On the Reproducibility and Stability of Water Vapor in Stainless Steel Gas Cylinders

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Recent work by Solomon et al (2010) has sparked interest in the link between changes in stratospheric water vapor and changes in tropospheric temperature. There is a growing need to reliably measure trends and distributions of water vapor in the upper troposphere and lower stratosphere (UTLS). Measurement of water vapor in the UTLS region is difficult, and there has been some disagreement among measurement methods. The issue is complicated by the fact that accurate, stable sources of water vapor for calibration are difficult to obtain, particularly for use in field projects. We have explored the preparation of water vapor/air mixtures in electropolished stainless steel cylinders. Stable mixtures of humidified air at high pressure might be very useful as a tool to test water vapor instruments over long periods. They might also be used to link the calibrations of multiple instruments together, as long as the air taken out of the cylinder can be shown to provide a constant water vapor mixing ratio. We will present work performed to evaluate the stability and reproducibility of water vapor mixtures in electro-polished stainless steel cylinders.

Solomon, S., K. Rosenlof, R. Portman, J. Daniel, S. Davis, T. Sanford, G-K. Plattner, Contributions of stratospheric water vapor to decadal changes in the rate of global warming, Science, 10.1126/science.1182488, (2010).

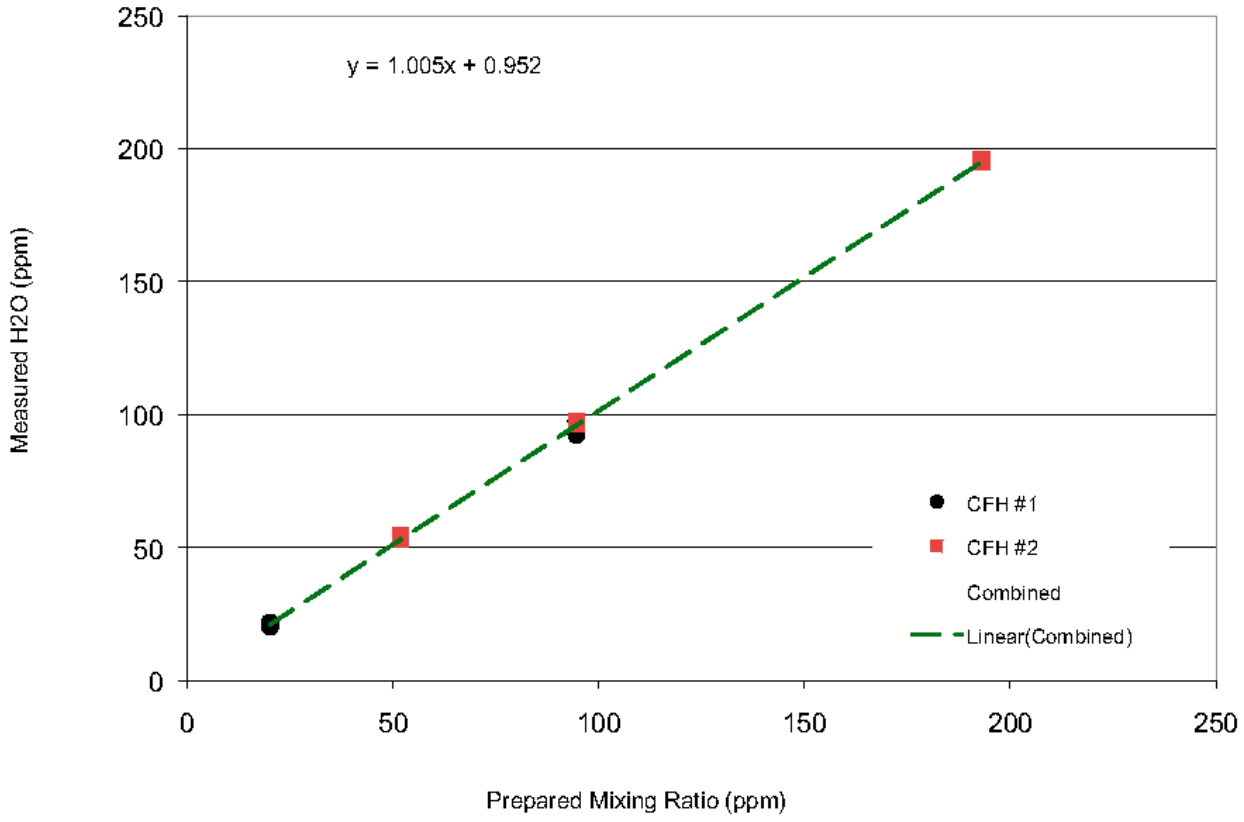

Figure 1. Analysis of water vapor mixtures prepared in stainless steel cylinders was performed using two cryogenic frost-point hygrometers.