

Instrument Calibration of Picarro L2140-i (HKDS2038) - Version 2

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April 19, 2017

1 Drift and Precision test

2 Water Concentration Calibration

Water concentration measured by Picarro L2140-i was calibrated against dew point generator LI-610 on 2016-06-06 in FARLAB, UiB.

1. Picarro mode: iH₂O Air & iH₂O N₂; inlet flow rate ~ 32 sccm.
2. Ambient air through dew point generator (LI-610); flow rate ~ 70 – 80 sccm.
3. Ambient pressure measured by Pfeiffer Vacuum (Gauge APR250), which has been calibrated against VAISALA barometer.

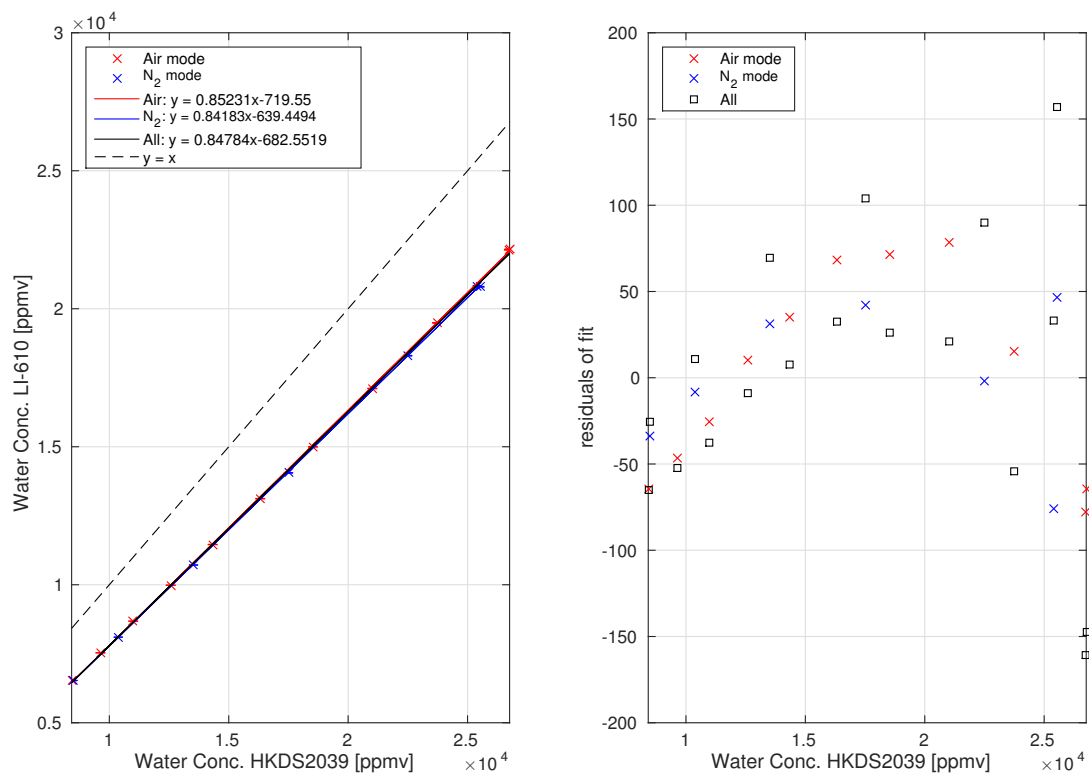


Figure 1: Water concentration calibration vs. dew point generator LI-610. Dew points are in sequence set to 19°C, 1°C, 3°C, 5°C, 7°C, 9°C, 11°C, 13°C, 15°C, 17°C, 19°C for air mode and 18°C, 1°C, 4°C, 8°C, 12°C, 16°C, 18°C for N₂ mode.

