

Evidence for a continuous decline in lower stratospheric ozone offsetting ozone layer recovery

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The Montreal Protocol came into force to protect the ozone layer from ozone depleting substances at the end of the 1980s. Nearly a decade later, the total column ozone stop decreasing. A recovery in the upper part of the ozone layer has been detected (between 32 and 48 km, between 60S and 60N), but a significant detection of recovery in the total column has remained elusive. We report evidence from multiple composites of satellite measurements, covering several decades, that lower stratospheric ozone has continued to decline from 1998 at mid- and tropical latitudes. Despite the upper stratospheric ozone recovery, the lower stratospheric decreases more than compensate for this increase, leading to the conclusion that stratospheric ozone as a whole, i.e. the ozone layer between 60S and 60N, was lower in 2016 than in 1998. We suggest that the apparent lack of a decrease in total column ozone is due to rising tropospheric column ozone that balances the stratospheric decreases. The reason for the decline is not clear are not well reproduced by most models, and urgently need to be understood. The results are placed in context of other new studies investigating changes in the ozone layer.

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