry now shown to be occurring at both poles.

Joseph Palca & Philippa Lloyd

Compensation for haemophiliacs

Tokyo

A PANEL set up by Japan's Ministry of Health and Welfare last week approved the first relief payments to haemophiliacs infected with the AIDS virus, thus ending a long controversy over the government's responsibility for screening blood products.

The National Association of Haemophiliacs has been fighting for compensation for alleged government negligence in failing to ensure a blood supply free from the AIDS virus (see *Nature* 333, 5; 1988). Most of those in Japan infected by the virus are believed to be haemophiliacs and members of their families. Relief funds have been donated by blood product manufacturers and provide monthly allowances of ¥208,900 (\$1,600) for infected people and monthly compensation of ¥156,900 (\$1,225) to families where a main income earner has died from AIDS.

Also last week, Japan's 'AIDS prevention law' took effect after a long spell stalled in the Diet last year. The law contains controversial clauses, attacked as infringing human rights, that require doctors to report details of patients who test positive for the AIDS virus. Names and addresses must be registered if a seropositive person is judged likely to infect other people. Mandatory registrants include drug users and those who regularly have unprotected sex with two or more persons other than their spouses.

Alun Anderson

New Delta rocket off the ground

Washington

THE first of a new family of rockets that will provide the United States with an alternative to the space shuttle blasted off successfully from Cape Canaveral last week. The Delta II rocket, which placed a military navigational satellite in orbit, is one of a new fleet of powerful expendable rockets bought by the Pentagon to reduce their dependence on the shuttle. A Delta II can put a 1.8-tonne payload in geostationary orbit.

Next month should also see the first launch of an upgraded Titan rocket, Titan IV, which will be able to launch a 4.5-tonne payload into a stationary orbit, the same lift capacity as the shuttle.

Last week's payload was the first in the Navstar Global Positioning System, an array of 21 satellites in six orbital planes that will allow US and allied forces on the ground, at sea and in the air to determine position and altitude with great accuracy, at any time, anywhere on the globe. The Navstar system will also be used for civilian navigational purposes. David Swinbanks