Predictions of future ozone levels

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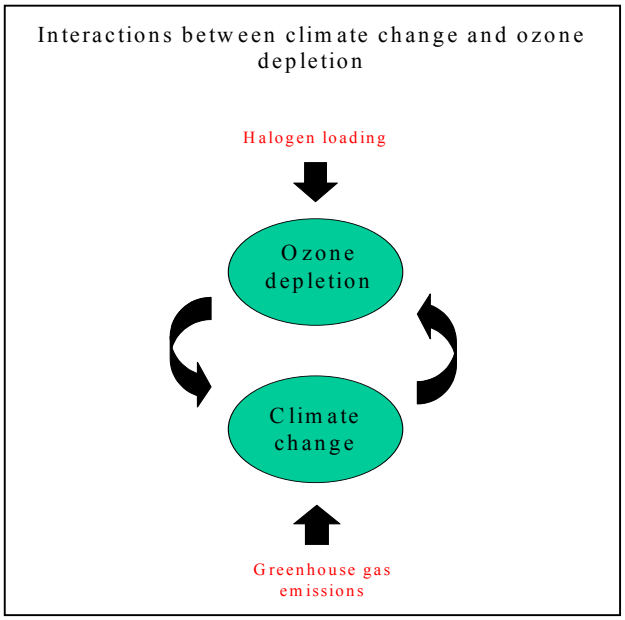
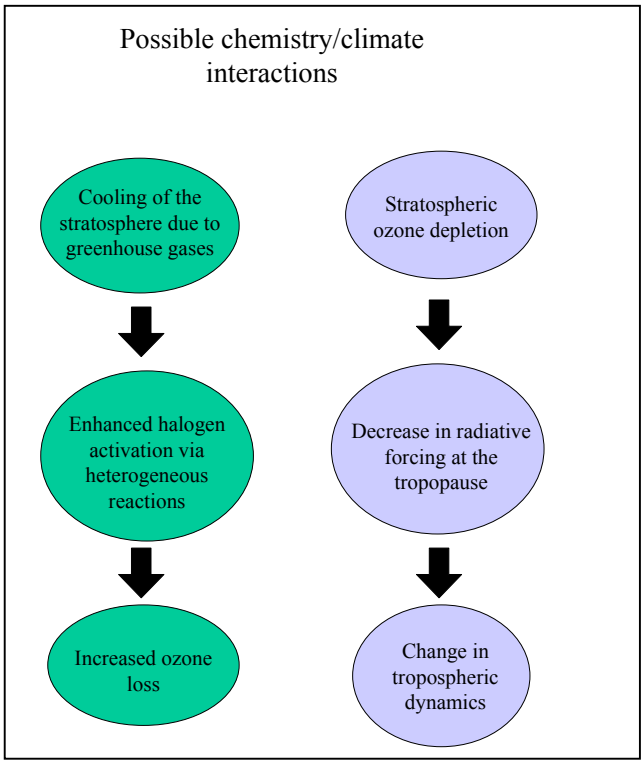
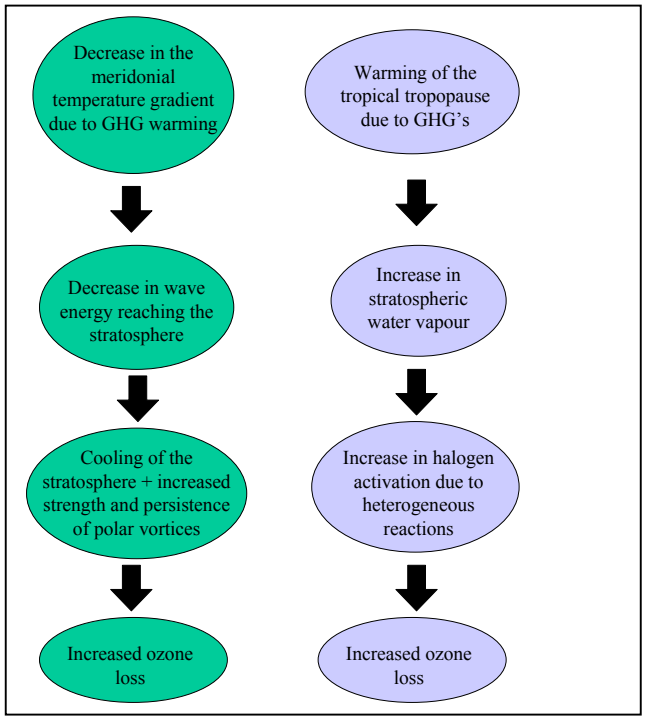
Abstract. In recent years, it has been realized that global ozone recovery depends on all large-scale anthropogenic change in the atmosphere, not only that addressed by the Montreal Protocol..Atmospheric temperature and 'greenhouse gas' concentrations must also be considered. The following figures illustrate some of the possible relations and feedback between ozone depletion and climate change.





