Geophysical Research Abstracts
Vol. 12, EGU2010-14467, 2010
EGU General Assembly 2010

A new Methane and carbon dioxide eddy-covariance flux monitor for land-based, sea-based, and aircraft-based applications.

Eric Crosson (1), Anna Karion (2), Beverly Law (3), Colm Sweeney (2), Thomas Christoph (3), Thomas Rahn (4), and Wade Mc Gillis (5)

(1) Picarro Inc., 480 Oakmead Parkway, Sunnyvale California 94085 USA. , (2) NOAA/ESRL/GMD, 325 Broadway R/GMD1, Boulder, CO 80305., (3) 328 Richardson Hall College of Forestry Oregon State University Corvallis, OR 97331., (4) 328 Richardson Hall College of Forestry Oregon State University Corvallis, OR 97331., (5) Lamont Doherty Earth Observatory, Columbia University, P.O. Box 1000 61 Route 9W Palisades, NY 10964-8000 USA.

It is now recognized that a comprehensive understanding of global warming's full impact on local and global weather patterns still requires much more data, namely, mapping the atmospheric mixing ratios (concentrations) of carbon dioxide (CO2), methane (CH4). Moreover, even as this understanding becomes more complete, there will also be a major ongoing need to continuously map quantitative levels of these gases to monitor the effects of regional, national and international green house gas (GHG) reduction efforts, as well as to certify compliance. To carry out this effort will require analyzers that can produce continuous, parts-per-billion precision, high accuracy measurements of ambient levels of atmospheric gases at very high data rates over years of operation in land-based, sea-based, as well as aircraft-based applications. A challenge worth considering is to create a single analyzer that can address the GHG measurement needs of virtually all these applications. Such an analyzer would be required to produce slow time-response (e.g. minute to minute data is considered very fast time response), and very high accuracy (which can also be described as precision across a network of independent measurements) as required for atmospheric inversions and some mobile applications as well as fast time-response (e.g. 1 Hz to 10 Hz) and excellent relative precision (without the need for long-term accuracy, or comparability of mixing ratios across multiple sites) as needed for eddy covariance flux measurements. Such an analyzer would give the research community much more flexibility, a wider choice of research applications, reduce overall capital equipment cost, and improve the inter-comparability of GHG measurements across applications.
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 collaboration with researchers from the University of Colorado, Oregon State University, Los Alamos National Laboratory, and Columbia University the performance of this newly developed analyzer was quantified while operating under different field conditions. In this work, measurements showing the exchange of both CO2 and CH4 between terrestrial ecosystems and the atmosphere, the exchange of CO2 and CH4 across the air-sea interface, and the recording of CO2 and CH4 mixing ratios of outside ambient air while aboard a research aircraft will be shown.