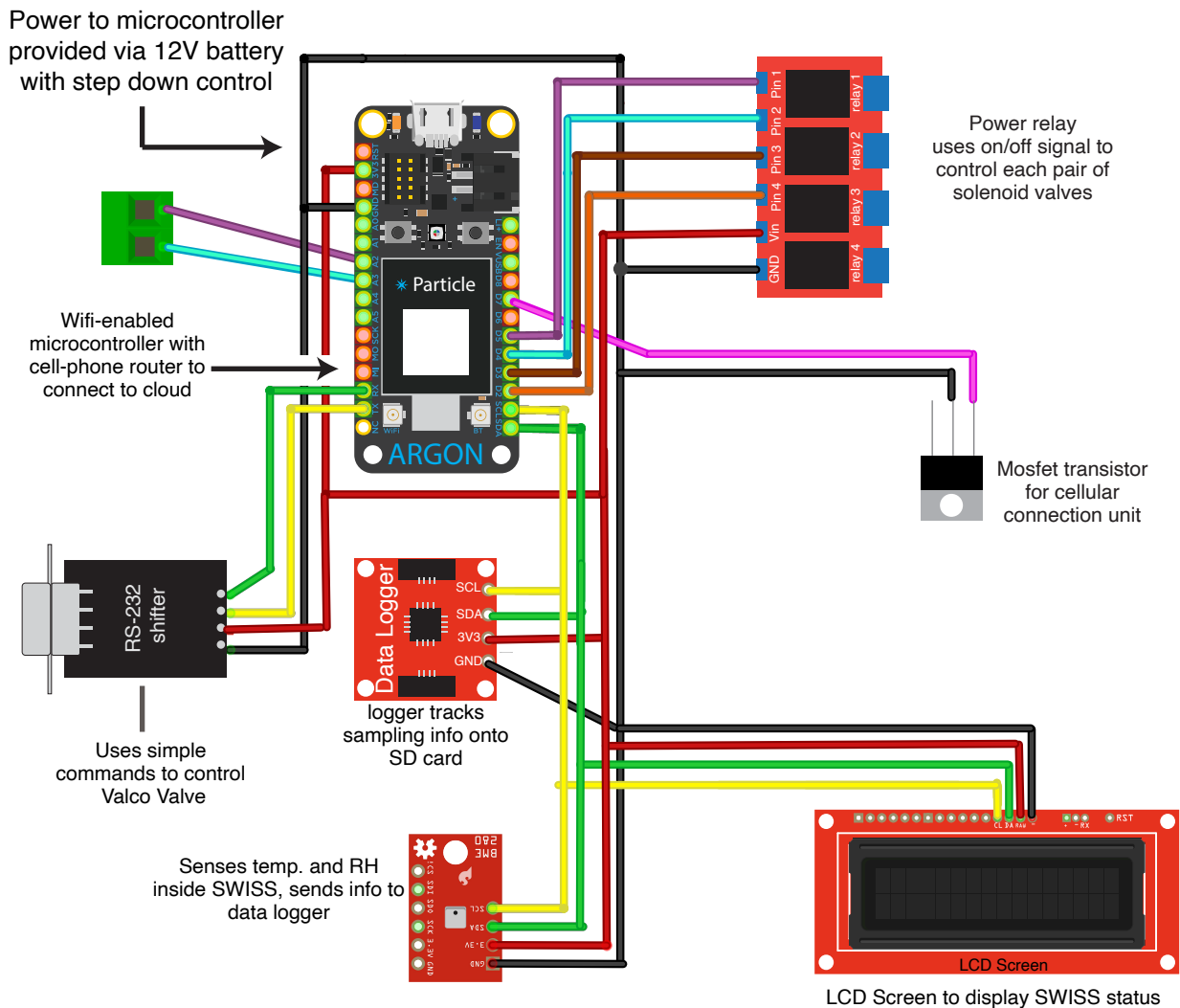
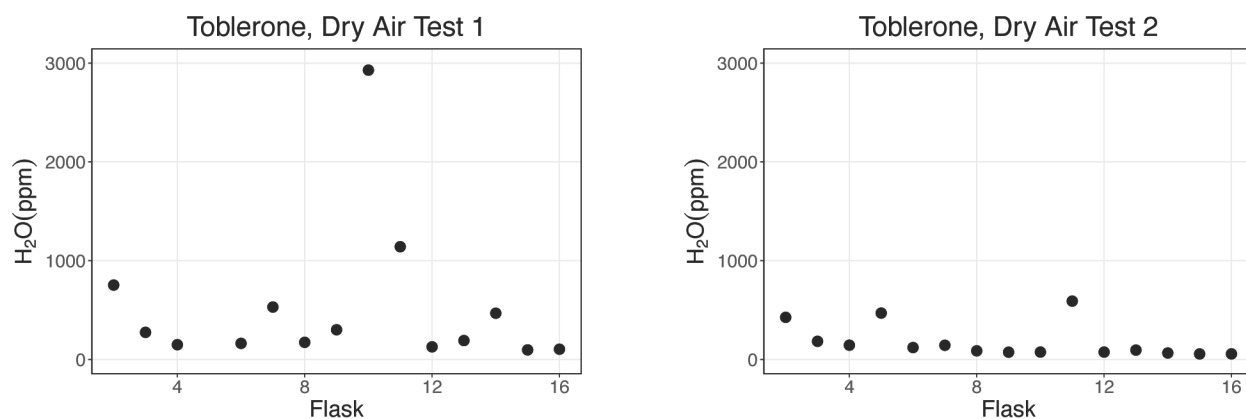


