A Study of the Behavior of $Mg(ClO_4)_2$ Drying Traps Used in Gas Chromatography-Mass Spectrometry (MS) Analysis of Flasks

C. Siso[1] and S.A. Montzka[2]

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80309; 303-497-7012, E-mail: carolina.siso@noaa.gov
[2]NOAA Earth System Research Laboratory, Boulder, CO 80305

Instrumentation used during chromatographic analysis of air samples often requires drying of an air stream. We dry flask air during its analysis by passing it over short ¼" traps filled with $Mg(ClO_4)_2$. The reason for this study was an increasing frequency of chromatographic problems affecting the results of a group of compounds that we believed were caused by water. Water causes blockage of cold zones prohibiting sampling; water also appears to interfere with the ionization process and adversely affects the sensitivity of the mass spectrometer. While driers had behaved predictably for many years, it seemed that the capacity of a drier to remove water had become highly variable. At times dry air appeared anomalously wet while humidified samples appeared well dried. Given the universality of a mass spectrometer for detecting many different chemicals including water, we began studying the variables influencing the efficiency of our driers. By analyzing dry zero air with the MS detector in "SCAN" mode, to explicitly monitor the water passing through the $Mg(ClO_4)_2$ trap, we were able to confirm that high water levels were indeed interfering with the results. These tests allowed us to realize that the pressure over the drier during the analysis of different types of samples (flasks vs. cylinders) influenced the water concentration downstream of the trap (drying is more efficient at higher pressures). These tests also demonstrated that reversed flow of humid room air temporarily over the trap made it essentially unusable once flow was restored in the proper direction; it appeared as if water absorption by $Mg(ClO_4)_2$ was surprisingly reversible. Regular analyses of zero air for water in the "SCAN" mode are now performed and allow us to accurately track the performance of the drier. As a result, we replace the $Mg(ClO_4)_2$ on an as-needed basis only, and this leads to significant improvements in instrument performance and consistency, and, equally important, happier analysts.

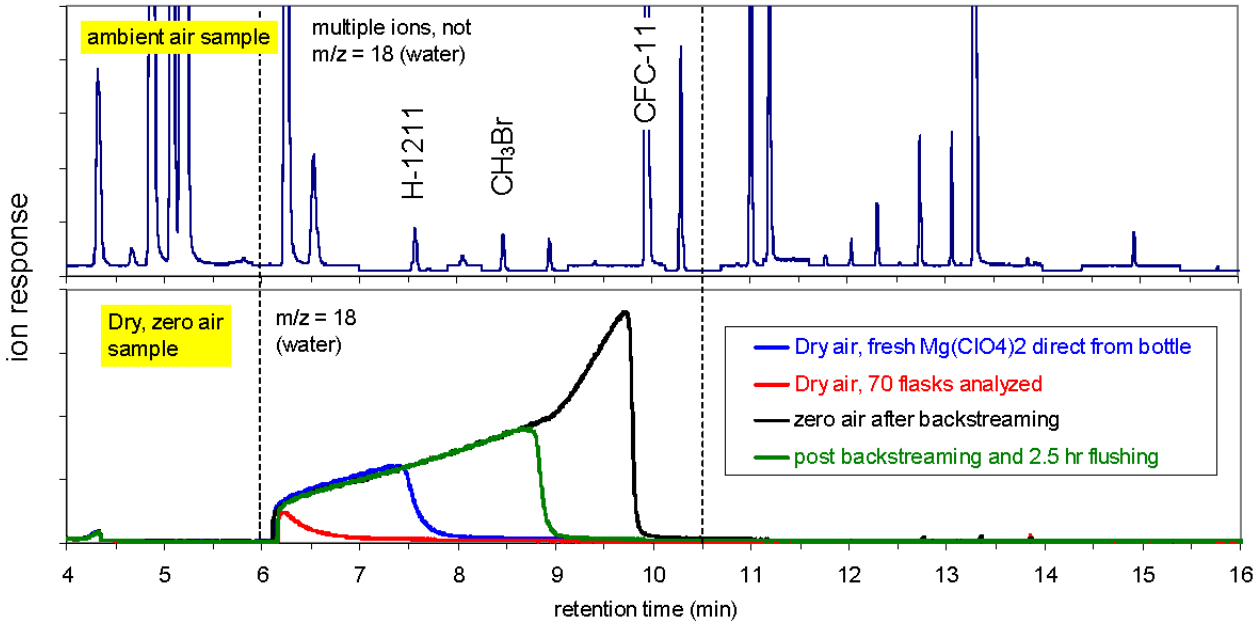

Figure 1. ion chromatograms showing the retention time of analytes (upper panel) and the elution of water as a function of past history of the $Mg(ClO_4)_2$ drying trap.