

'Daily work with stable isotope spectroscopy instruments'

(...and the things that do not end up in papers).

2010-12-12, 13:00 - 17:00 hrs, UC Berkeley, Berkeley, USA

-- Valley Life Science Building (VLSB) / Room 2063 --

MOTIVATION

We think it would be of importance to have our stable isotope community come up with solutions to better utilize the new spectroscopy technologies in continuous operation at field sites and prepare for future collaborative opportunities, e.g. within new observational networks.

GOAL

Discuss what works best and what did not work well, document these outcomes and report to the community.

MEETING SUMMARY

Introduction presentations, by the speakers listed below:

1. Matthias J. Zeeman, Oregon State University, Corvallis (OR), USA.
2. Rick Wehr, University of Arizona, Tucson (AZ), USA.
3. Lisa Wingate, University of Cambridge, Cambridge, UK / University of Edinburgh, Edinburgh, UK.
4. Daniel Epron, University of Nancy / Université Henri Poincaré, Nancy, France.
5. Nicolas Brueggemann, Forschungszentrum Jülich, Jülich, Germany.
6. David Noone, University of Colorado, Boulder (CO), USA.
7. Camille Risi, University of Colorado, Boulder (CO), USA.

The following topics were discussed:

At lab level

- Instrument characterization (lab, field) and calibration (field) are strongly application dependent.
- Instrument characterization and calibration information should be added to papers (as appendix)
- Instrument characterization
 - Instrument drift & precision (single gas, Allan variance statistics)
 - Response time & memory effects (step change, Allan variance statistics, (co) spectra. turbulence measures)
 - Cross sensitivity & interference (remove substance or correct, e.g. purging of the optical path, permeation drying of inlet gas)

- Temperature sensitivity (analyze, stabilized ambient conditions, e.g. micro-dosing LN₂ for detectors, water cooling for lasers, air conditioning)
- Effect of your sampling system (tube heating, below ambient pressure, effect of different tubing materials)
- Calibration
 - Check if the calibration response is linear.
 - Generally, a 2-3 points calibration based on individual isotopologues. Delta values derived from isotopologue mixing ratios only in a final step.
 - Make sure that you bracket calibration well for the expected mixing and delta ratio range, as there are non-linear effects. Particularly important for labeling experiments.
 - Tie calibrations to mass spectrometer measurements.
- Keep spectra for long-term QC. Open questions: Data space considerations, info on how to calibrate or use the spectra needs to be made available from manufacturers.

At community level

What could be helpful to share/compare/standardize within the community and how:

- Standardization and comparison of H₂O isotope measurement setups:
 - SMOW and Vostok standards do not cover the range found in the field; we need alternatives.
 - A performance test of currently used vaporizer systems and methods: through a ring exchange of liquid standards among labs, or the use of bottled Evian or Deep Blue as used at SIRFER (<http://sirfer.utah.edu>).
- Standardization of CO₂ isotope measurement setups
 - Tanks or flasks sources: IMECC, ICOS/NEON?
 - Or produce your own flasks/tanks and sent it to mass spectrometer labs.
- Comparison of data processing:
 - use of Golden files, similar to Ameriflux/CarboEuroflux, only for EC or just use existing CO₂ golden files
- Reporting and communicating progress and issues:
 - Need for a new journal. For example, RCM is no longer accepting spectroscopy work (without IRMS).
 - Exchange of information through BASIN (end of funding), NEON or SIBAE initiatives.
 - Peer-reviewed Wikis. For example, Prometheus (<http://prometheuswiki.publish.csiro.au>); A CSIRO managed, peer-reviewed wiki for 'Protocols in ecological & environmental plant physiology'
 - Manufacturer websites, e.g. Picarro forum.

Reporting of this meeting

- Online publication of the presentations and meeting notes.
 - BASIN: <http://basin.yolasite.com/>
 - SIBAE: <http://www.sibae.ethz.ch/cost-sibae/>
- Submit a meeting report to inform the broader community of our activities, e.g. to AGU's

EOS.

- An international, collaborative effort for “best practice” guidelines (or tech note publication) is not considered at this time.

LIST OF ATTENDEES

The following (37) persons were present:

Mark Blonquist	David Nelson (Aerodyne)
Dave Bowling	David Noone
Nicolas Brueggemann	Heath Powers
Matthias Cuntz	Thom Rahn
Claudia Czimczik	Camille Risi
Masako Dannoura	Adam Roddy
Todd Dawson	Scott Saleska
Daniel Epron	Greg Santoni
Jim Ehleringer	Ulli Seibt
Iain Green (Picarro)	Rolf Siegwolf
John Hunt	Kevin Simonin
Ali Ismail	Kevin Tu
Larry Jacobsen (Campbell Sci)	Aaron Van Pelt (Picarro)
Hans-Joerg Jost (Thermo-Fisher/ Novawave)	Bruce Vaughn
Alexander Knohl	Eric Wapelhorst (Thermo-Fisher/ Novawave)
Xuhui Lee	Rick Wehr
Hank Loescher	Lisa Wingate
Hongyan Luo	Matthias Zeeman
Dayle McDermitt (LI-COR)	

ORGANIZERS

Kevin Tu (UC Berkeley)
Alexander Knohl (ETH Zurich/U Goettingen)
Matthias Zeeman (Oregon State University)

ACKNOWLEDGEMENT

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