AIRBORNE C_1- AND C_2-HALOCARBONS IN CORRELATION TO INORGANIC AIR POLLUTANTS.

H. Frank[1], W. Frank[1], D. Renschen[1], G. Baumbach[2]

1) Institut für Toxikologie, Wilhelmstraße 56, D-72074 Tübingen
2) Institut für Verfahrenstechnik, Universität Stuttgart, D-70569 Stuttgart

The ubiquitous airborne C_1- and C_2-halocarbons (SCAH's) have been monitored worldwide since the mid-seventies at several remote stations to determine global atmospheric burdens. However, the sporadic measurements in industrialized countries are insufficient to estimate local or regional SCAH-levels.

On the other hand, numerous monitoring stations in Central Europe have been established during the last decade where meteorological and some inorganic-chemical parameters are monitored, in particular air levels of sulphur dioxide, nitrogen oxides, ozone, and carbon monoxide.

The present study was undertaken to determine whether correlations of selected meteorological or air-chemical data and SCAH-levels exist. Over a period of six weeks, wind velocity, wind direction, and UV-radiation as well as ambient air levels of sulphur dioxide, nitrogen oxide, nitrogen dioxide, and ozone have been monitored as half-hourly averages at the site "Schöllkopf" near Freudenstadt (Northern Black Forest), as well as air levels of the following SCAH's, determined every half hour: trichlorofluoromethane, dichlorodifluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, dichloromethane, trichloromethane, tetrachloromethane, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene. Multivariate correlations have been calculated.

Strong correlations have been found for ambient air levels of tri- and tetrachloroethene to those of nitrogen dioxide (R = 0.5 and 0.63, respectively). A weaker correlation exists for chloroform and nitrogen dioxide (R = 0.44). A weak negative correlation was found for trichloroethene and ozone (R = - 0.37), indicating the relevance of the ozone as OH-radical precursor and, thus, its indirect impact upon atmospheric degradation of this halocarbon. Strong correlations - however to be expected - are found for those halocarbons which are commonly employed as technical solvents, i.e. tetrachloroethene and trichloroethene (R = 0.81), and tetrachlorethene and 1,1,2-trichloro-1,2,2-trifluoroethane (R = 0.81). Less strongly correlated are tetrachloroethene and 1,1,1-trichlorethane (R = 0.31). Correlation of wind direction to ambient air levels of 1,1,1-trichloroethane, trichloroethene and tetrachloroethene suggest that the main sources for local SCAH-air pollution are located toward the southwest and northwest of the particular site Schöllkopf. No correlation existed for any of the halocarbons and sulphur dioxide levels.

Although the study shows that none of the inorganic air chemical parameters correlates well enough to reconstruct a "history" of past SCAH-levels, the data allow to deduce some information on the regional association and location of the main sources. The significance of ozone for atmospheric degradation of non-persistents chlorocarbons is supported by these findings.