## Automation components and wiring



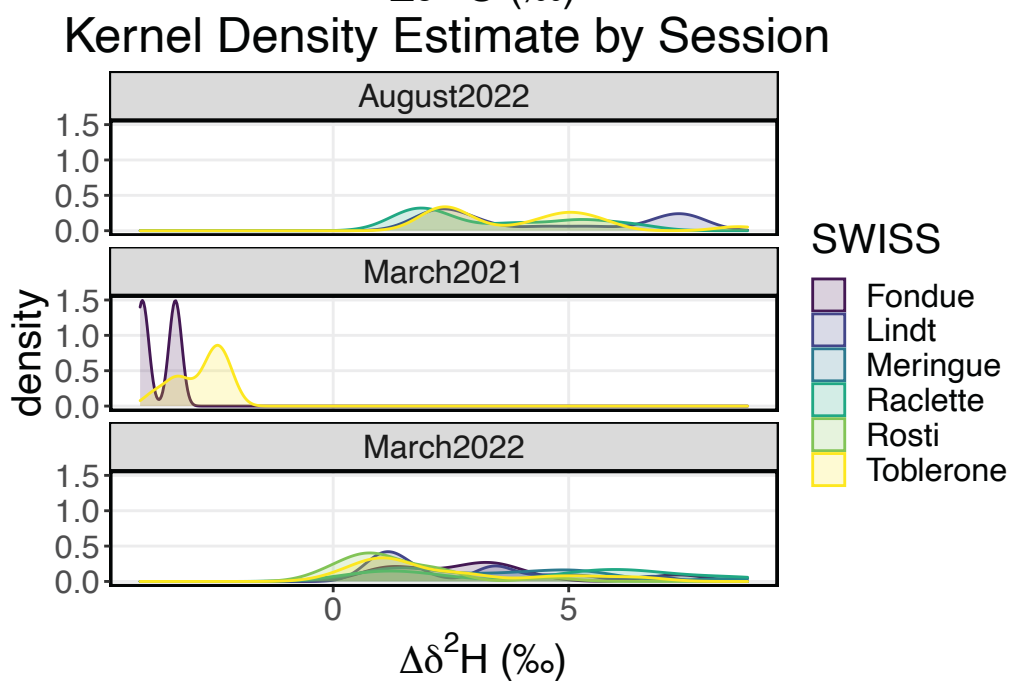
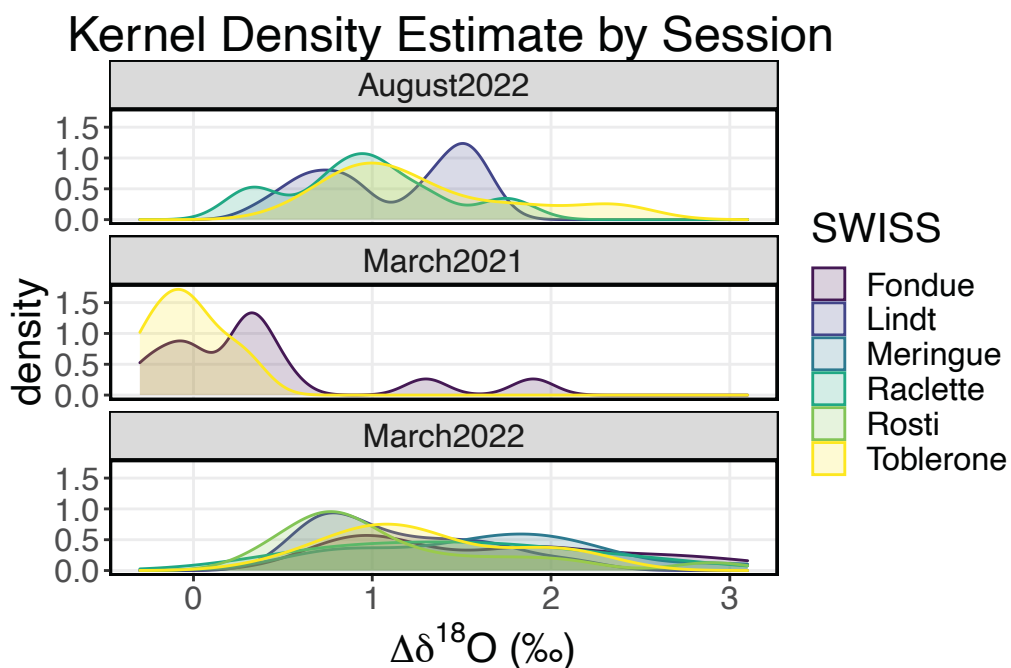
**Figure S1.** A wiring schematic of the components used to automate the SWISS.

