Greenhouse gases to overpower ozone hole

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(PhysOrg.com) -- One set of human-created gases is starting to relinquish its hold on Antarctic climate as another group of emissions produced by human activity is starting to take hold, according to a paper in *Nature Geoscience,* co-authored by ARC Laureate Fellow Professor Matthew England, co-director of the UNSW Climate Change Research Centre.

The review paper highlights how the influence on Southern Hemisphere climate of the Antarctic ozone hole is slowly dissipating and will be progressively overtaken by human-induced emissions of carbon dioxide and other greenhouse gases.

Research into the ozone hole has shown that it has had a profound impact on Southern Hemisphere climate. This has directly affected

rainfall, wind speeds and temperatures over an area that ranges from Antarctica to the mid-latitude regions of the Southern Hemisphere.

"Our study shows how ozone depletion over the past three to four decades has had a marked impact on Antarctic and Southern Ocean climate," says Professor England, who is also a Chief Investigator in the ARC Centre of Excellence for Climate System Science.

"However, this will shortly be overwhelmed by the influence of greenhouse gases."

The ozone hole has significantly transformed the Southern Annular Mode (SAM), which sets the latitude of the Southern Hemisphere jet stream and storm track, and has a profound influence on the oceans.

The ozone-induced changes in the SAM have been linked to cooler than average temperatures over East Antarctica and higher than normal summer temperatures over Patagonia and the northern Antarctic Peninsula.

Further north, it has been identified as leading to higher mountain-related rainfall on the eastern side of New Zealand's Southern Alps and the south east coast of Tasmania. At the same time this has led to less rainfall over western Tasmania and west of New Zealand's Southern Alps and higher than normal summer temperatures in New Zealand.

As the influence of the ozone hole on the SAM decreases and greenhouse gases increase, dramatic shifts in climate are expected across Antarctica and many regions of the mid-latitude the Southern Hemisphere.

"Ozone depletion was an unintended consequence of global CFC emissions during the 20th Century, with pervasive impacts on our

climate system," Professor England said.

"This highlights how human activity can strongly alter atmospheric chemistry and how this, in turn, impacts the Earth's radiation balance; altering natural systems now and into the future.

"Unfortunately, carbon dioxide resides in the atmosphere for many hundreds or perhaps thousands of years, unlike CFCs that decline over just decades. So, while the ozone hole will repair over the coming decades, the legacy of our emissions of carbon dioxide is still likely to be felt 1,000 years from now".

More information: Paper online: www.nature.com/ngeo/journal/v4 … 1/full/ngeo1296.html

Provided by University of New South Wales

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