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Atmospheric Measurement Techniques Discussions

Interactive comment on "Water vapor $\vec{\delta}^2$H and $\vec{\delta}^{18}$O measurements using off-axis integrated cavity output spectroscopy" *by* P. Sturm and A. Knohl

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The particular Water Vapor Isotope Analyzer (WVIA) used in this manuscript was built 24 months ago and was the second WVIA built by LGR. Designed for operation in the field where electrical power availability is limited, these early WVIA were designed to operate on minimal electrical power and thus required only about 120 watts to operate, including vacuum pump. Newer WVIA versions (ship date 2009) incorporate significantly improved thermal control of the internal sub-systems (including the measurement cell, detection electronics and launch optics) and require additional electrical power. Although these new WVIA (including vacuum pump) require about 180 watts of electrical power, variations in δ18O and δ2H due to temperature changes are substantially reduced (typically less than 0.3 per mil over the entire operating range from

10-40 C for δ18O). In addition, WVIA may now be operated in conjunction with LGR's new Water Vapor Isotope Standard Source (WVISS). The WVISS employs a heated nebulizer to vaporize a liquid-water stream from a 1-liter reservoir, is controlled by the WVIA and is designed to regularly characterize the operation of the WVIA in a manner similar to the vapor generation systems based on the piezo-injector (by the authors), or dewpoint generators or syringe-pump systems reported by others (and referenced in the manuscript). The WVISS, which mixes the vapor stream from the nebulizer with controlled dry air flows for dilution, can provide continuous reference (i.e. isotopically known) water vapor flows over a range of water vapor mixing ratios (5000-30000 ppmv) to validate the data from the WVIA at user-selectable intervals automatically without user intervention.

Recent measurements recorded with a 2009 version of the WVIA and a new WVISS are presented to demonstrate the performance that may be obtained with recent LGR models that incorporate enhanced thermal control and improved spectroscopic line-shape analysis.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 2055, 2009.

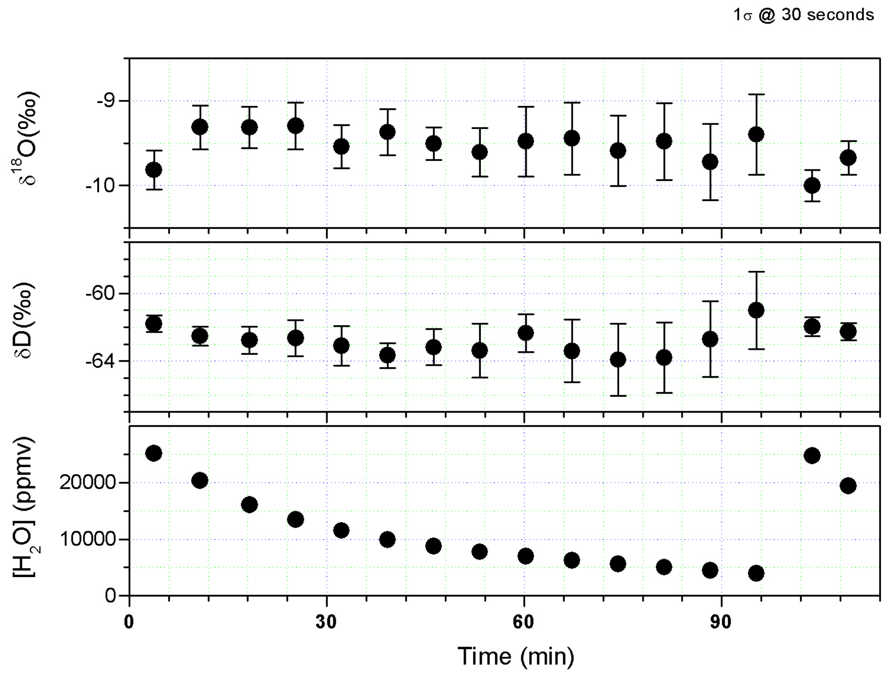

Fig. 1. Measurements over a wide range of H2O values (5000-25000 ppmv, 30-secs/point) indicate relative insensitivity to changes in H2O mixing ratio.

