



Evaluation of the G2301-f Picarro methane and carbon dioxide flux analyzer for micrometeorological applications*

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Picarro, Inc. has developed a high speed Cavity Ring-Down Spectroscopy (CRDS) based analyzer, able to measure carbon dioxide (CO₂) concentration to a precision (one standard deviation) of 200 parts-per-billion (ppbv), and methane (CH₄) concentration to a precision of 2 ppbv, both at up to 10-Hertz (Hz) quasi-simultaneously with extremely high accuracy.

In an effort to prove out the viability of this new technology for micrometeorological applications, a number of land and sea based tests were executed on over the last year by research teams from NOAA and Columbia University. These test included deployments on the Research Vessels Gould in the Southern Ocean, Atlantis in the Eastern Pacific Ocean, and Oceanus in the Gulf of Mexico. Stationary tests were performed in the Picarro, Inc laboratory and on Sherman Island California UC Berkeley Flux site. Tests were also conducted on aircraft as the final platform testing. The experiments conducted on Aircraft, Ocean Vessels, terrestrial sites, ocean tower site, and lab tests provided the characterization of the G2301-f for micrometeorological use. The analyzer is required to measure fast and be synced with other meteorological instruments to provide an accurate and precise measurement of the eddy covariance flux. Successful testing was performed that identified motion response, timing and synchronization, and frequency response of the G2301-f. The analyzer was used during field studies of CH₄ and CO₂ impacts of the 2010 Gulf Oil leak and combined with Picarro analyzer measurements of water side CH₄ and CO₂ using equilibrator head space techniques. The G2301-f has recently been integrated into a continuous, real-time, measurement of air-sea direct eddy covariance fluxes on the unique air-sea flux tower 3.5 km out at sea in the Western Atlantic off of Martha's Vineyard.

In this work, flux measurements taken from a variety of deployments will be shown. Using these results, the strengths and weaknesses of the Picarro G2301-f will be discussed.

* This material is based upon work supported by the Department of Energy SBIR Program under Grant No. DE-FG02-07ER84902 and does not constitute an endorsement by DOE of the views expressed in this presentation.