Figure S1  
Havranek et al.,



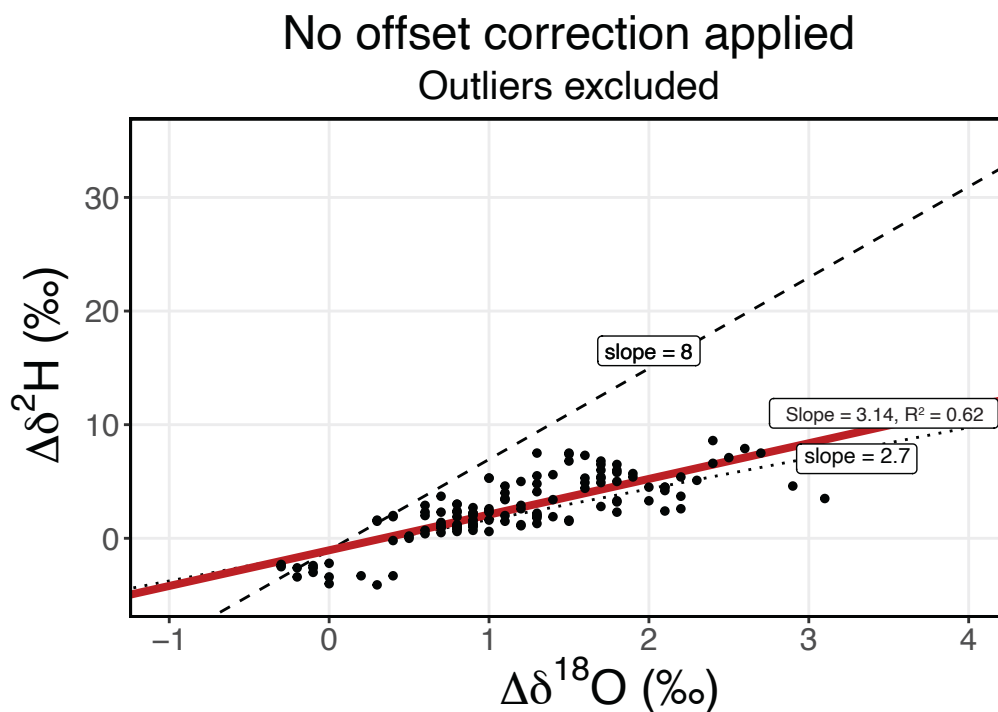
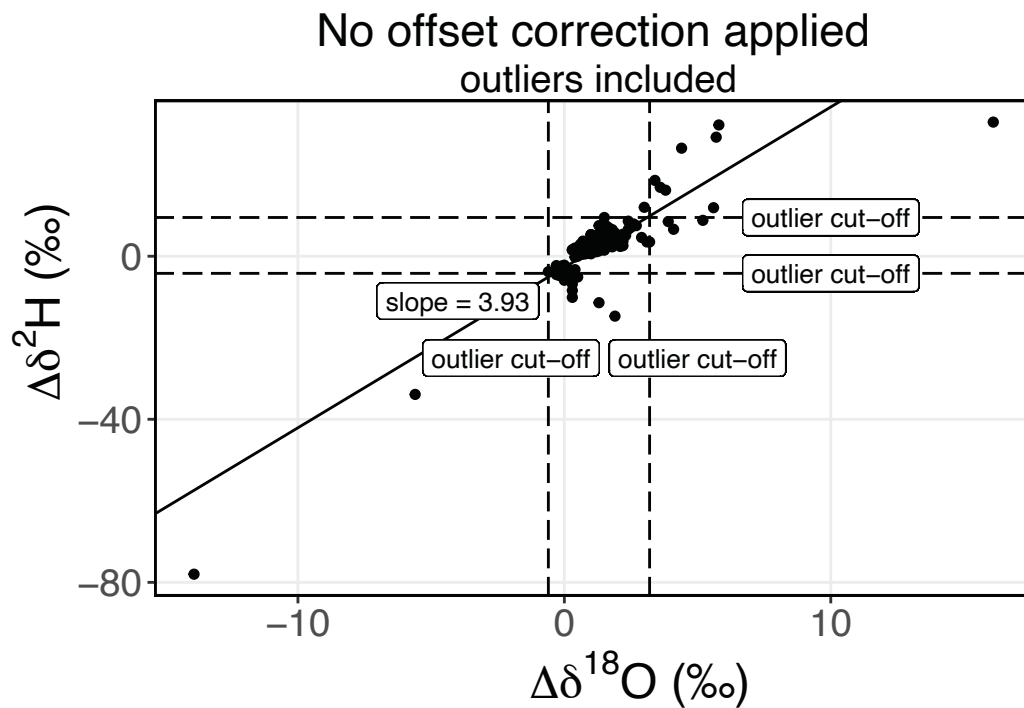
**Figure S2.** The results of two successive dry air tests completed on the SWISS unit named Toblerone. Between the two tests we tightened the Swagelok and Valco valve fittings.

