Ozone hole healing could cause further climate warming

January 25 2010

The hole in the ozone layer is now steadily closing, but its repair could actually increase warming in the southern hemisphere, according to scientists at the University of Leeds.

The Antarctic ozone hole was once regarded as one of the biggest environmental threats, but the discovery of a previously undiscovered feedback shows that it has instead helped to shield this region from carbon-induced warming over the past two decades.

High-speed winds in the area beneath the hole have led to the formation of brighter summertime clouds, which reflect more of the sun's powerful rays.

"These clouds have acted like a mirror to the sun's rays, reflecting the sun's heat away from the surface to the extent that warming from rising carbon emissions has effectively been cancelled out in this region during the summertime," said Professor Ken Carslaw of the University of Leeds who co-authored the research.

"If, as seems likely, these winds die down, rising CO_2 emissions could then cause the warming of the southern hemisphere to accelerate, which would have an impact on future climate predictions," he added.

The key to this newly-discovered feedback is aerosol - tiny reflective particles suspended within the air that are known by experts to have a huge impact on climate.

Greenhouses gases absorb infrared radiation from the Earth and release it back into the atmosphere as heat, causing the planet to warm up over time. Aerosol works against this by reflecting heat from the sun back into space, cooling the planet as it does so.

Beneath the Antarctic ozone hole, high-speed winds whip up large amounts of sea spray, which contains millions of tiny salt particles. This spray then forms droplets and eventually clouds, and the increased spray over the last two decades has made these clouds brighter and more reflective.

As the ozone layer recovers it is believed that this feedback mechanism could decline in effectiveness, or even be reversed, leading to accelerated warming in the southern hemisphere.

"Our research highlights the value of today's state-of- the-art models and long-term datasets that enable such unexpected and complex climate feedbacks to be detected and accounted for in our future predictions," added Professor Carslaw.

The Leeds team made their prediction using a state-of-the-art global model of aerosols and two decades of meteorological data. The research was funded by the Natural Environment Research Council's Surface Ocean-Lower Atmosphere Study (UK SOLAS) and the Academy of Finland Centre of Excellence Programme.

More information: "Aerosol climate feedback due to decadal increases in southern hemisphere wind speeds." An advance online copy will be published in *Geophysical Research Letters* on Wednesday 27th January.

Provided by University of Leeds