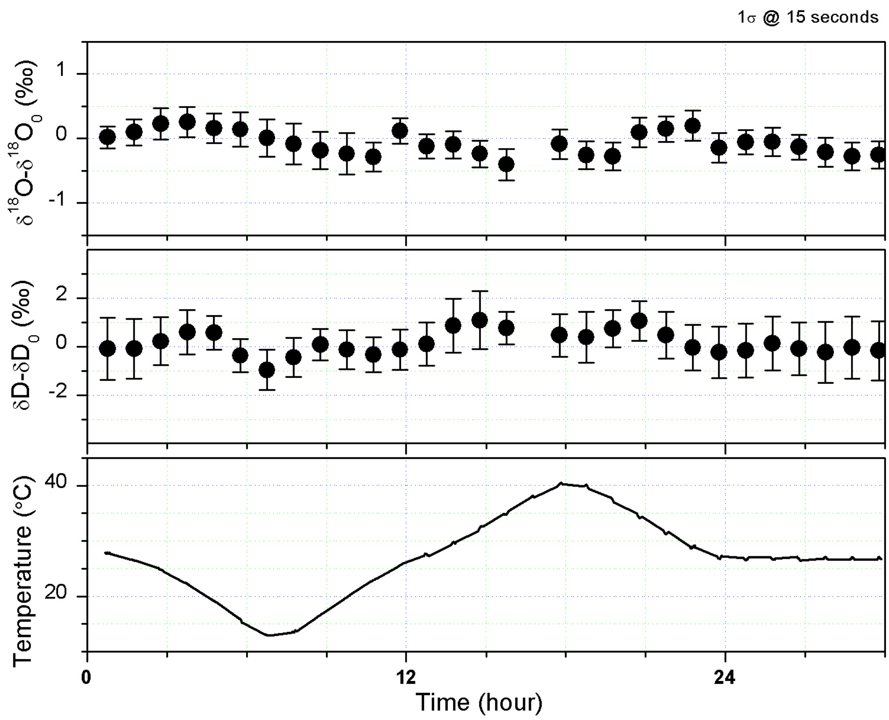

Fig. 2. Measurements of δ18O and δ2H over a range of temperatures (7-40 C, 2.5 C/hr, 10,000 ppmv H2O in air, 15 sec/point) indicate relative insensitivity to changes in ambient temperature.

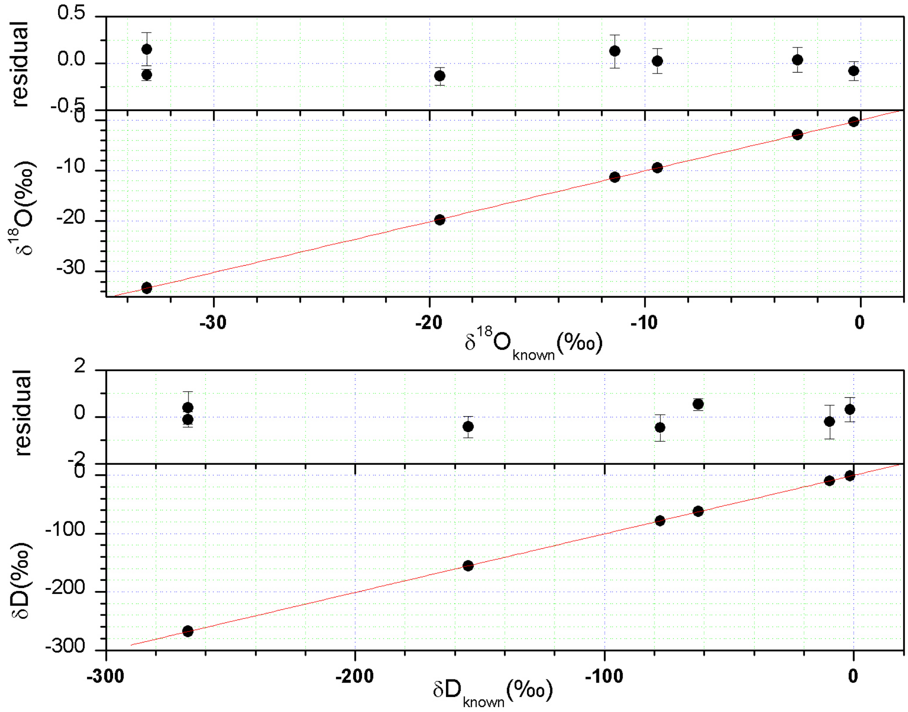

Fig. 3. Measurements of δ18O, δ2H in water vapor (y) compared with corresponding values in liquid water samples supplied to the WVISS (x) indicate WVISS provides water vapor from liquid without fractionation.