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Depletion and Recovery of the Stratospheric Ozone Layer

Professor Martyn Chipperfield

(Institute for Climate and Atmospheric Science (ICAS), University of Leeds,
UK)

Abstract

Depletion of the stratospheric ozone layer has been an environmental issue of major concern since the 1970s. The Antarctic ozone hole, discovered in 1985, is still an annual occurrence and is driven by ozone loss through chlorine and bromine chemistry. Action taken through the Montreal Protocol (and its amendments) is leading to a decrease in the long-lived gases which are the sources of stratospheric chlorine and bromine compounds. Consequently, the ozone layer is expected to recover by the middle/end of this century.

Nevertheless, there are many open scientific questions and uncertainties related to the present and future evolution of the ozone layer. Uncontrolled short-lived anthropogenic chlorine compounds, such as dichloromethane, are increasing in the atmosphere and could potentially cause additional depletion. There is evidence that ozone has decreased in the tropical lower stratosphere where we expect it to be under mainly dynamical control and where ozone change has so far been small. Due to climate change, the future atmosphere will be different to that of the 1980s, and so it is unlikely in any case that the stratosphere would simply return to its pre-depletion state. The deviations in the extent of recovery will likely vary with latitude region.

I will use simulations from 3-D chemical-transport and chemistry-climate models to discuss and quantify the above issues.