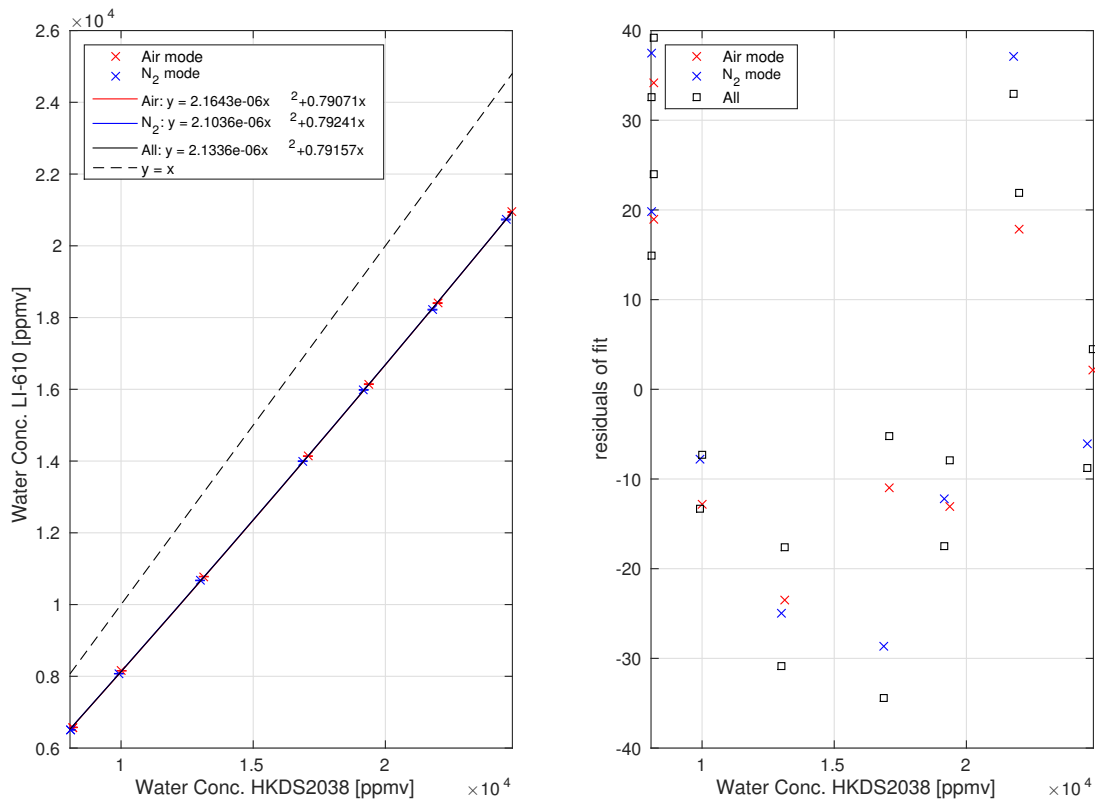


Figure 2: Water concentration calibration vs. dew point generator LI-610. Dew points are in sequence set to 19°C, 1°C, 3°C, 5°C, 7°C, 9°C, 11°C, 13°C, 15°C, 17°C, 19°C for air mode and 18°C, 1°C, 4°C, 8°C, 12°C, 16°C, 18°C for N₂ mode. Fitting is polynomial function with constraint point of (0,0).

3 Isotopic Dependency on Water Concentration

The isotopic compositions (δ values) measured by CRDS have a dependency on water concentration levels. During the calibration experiment, N₂ from gas cylinder was mixed with the saturated water vapour generated from dew point generator to reach various water concentration levels. The saturated water vapour at dew point 18°C was measured at the beginning and end of the experiment to take into account of the drift of the water standard isotopic composition caused by the evaporation while ambient air (at 20°C) was bubbled through water standard.

Picarro L2140-i (HKDS2038) is currently used to measure only liquid samples in vials. For injected liquid water, the water concentration is maintained normally between 16000 to 21000 ppm (calibrated). A linear fit in this section presents well the isotopic response (see Figure 3).

1. Picarro Mode: iH₂O N₂ (flow rate \sim 30 sccm).
2. Ambient air through dew point generator (LI-610); flow rate \sim 75 sccm.
3. Dew point set to 18°C.

