UNIVERSITY OF RHODE ISLAND
Department of Chemistry

SEMINAR

Room 234 Pastore Hall
3:00 p.m, Monday, March 28, 2016

Dr. David Nelson, Jr.

Principal Scientist & VP of Operations
Aerodyne Research Inc.
Billerica, MA

"Measuring the Drivers of Global Climate Change: Using Infrared Lasers to Quantify Atmospheric Greenhouse Gases and their Isotopes"

HOST

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Measuring the Drivers of Global Climate Change: Using Infrared Lasers to Quantify Atmospheric Greenhouse Gases and their Isotopes

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The availability of room temperature (RT), continuous wave (CW), mid-infrared lasers has enabled the development of extremely sensitive and precise laser based trace gas monitors based on the principle of infrared (IR) absorption spectroscopy. Our measurement method is rapid sweep, direct absorption spectroscopy using long path, astigmatic Herriot cells. Typically our measurements are performed at low pressure, with flowing samples and high time resolution (t = 0.1 seconds). This high time resolution enables eddy covariance flux studies to quantify the exchange of gases between the atmosphere and the Earth's surface.

A wide variety of atmospheric molecules can be precisely and accurately monitored with this approach including some that are present in the atmosphere only at very low concentration like carbonyl sulfide ([COS] ~ 0.5 ppbv). In this presentation I will focus on our studies of trace atmospheric species that are related to global climate change. These studies include measurements of the isotopic compositions of carbon dioxide ($^{13}CO_2$, $CO^{18}O$), methane ($^{13}CH4$ and CH_3D), and nitrous oxide ($N^{15}NO$, ^{15}NNO and $NN^{18}O$) as well as ultra high precision measurements of atmospheric oxygen content. I will also briefly mention the many other atmospheric species that can be quantified with these techniques including: NH_3, HNO_3, HONO, NO, NO_2, CO, HCHO, HCOOH, CH_3CH_3, CH_2CH_2 and many others.