



# Online Resources for Stable Isotope Laboratory Education and Training and Ecological Applications



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## Introduction

EPA's Integrated Stable Isotope Research Facility developed a table of online educational and training resources for stable isotope analysis methods and ecological applications. This table was compiled from broad input from the stable isotope geochemistry community on the ISOGEOCHEM list serve. This resource material provides continued training of EPA and other staff in the greater stable isotope research group during situations when they may not have access to the laboratories. For any comments or recommendations to incorporate into this general listing, email [CPHEA\\_Communications@epa.gov](mailto:CPHEA_Communications@epa.gov).

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| Type  | Cost*  | Title  | Author(s)  | URL   |
|-------|--------|--|--|---|
| Books | \$\$   | Practical Laboratory Automation: Made Easy with AutoIt (2016)                                | Carvalho, Matheus C.                                     | <a href="http://www.wiley-vch.de/publish/en/books/ISBN978-3-527-34158-0/">http://www.wiley-vch.de/publish/en/books/ISBN978-3-527-34158-0/</a>   |
|       | \$     | Environmental Isotopes in Hydrogeology (1997)  | Clark, Ian D. and Frits, Peter                           | <a href="https://www.crcpress.com/Environmental-Isotopes-in-Hydrogeology/Clark-Fritz/p/book/9781566702492">https://www.crcpress.com/Environmental-Isotopes-in-Hydrogeology/Clark-Fritz/p/book/9781566702492</a>   |
|       | \$\$   | Carbon Isotope Techniques (1991)   | Coleman, David and Fry, Brian                            | <a href="https://www.elsevier.com/books/carbon-isotope-techniques/paul/978-0-08-050074-4">https://www.elsevier.com/books/carbon-isotope-techniques/paul/978-0-08-050074-4</a>   |
|       | \$\$   | Stable Isotopes as indicators of Ecological Change, Volume 1, 1 <sup>st</sup> edition (2007) | Dawson, Todd and Siegwold, Rolf                          | <a href="https://www.elsevier.com/books/stable-isotopes-as-indicators-of-ecological-change/dawson/978-0-12-373627-7">https://www.elsevier.com/books/stable-isotopes-as-indicators-of-ecological-change/dawson/978-0-12-373627-7</a>                                   |
|       | \$     | Stable Isotope Biogeochemistry and Ecology: Laboratory Manual (2017)                         | Ehleringer, James  | <a href="https://www.amazon.com/Stable-Isotope-Biogeochemistry-Ecology-Laboratory/dp/1973349086">https://www.amazon.com/Stable-Isotope-Biogeochemistry-Ecology-Laboratory/dp/1973349086</a>   |
|       | \$\$\$ | Stable Isotopes and Plant Carbon-Water Relations (2012)                                      | Ehleringer, James; Hall, Anthony and Farquhar, Graham    | <a href="https://www.elsevier.com/books/stable-isotopes-and-plant-carbon-water-relations/ehleringer/978-0-08-091801-3">https://www.elsevier.com/books/stable-isotopes-and-plant-carbon-water-relations/ehleringer/978-0-08-091801-3</a>                               |
|       | 0      | Good Practice Guide for Isotope Ratio Mass Spectrometry, 2 <sup>nd</sup> edition (2018)      | Forensic Isotope Ratio Mass Spectrometry Network (FIRMS) | <a href="http://forensic-isotopes.org/assets/FIRMS%20Good%20Practice%20Guide%20Second%20Edition.pdf">http://forensic-isotopes.org/assets/FIRMS%20Good%20Practice%20Guide%20Second%20Edition.pdf</a>   |
|       | \$\$   | Stable Isotope Ecology, 1 <sup>st</sup> edition (2006)                                       | Fry, Brian   | <a href="https://link.springer.com/book/10.1007/0-387-33745-8">https://link.springer.com/book/10.1007/0-387-33745-8</a>   |
|       | \$     | Isotope Hydrology: A Study of the Water Cycle (2010)   | Gat, Joel R.   | <a href="https://www.amazon.com/isotope-hydrology-environmental-management-greenlight/dp/b00t44o8lu">https://www.amazon.com/isotope-hydrology-environmental-management-greenlight/dp/b00t44o8lu</a>   |
|       | \$\$\$ | Stable isotopes: integration of biological, ecological and geochemical processes (1998)      | Griffiths, Howard  | <a href="https://www.worldcat.org/title/stable-isotopes-integration-of-biological-ecological-and-geochemical-processes/oclc/38515313">https://www.worldcat.org/title/stable-isotopes-integration-of-biological-ecological-and-geochemical-processes/oclc/38515313</a> |
|       | \$\$   | Tracking Animal Migration with Stable Isotopes, 2 <sup>nd</sup> edition (2018)               | Hobson, Keith A. and Wassenaar, Leonard I.               | <a href="https://www.elsevier.com/books/tracking-animal-migration-with-stable-isotopes/hobson/978-0-12-814723-8">https://www.elsevier.com/books/tracking-animal-migration-with-stable-isotopes/hobson/978-0-12-814723-8</a>   |
|       | \$\$   | Stable Isotope Geochemistry, 8 <sup>th</sup> edition (2018)                                  | Hoefs, Jochen  | <a href="https://www.springer.com/us/book/9783319785264">https://www.springer.com/us/book/9783319785264</a>   |
|       | \$     | Varied publications about Isotopes   | International Atomic Energy Agency (IAEA)                | <a href="https://www.iaea.org/publications/search?keywords=ISOTOPE">https://www.iaea.org/publications/search?keywords=ISOTOPE</a>   |