Figure S2  
Havranek et al.,



**Figure S3.** Kernel density estimates from three different water vapor hold test analytical sessions. KDEs are colored by SWISS unit. Each analytical session used a different tertiary standard.

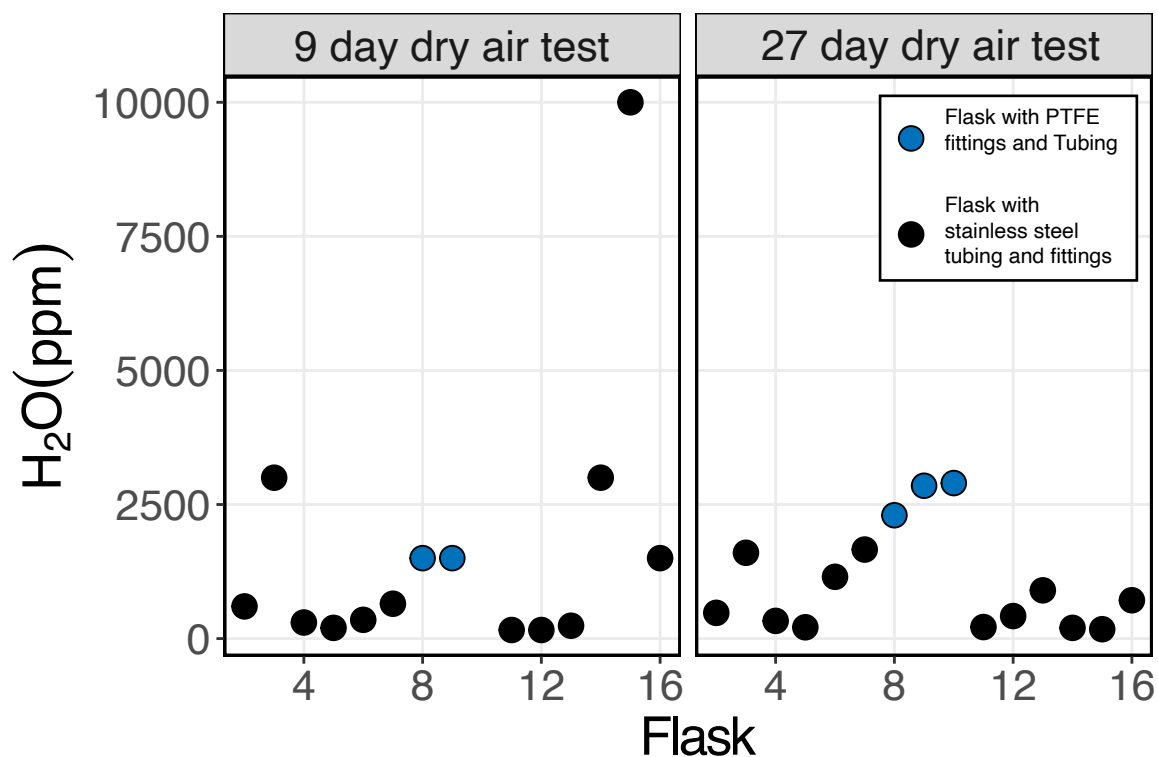
Figure S3  
Havranek et al.,



**Figure S4.** Results from the water vapor hold tests. Top plot includes all data and the bottom plot has excluded outliers. With outliers, the regressed slope is 3.93, and without outliers the slope is 3.14 ( $R^2 = 0.62$ ). We have also plotted the slope of pure diffusion shown as a dotted line in the bottom plot, which has a slope of approx. 2.7 (Gonfinatini et al., 2018).

