

Ozone nightmare: A lucky escape?

Atoms of bromine (Br) are **45 times** more efficient than chlorine (Cl) at destroying ozone.

"... if the chemical industry had developed organobromine compounds [halons] instead of CFCs... then without any preparedness, we would have been faced with a catastrophic ozone hole everywhere and in all seasons ...

Noting that nobody had given any thought to the atmospheric consequences of the release of Cl or Br before 1974, I can only conclude that mankind has been extremely lucky " **Paul Crutzen, Nobel Prize acceptance speech, 1995**

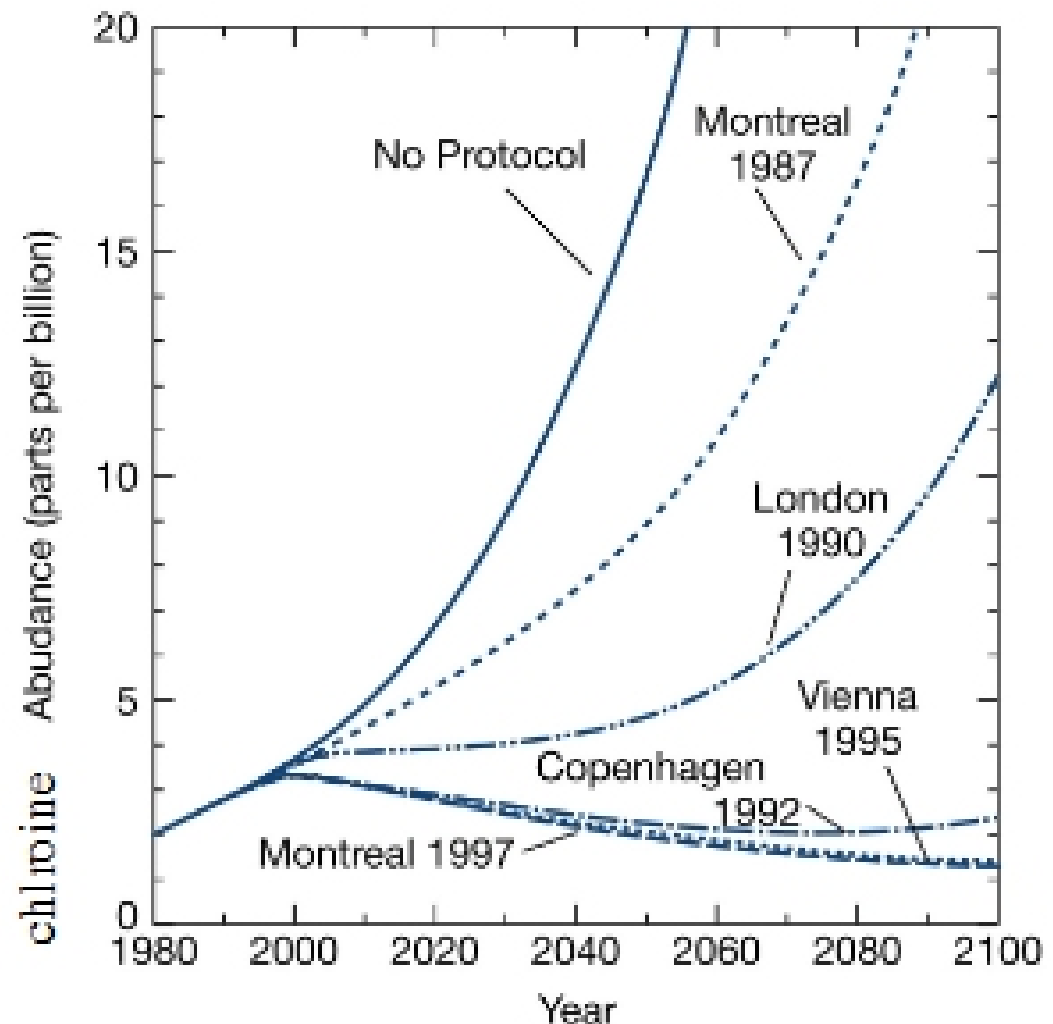
(The 1995 Nobel Prize in Chemistry was shared between Paul Crutzen, Mario Molina, and Sherwood Rowland for their work on ozone chemistry)

Halting ozone depletion

Montreal Protocol (1987)
with various amendments
replaced CFCs with ozone-
friendly chemicals.

Graph: when will
stratospheric chlorine
get back down to
pre-1980 levels?

After about 2050



Kump, Fig 17-14

Freon substitutes:

HCFCs - vulnerable to chemical removal in troposphere

HFCs - contain no chlorine

Lessons from the ozone experience

- Earth is a coupled system:
 - >> actions can have unanticipated consequences
 - >> these can be sudden and dramatic
- Be careful of anything that has a long atmospheric lifetime
- Vigilant monitoring is good even if it doesn't seem interesting
We caught the ozone hole this way.
- High-tech monitoring systems can screw up. Good to have someone actually looking at the data.
- Dramatic events drive public policy far more than theoretical predictions.
- A successful model for coping with global change: International scientific assessments and international treaties based on them.