| Type            | Cost*   | Title  | Author(s)   | URL   |
|-----------------|---|--|---|---|
| Books           | \$\$  | Compound-specific Stable Isotope Analysis (2012)   | Jochmann, Maik A. and Schmidt, Torsten C.   | <a href="https://pubs.rsc.org/en/content/ebook/978-1-84973-157-7">https://pubs.rsc.org/en/content/ebook/978-1-84973-157-7</a>   |
|                 | \$\$  | Isotope Tracers in Catchment Hydrology (1999)  | Kendall, Carol and McDonnell, Jeffrey J.  | <a href="https://www.elsevier.com/books/isotope-tracers-in-catchment-hydrology/kendall/978-0-444-81546-0">https://www.elsevier.com/books/isotope-tracers-in-catchment-hydrology/kendall/978-0-444-81546-0</a>   |
|                 | \$\$  | Nitrogen Isotope Techniques (2012)   | Knowles, Roger and Blackburn, Henry   | <a href="https://www.elsevier.com/books/nitrogen-isotope-techniques/paul/978-0-08-092407-6">https://www.elsevier.com/books/nitrogen-isotope-techniques/paul/978-0-08-092407-6</a>   |
|                 | \$\$\$  | Stable Isotope Forensics: Methods and Forensic Applications of Stable Isotope Analysis, 2 <sup>nd</sup> edition (2017) | Meier-Augenstein, Wolfram   | <a href="https://www.wiley.com/en-us/Stable+Isotope+Forensics:+Methods+and+Forensic+Applications+of+Stable+Isotope+Analysis,+2nd+Edition-p-9781119080237">https://www.wiley.com/en-us/Stable+Isotope+Forensics:+Methods+and+Forensic+Applications+of+Stable+Isotope+Analysis,+2nd+Edition-p-9781119080237</a> |
|                 | \$  | Stable Isotopes in Ecology and Environmental Science, 2 <sup>nd</sup> edition (2007)                                   | Michener, Robert and Lajtha, Kate   | <a href="https://onlinelibrary.wiley.com/doi/book/10.1002/9780470691854">https://onlinelibrary.wiley.com/doi/book/10.1002/9780470691854</a>   |
|                 | \$\$\$  | Stable Isotopes in Ecological Research (1989)  | Rundel, Philip; Ehleringer, James and Nagy, Kenneth   | <a href="https://www.springer.com/us/book/9781461281276">https://www.springer.com/us/book/9781461281276</a>   |
|                 | \$\$  | Theory and Application of Tracers (1993)   | Schimmel, David S.  | <a href="https://www.amazon.com/Application-Tracers-Isotopic-Techniques-Aquatic/dp/0126246505">https://www.amazon.com/Application-Tracers-Isotopic-Techniques-Aquatic/dp/0126246505</a>   |
|                 | 0   | Principles of Stable Isotope Geochemistry, 2 <sup>nd</sup> edition (2017)  | Sharp, Zachary  | <a href="https://digitalrepository.unm.edu/unm_oer/1/">https://digitalrepository.unm.edu/unm_oer/1/</a>   |
|                 | \$\$\$  | Stable Isotope Techniques in the Study of Biological Processes and Functioning Ecosystems (2001)                       | Unkovich, Murray; Pate, John; McNeill, Ann; and Gibbs, D. Jane  | <a href="https://www.springer.com/us/book/9780792370789">https://www.springer.com/us/book/9780792370789</a>   |
| \$\$            | Isoscapes: Understanding movement, pattern, and process on Earth through isotope mapping (2010) | West, Jason B.; <i>et al.</i>  | <a href="https://www.springer.com/us/book/9789048133536">https://www.springer.com/us/book/9789048133536</a> |   |
| Review Articles | \$  | The role of stable isotopes in understanding rainfall interception processes: a review (2016)                          | Allen, Scott T.; <i>et al.</i>  | <a href="https://onlinelibrary.wiley.com/doi/abs/10.1002/wat2.1187">https://onlinelibrary.wiley.com/doi/abs/10.1002/wat2.1187</a>   |
|                 | \$  | Stable oxygen isotope composition of plant tissue: a review (2007)   | Barbour, Margaret M.  | <a href="https://www.publish.csiro.au/FP/FP06228">https://www.publish.csiro.au/FP/FP06228</a>   |
|                 | 0   | Theoretical and analytical advances in mammalian isotope ecology: an introduction (2012)                               | Ben-David, Merva and Flaherty, Elizabeth A.   | <a href="https://academic.oup.com/jmammal/article/93/2/309/919418">https://academic.oup.com/jmammal/article/93/2/309/919418</a>   |