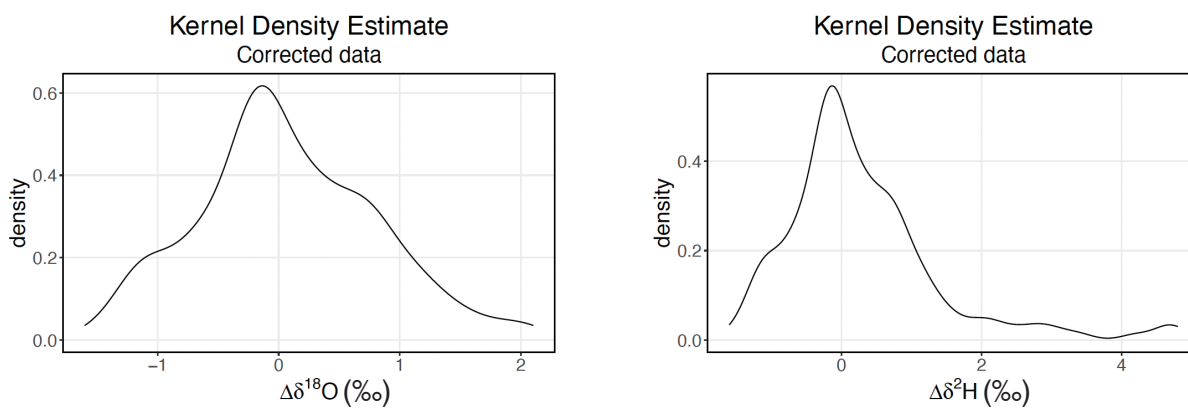
Figure S4  
Havranek et al.,





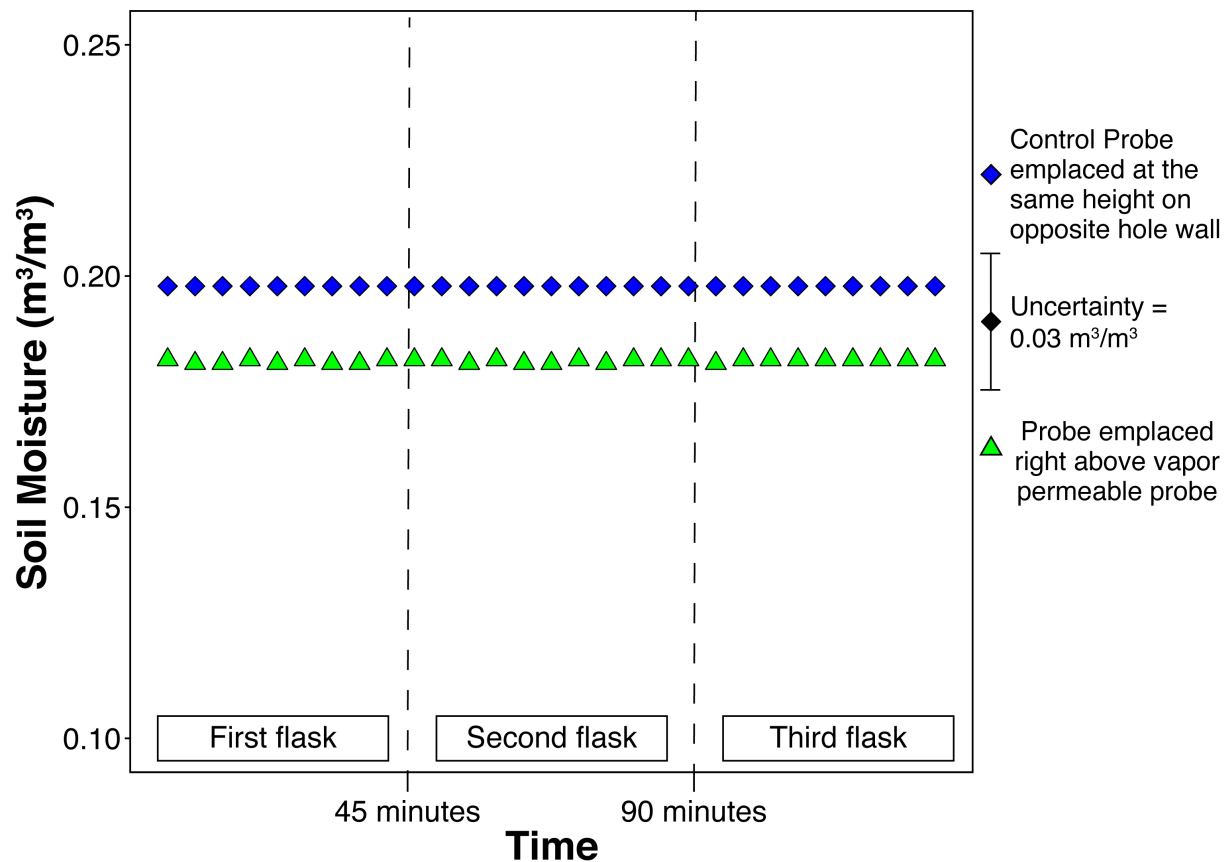
**Figure S5.** Results of 2 separate dry air tests done with the SWISS unit Toblerone. 3 sets of stainless steel fittings and tubing were replaced with PTFE fittings. The PTFE fittings performed reasonably well over 9 days, but