EGU24-13866, updated on 26 Mar 2025
https://doi.org/10.5194/egusphere-egu24-13866
EGU General Assembly 2024

Laser absorption spectroscopy-based ultraportable analyzer for δ18O and δ2H in water.

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Stable isotope analysis of water $^{2}H_2O$ and $H_2{}^{18}O$ are powerful tracers to understand the different hydrological processes like ecohydrological processes, and hydroclimatic processes [1]. The measurement of $\delta^{2}H$ and $\delta^{18}O$ in water samples using laser-based absorption techniques is adopted increasingly in hydrologic and environmental studies. In contrast to the conventional Isotope ratio mass spectrometry (IRMS) technique, optical absorption spectroscopic techniques allow the realization of isotopologue-specific, non-destructive, and compact spectrometers with short analysis times with high-precision capabilities.

ABB's ultraportable water analyzers are compact, portable field-deployable laser spectrometers capable of making continuous, high-frequency measurements of $\delta^{18}O$ and $\delta^{2}H$ from multiple water sources. The instrument is based on Off-Axis Integrated Cavity Output Spectroscopy (OA-ICOS) technique [2]. These analyzers are capable of measuring liquid water (GLA132-LWIA) or vapor (GLA132-WVIA). They are rugged and designed to handle both natural and isotopically enriched water samples. Users can leverage the precision and speed of the GLA132-LWIA by coupling it with a portable auto-injector to perform automated, unattended injection patterns on multiple samples.

An important asset of this innovative approach based on OA-ICOS technology coupled with the portable auto-injector technology is its sample throughput, which allows one to measure approximately 90 samples a day corresponding to 720 injections each with a sample volume of 0.5 µL per injection per day. The precision (1σ) achieved corresponds to 0.6 ‰ for $\delta^{2}H$ and 0.2 ‰ for $\delta^{18}O$. The analyzer's ease of use, field portability, durability, and high throughput make it an excellent choice for reliable, high-performance measurement of freshly collected samples in the field, thereby opening a plethora of applications to understand the different processing governing the earth's climate.

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