oxides, however. They have also ruled out a number of other possible reactions, particularly one process (combination of HCl with ammonia) that has been suggested as a possible chemical sink for HCl. Their results indicate that transport of HCl to the lower atmosphere could be the main means of eliminating chlorine from the stratosphere. The net result is not to make the problem go away—indeed, if anything, the new data strengthen the assumptions in the models—but to suggest that it is not as urgent as was first believed.

Preliminary results from one updated model give some measure of the time scales and magnitudes involved. Paul Crutzen of the National Center for Atmospheric Research (NCAR) calculates, for example, that halomethanes in the atmosphere have already reduced ozone concentrations by about 0.5 percent. If halomethane production were halted in 3 years, the ozone depletion would climb from about 0.7 percent in 1978 to a maximum of about 1.7 percent in 1990 before leveling off, only slightly higher than would result from an immediate cutoff. These new estimates, as a result of the rate data of Watson and Davis, are about a factor of 2 smaller than his earlier estimates. Crutzen cautions, however, that these are minimum values, since the effects of CH_3Cl and CCl_4 could increase ozone depletion substantially.

Additional support for the models comes from measurements of HCl in the stratosphere, which agree with model predictions. Allan Lazrus of NCAR found evidence of HCl at concentrations as high as 500 ppt in samples collected up to 27 kilometers. William Sedlacek of the Los Alamos Scientific Laboratory analyzed the same samples by a different method with the same results. The most striking feature of the data is that the HCl concentration increases with altitude, a distribution consistent with the idea that this material is the sink for stratospheric chlorine as predicted by photochemical models.

High Concentration of CH_3Cl

A puzzling finding is the high concentration of CH_3Cl measured in the lower atmosphere near Pullman, Washington, by R. A. Rasmussen of Washington State University—as high as 530 ppt. Similar atmospheric concentrations have been detected by James Lovelock of Reading College in England, who has also found CH_3Cl in seawater at concentrations of about 3000 ppt.

The sources of CH_3Cl have been a subject of considerable speculation. Several halomethanes, including CH_3Cl and chloroform ($CHCl_3$), are reported to be formed in the treatment of sewage with chlorine and even in the process of chlorinating fresh water supplies. Other industrial uses of chlorine are also potential sources. Some investigators believe that these compounds, escaping into the atmosphere, account for the observations. Others believe that the high concentrations of CH_3Cl imply a nonanthropogenic origin and, possibly, the existence of a natural chlorine cycle in the stratosphere.

Methyl chloride and other halomethanes with a carbon-hydrogen bond are not as chemically inert as the chlorofluoromethanes, and their lifetimes in the atmosphere are not expected to be as long. But if CH_3Cl does indeed reach the stratosphere (no measurements have been reported), it might be a major source of stratospheric chlorine. A key measurement to make, according to Davis, will be the atmospheric concentration of hydroxyl radical (OH^-), which decomposes CH_3Cl; he and his colleagues have developed a laser-induced fluorescence instrument for that purpose.

Another catalyst capable of destroying ozone, one now receiving increased attention, is free bromine. Bromine undergoes photochemical cycles similar to those of chlorine, according to

Speaking of Science

Public Credibility on Ozone

The discovery of a new environmental problem unfortunately often brings with it both claims of imminent disaster and bland denials that the problem exists at all. Two recent examples in connection with the ozone problem are worthy (if that is the word) of note.

The press release and summary report issued by the Department of Transportation (DOT) in connection with the Climatic Impact Assessment Program (see accompanying story) can only be described as misleading, whether deliberately or not. The authors of that report have added to the confusion by not immediately correcting press reports which headlined precisely the reverse of the principal research finding. "Scientists clear the SST" was the way the *Christian Science Monitor* put it; the fact is that SST's in large numbers, in the opinion of the scientists who did the research, do pose a threat to the ozone layer. The result has been, temporarily at least, to publicly discredit those scientists who initially raised a quite justified concern about SST's and to raise a credibility gap in regard to the still more serious threat of ozone depletion by halocarbons and other chemicals. Thus the report and DOT's public stance on the environmental effects of SST's, while not a bland denial, amount to nearly the same thing.

Alarmist statements have had their share of exposure as well. Warnings that continued use of halomethanes "could drive life on earth back to where it was hundreds of millions of years ago," calls for an immediate ban on halomethane production because "the danger is too great to wait even a single year," and scare statements about the possible use of bromine as an ozone-destroying weapon have been made publicly and, not surprisingly, have found their way into press accounts. These statements are incautious, to say the least, in view of the uncertainties still attached to the calculations and assumptions on which they are based. Ironically, the eastern university scientists who made them have also played major roles in discovering and documenting the vulnerability of the ozone layer to human activities—in establishing, in other words, that there is a real ozone problem. Whether alarmist statements can be attributed to what one scientist described as "the smell of a Nobel Prize" or simply to poor judgment, they have not served to increase the credibility of a serious problem.—A.L.H.