performed much worse than the stainless steel fittings over 27 days. Note: we did tighten all fittings between the two tests.

Figure S5  
Havranek et al.,



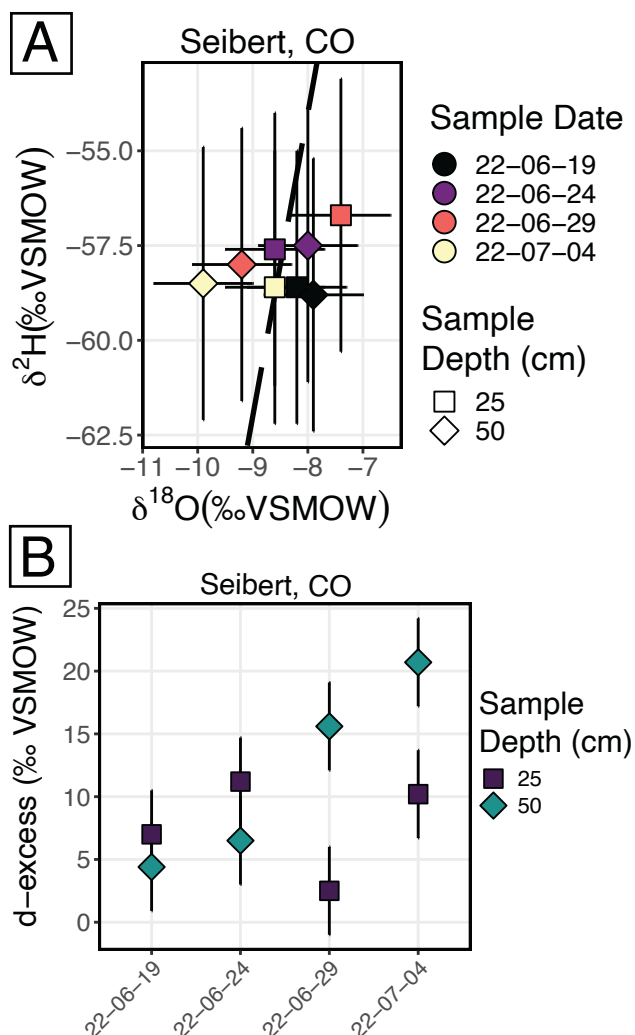
**Figure S6.** Kernel density estimates from three different water vapor hold test analytical sessions after the offset correction has been applied.