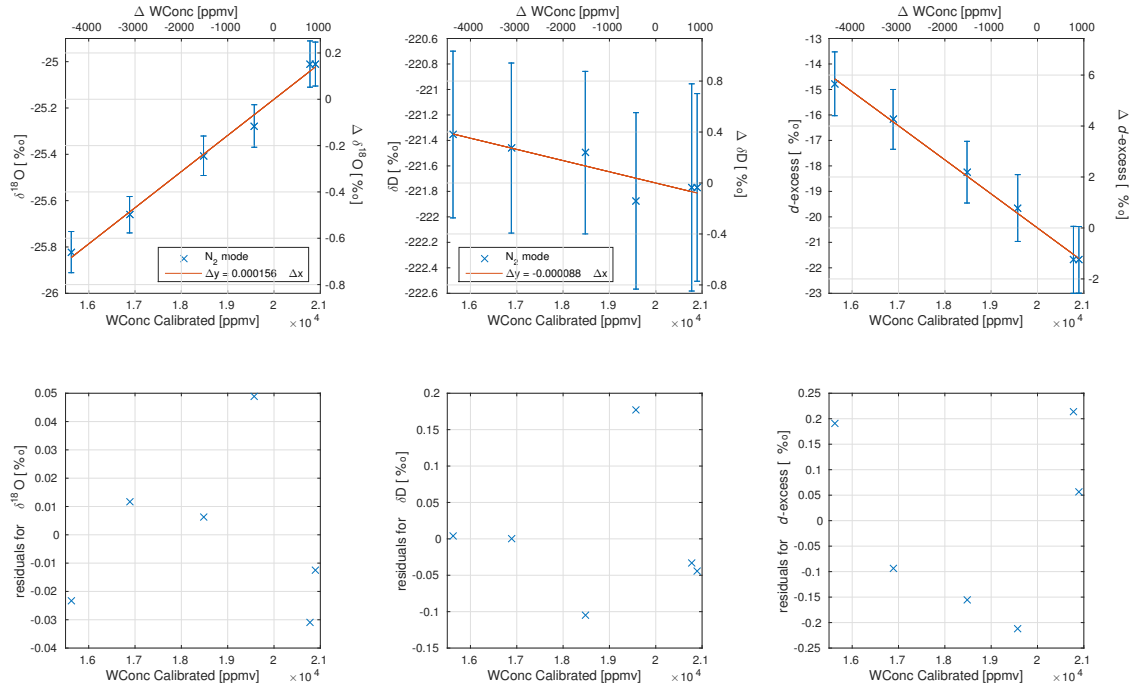


Figure 3: Isotopic dependency on water concentration in the range of 15000-21000 ppm. A linear fit is presented for $\delta^{18}\text{O}$ and δD . The fit for d -excess is calculated based on the linear fits of $\delta^{18}\text{O}$ and δD .

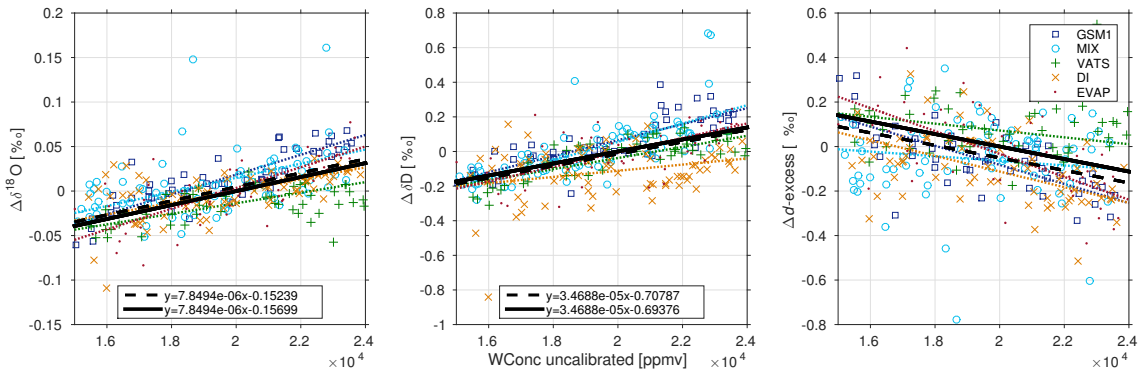


Figure 4: Isotopic dependency on water concentration in the range of 15000-24000 ppm. Five water standards are measured. Water concentration presented here are not calibrated. A linear fit is presented for $\delta^{18}\text{O}$ and δD . Dotted lines are linear fits for each water standard; dashed line is a linear fit for all of 5 water standards; black thick line is the final fit by constraining the dashed line to cross the fixed point of [20000,0]. The fit for d -excess is calculated based on the linear fits of $\delta^{18}\text{O}$ and δD .