LI-5300A Dissolved Inorganic Carbon Analyzer

Specifications

- **Sample volume:** 0.5 – 4 ml per analysis
- **Time consumption:** ~ 4 min per analysis
- **Precision:** ± 0.05% or ± 1 µmol kg^{-1} for seawater (± 0.1% for small sample volume)
- **Analytical range:** 0.2 – 20 mM
- **Only one standard is required**
- **Working environment:** both land and shipboard laboratories

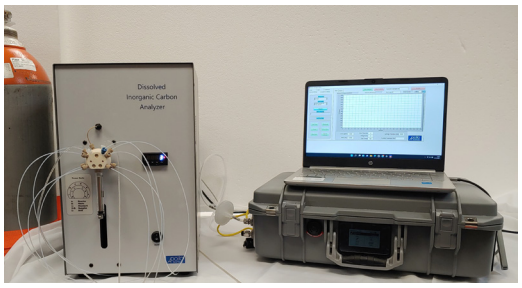

Figure 1. Front view of the DIC analyzer LI-5300A with a multi-port sampler and the LI-7815 laser-based CO_2 detector (under the laptop).

Description

The LI-5300A Dissolved Inorganic Carbon Analyzer (formerly Apollo AS-C6L) has been tested for precise measurements of total dissolved inorganic carbon (DIC) in a variety of aquatic environments. It is comprised of the highest quality laser-based CO_2 detector (LI-7815), a digital syringe pump for precise delivery of reagent and sample solutions, a high-quality mass flow controller to accurately regulate the carrier gas flow rate, a specially designed CO_2 stripping reactor allowing for an efficient and smooth stripping of CO_2 from the water sample, and an electronic cooling system for removing moisture in the gas stream.

Advantages of this DIC analyzer include the use of small sample volumes (0.5 – 4 mL) with a fast analytical rate (~ 4 minutes per analysis). The system can work on both land and shipboard laboratories. It maintains a precision of better than ± 0.1% or ± 2 µmol kg^{-1} for seawater sample volume near 1.0 mL. In the 3 – 4 mL volume range and under a temperature-controlled environment, a higher precision of ± 0.05% or ± 1 µmol kg^{-1} is achievable. Users can choose to analyze each sample with no repeat or with a specified precision for 2 or more repeats. Analytical precision is established by analyzing a set of 8 bottles containing the same water sample.

The LI-5300A DIC Analyzer has a very large analytical range (0.2 – 20 mM) and therefore is ideal for DIC analysis (and has been tested) in a variety of aquatic conditions such as in river and lake waters, coastal and open ocean waters, sediment porewater, and groundwater (precision may vary and analytical condition may be adjusted for low DIC samples). Sample salt and hydrogen sulfide (H_2S) contents have no effects on DIC analyses. The analyzer has a few unique features that other vendors do not have. The analyzer is designed for small volume (< 1 mL) analysis but still has a high precision. The analyzer requires only a single standard solution and will produce a calibration line of three standards. It is also automated for analyzing 8 samples and a set of 3 standards uninterrupted in ~ 2.5 hours (depending on user input).

Sample Analysis Results

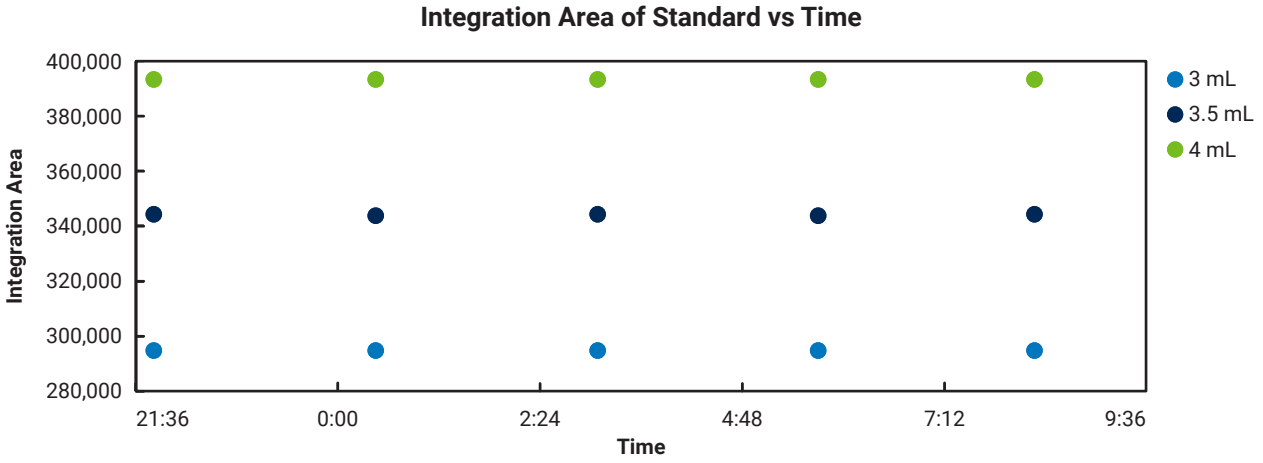

Figure 2. Measured Integration Area vs. time for standard. Data obtained on Jan. 27 and 28, 2020. Each set of standards consist of three volumes of the same standard material. Overall standard deviation (stability of the standard) is better than 0.05% within 12 hours.

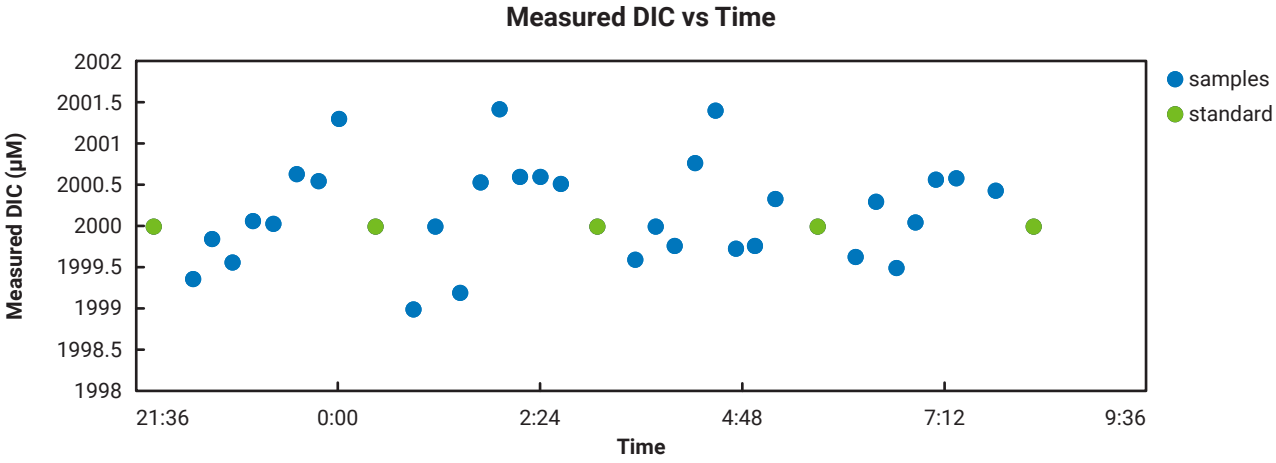

Figure 3. Measured DIC vs. time for samples. Data obtained on Jan. 27 and 28, 2020. Four groups of eight samples were measured sequentially via each sample port after a set of standards is measured. Overall standard deviations of DIC for samples via eight sample ports are better than 0.05% within 12 hours, despite the slight drift in standard. The accuracy of the average DIC of eight samples in each group is ± 0.05%.