30 years of healing the ozone layer

September 12 2017

Credit: PlanetEarth Online

This week marks the 30th anniversary of the signing of the Montreal Protocol on Substances that Deplete the Ozone Layer. The signing of the Montreal Protocol was a landmark political event. The treaty is the first in the history of the United Nations to achieve universal ratification. Environmental science made it happen.

Scientists at NERC's British Antarctic Survey (BAS), Joe Farman, Brian Gardiner and Jonathan Shanklin, described their observation of large

losses of ozone over Antarctica in the journal *Nature*. The discovery of the Antarctic ozone hole by BAS provided an early warning of the dangerous thinning of the ozone layer worldwide.

NERC-funded atmospheric research by Professor John Pyle, Dr Neil Harris and colleagues at the University of Cambridge and the National Centre for Atmospheric Science played a leading role in demonstrating the effect of man-made gases on the ozone layer, and the consequences for human health. Their contributions played a key part in the strengthening of the Montreal Protocol.

With this evidence, governments from all over the world took action and created the 1987 Montreal Protocol, which was signed on 16 September. The protocol, along with other pieces of related legislation, has ensured the rapid phase-out of ozone depleting substances.

A NERC-commissioned analysis in 2015 found that NERC's ozone research has spared thousands of lives and led to lower food prices, leading to savings of £1·3 billion every year for the UK, thanks to the early implementation of the Montreal Protocol.

The analysis estimated that, had NERC-funded scientists at NERC's British Antarctic Survey not reported their discovery of a hole in the ozone layer in 1985, its discovery might have been delayed by five to ten years. By 2030, the cost of this delay would have resulted in 300 more skin cancer cases every year in the UK, costing the country around £550 million a year in today's money. The analysis, by Deloitte, estimates the discovery also led to avoided losses in farm production worth up to £740 million a year.

Jonathan Shanklin, one of the discovery team at BAS, said, "The Montreal Protocol is a remarkable agreement which we are seeing the effects of now. Signs of recovery of the ozone hole are becoming

evident, which will have huge benefits to society with fewer cases of UV-related problems. It demonstrates that when policy and science work together it can result in effective action."

Carolyn Graves, a meteorologist at BAS who takes daily ozone measurements in the Antarctic summer at the Halley Research Station, said, "I feel extremely privileged to be involved in monitoring the ozone hole, and it's especially rewarding to be observing its recovery as a result of a science policy success story."

After 30 years, the Montreal Protocol continues to be a fantastic example of successful global action to tackle a worldwide environmental issue. The recent observations indicating that the ozone hole appears to be on the path to recovery, exemplifies this.

About the ozone hole

The Antarctic ozone hole is caused by chlorine and bromine in the atmosphere, which come from chlorofluorocarbons (CFCs) and halons. The hole itself begins to form when sunlight returns at the end of the Antarctic winter, and reaches its largest extent every September, before disappearing again by mid-summer. The amount of ozone overhead should follow a regular seasonal pattern. This is what occurred during the first 20 years of BAS measurements, but by the late 1970s clear deviations were observed. In every successive spring the ozone layer was weaker than before, and by 1984 it was clear that the Antarctic stratosphere was progressively changing.

Ozone monitoring in Antarctica

Stratospheric ozone is measured at Halley and Rothera research stations. Daily ozone measurements are taken as part of long-term monitoring,

which is funded by NERC. At Halley, measurements are taken seven times a day in the summer season, when the sun is high enough to do so. Ozone measurements from Halley Research Station, that have been recorded since the International Geophysical year (IGY) in 1957-58, led to the discovery of the hole in the ozone layer in 1985.

Provided by NERC