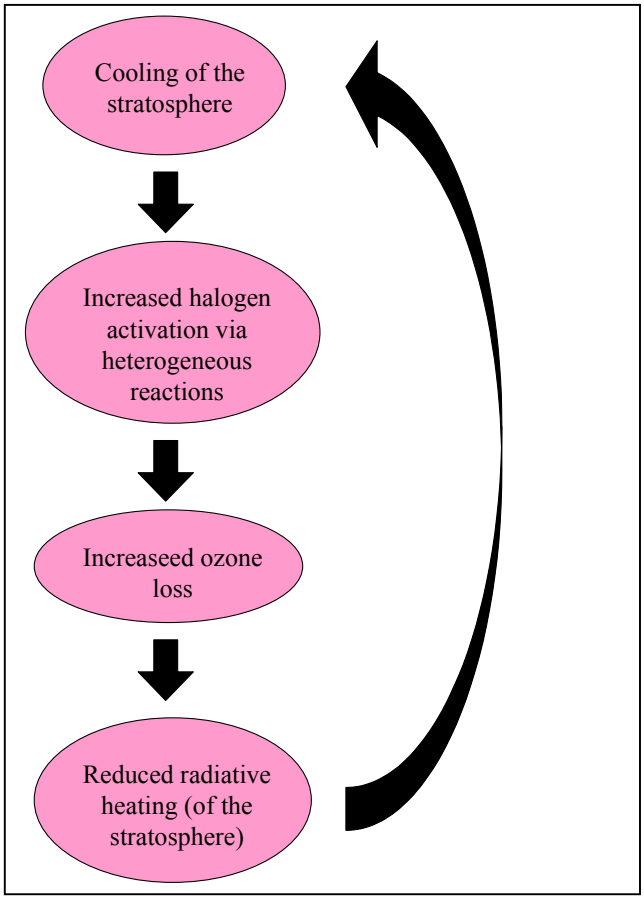


The UMETRAC Model

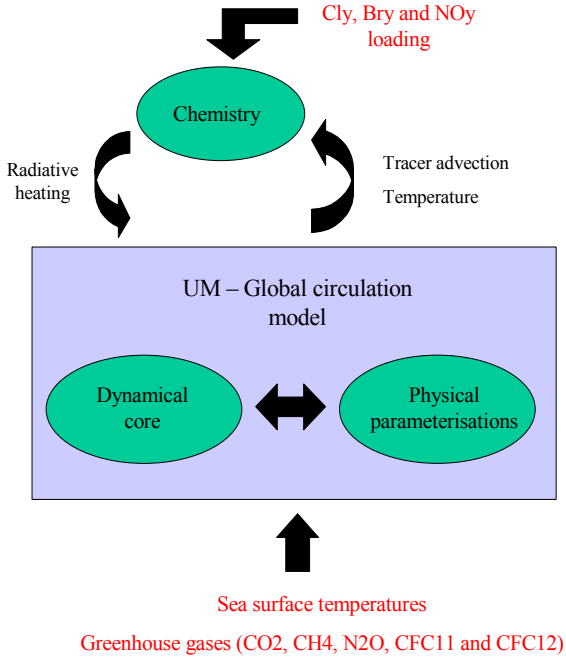
The Unified Model with Eulerian Transport and Chemistry (UMETRAC) is a state-of-the –art model of the climate/ozone interactions. Predictions with the UMETRAC model indicate that the Antarctic ozone hole will continue at its current severity until at least 2020 (though with large year-to-year variations. The same model run suggests Southern mid-latitude ozone is presently at its minimum and will begin to slowly recover during the next 20 years.

Conclusions

Long-term ozone predictions are both highly complex and uncertain, but the attempt to model future ozone values is highly productive in itself, leading to improved understanding of our atmospheric environment and our effect on it. Ozone recovery will likely be delayed, perhaps for 1-2 decades, by increasing greenhouse gas concentrations. Best estimates are that ozone over New Zealand has bottomed out, but year-to-year variations will long delay unambiguous detection of recovery. Recovery from halogen-related depletion may be detected first in the Antarctic, though perhaps not for 10-20 years.



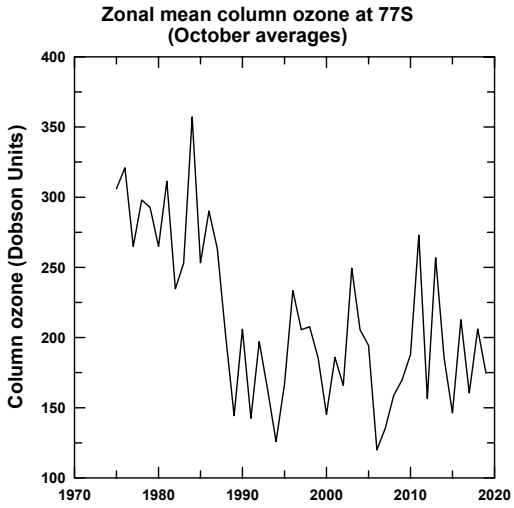
UMETRAC – coupled stratospheric chemistry/climate model



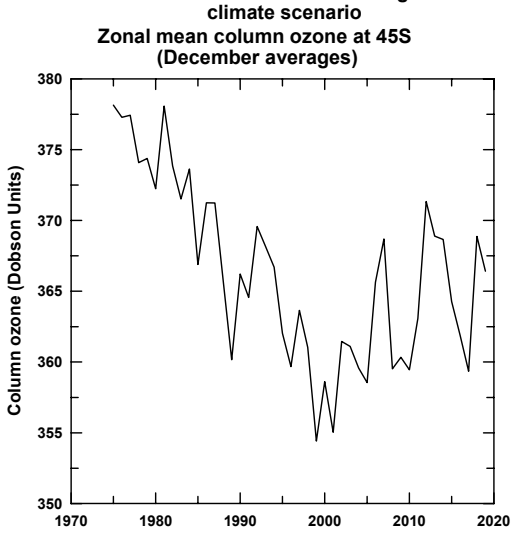
UMETRAC – coupled stratospheric chemistry/climate model

Chemistry

- 26 chemical species
  - 11 integrated explicitly
  - 15 calculated implicitly using photochemical equilibrium
- 4 chemical families
  - Oy, Cly, Bry and NOy
- 50 gas phase reactions
- 21 photolysis reactions
- 8 heterogeneous reactions
- HNO3 sedimentation
- Chemistry active in the stratosphere
- GCM radiation scheme uses the ozone field generated by the chemestry scheme



UMETRAC modelled ozone using IS92a climate scenario



UMETRAC modelled ozone using IS92a climate scenario