

Estimating When the Antarctic Ozone Hole Will Recover

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The Antarctic ozone hole develops each year and culminates by early spring (late September - early October). The severity of the hole has been assessed from satellites using the minimum total ozone value from the October monthly mean (depth of the hole) and by calculating the average area coverage during this September-October period. Profile information shows that ozone is completely destroyed in the 14-21 km layer by early October. Ozone is mainly destroyed by halogen (chlorine and bromine) catalytic cycles, and these losses are modulated by temperature variations.

Because atmospheric halogen levels are responding to international agreements that limit or phase out production, the amount of halogens in the stratosphere should decrease over the next few decades. Using projections of halogen levels combined with age-of-air estimates, we find that the ozone hole is recovering at an extremely slow rate and that large ozone holes will regularly recur over the next 2 decades. We estimate that the ozone hole will begin to show first signs of size decrease in about 2023, and the hole will fully recover to pre-1980 levels in approximately 2070. Estimates of the ozone hole's recovery from models reveal important differences that will be discussed.