Figure S6  
Havranek et al.,



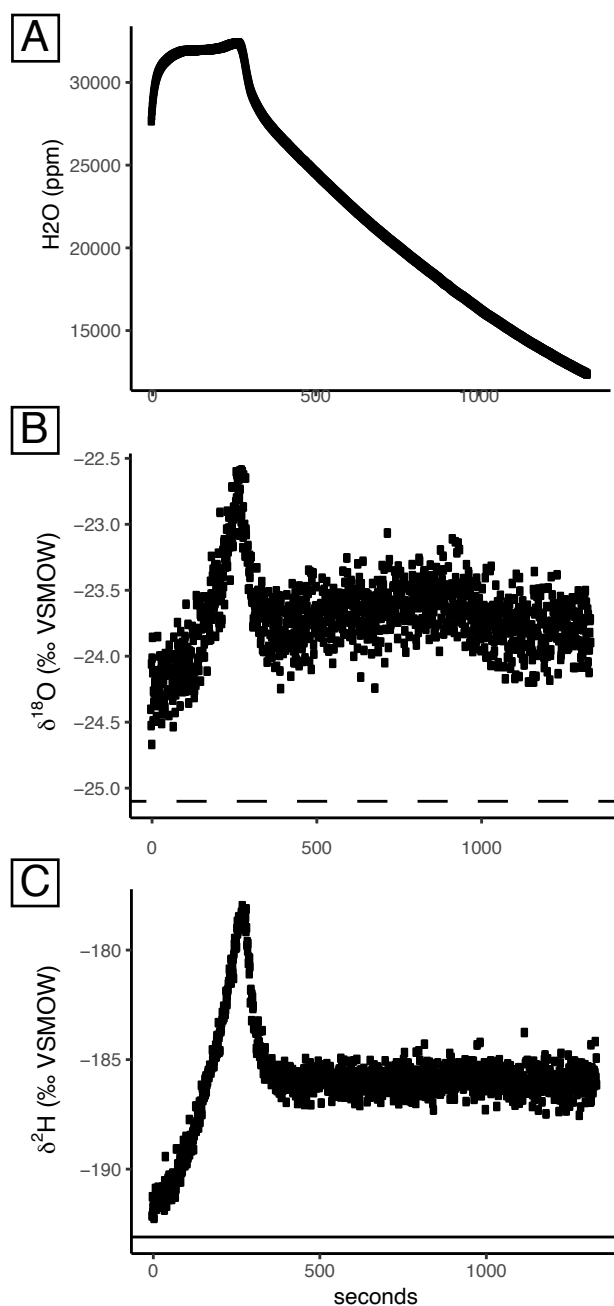
**Figure S7.** We buried soil moisture probes just above the vapor permeable probes and in the same hole, but on the opposite wall. We saw no variability in soil moisture as a result of flushing dry air through the vapor permeable probing for 135 minutes. This gives us confidence that our long sampling time does not alter natural conditions in the soil.

Figure S7  
Havranek et al.,



**Figure S8.** A) A dual isotope plot of the Seibert, CO results. The dashed line is the GMWL. B) Deuterium excess vs. date. The data from 25 cm scatter around  $10 \pm 2.6\text{‰}$ , but the data from 50 cm linearly increase through the sampling plan. Data from 75 cm were excluded from these plots.

Figure S8  
Havranek et al.,



**Figure S9.** A) Water vapor mole fraction during a test using the dry air carrier gas sampling introduction method. During this measurement there was condensation causing water vapor mole fraction to slightly rise, before beginning to decrease as expected. B) Oxygen isotope values increase as water vapor mole fraction increases. C) Hydrogen isotope values increase as water vapor mole fraction increases until the condensation is cleared.

Figure S9  
Havranek et al.,