| Type            | Cost* | Title  | Author(s)  | URL   |
|-----------------|-------|--|--|---|
| Review Articles | 0     | Environmental and physiological determinants of carbon isotope discrimination in terrestrial plants. (2013)  | Cernusak, Lucas A.; <i>et al.</i>                                      | <a href="https://www.ncbi.nlm.nih.gov/pubmed/23902460">https://www.ncbi.nlm.nih.gov/pubmed/23902460</a>   |
|                 | 0     | Stable isotopes in leaf water of terrestrial plants (2016)   | Cernusak, Lucas A.; <i>et al.</i>                                      | <a href="https://onlinelibrary.wiley.com/doi/full/10.1111/pce.12703">https://onlinelibrary.wiley.com/doi/full/10.1111/pce.12703</a>   |
|                 | 0     | Applying the principles of isotope analysis in plant and animal ecology to forensic science in the Americas  | Chesson, Lesley A.; <i>et al.</i>                                      | <a href="https://www.ncbi.nlm.nih.gov/pubmed/29955984">https://www.ncbi.nlm.nih.gov/pubmed/29955984</a>   |
|                 | 0     | Guidelines and recommended terms for expression of stable-isotope-ratio and gas-ratio measurement results (2011)   | Coplen, Tyler B.   | <a href="https://onlinelibrary.wiley.com/doi/full/10.1002/rcm.5129">https://onlinelibrary.wiley.com/doi/full/10.1002/rcm.5129</a>   |
|                 | 0     | Applications of stable isotope techniques to the ecology of mammals (2008)   | Crawford, Kerry; McDonald, Robbie A.; and Bearhop, Stuart              | <a href="https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2907.2008.00120.x">https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2907.2008.00120.x</a>                       |
|                 | 0     | Stable Isotopes in Plant Ecology (2002)  | Dawson, Todd E.; <i>et al.</i>   | <a href="https://www.annualreviews.org/doi/full/10.1146/annurev.ecolsys.33.020602.095451">https://www.annualreviews.org/doi/full/10.1146/annurev.ecolsys.33.020602.095451</a> |
|                 | \$    | Stable Isotopes and Carbon Cycle Processes in Forests and Grasslands   | Ehleringer, James R.; <i>et al.</i>                                    | <a href="https://onlinelibrary.wiley.com/doi/abs/10.1055/s-2002-25733">https://onlinelibrary.wiley.com/doi/abs/10.1055/s-2002-25733</a>                                       |
|                 | \$\$  | Water uptake by plants: perspectives from stable isotope composition (1992)  | Ehleringer, James and Dawson, Todd                                     | <a href="https://onlinelibrary.wiley.com/doi/10.1111/j.1365-3040.1992.tb01657.x">https://onlinelibrary.wiley.com/doi/10.1111/j.1365-3040.1992.tb01657.x</a>                   |
|                 | 0     | Carbon Isotope Discrimination and Photosynthesis (1989)  | Farquhar, Graham D.; Ehleringer, James R.; and Hubick, K. T.           | <a href="https://www.annualreviews.org/doi/abs/10.1146/annurev.pp.40.060189.002443">https://www.annualreviews.org/doi/abs/10.1146/annurev.pp.40.060189.002443</a>             |
|                 | 0     | Comparison of Modeled and Observed Environmental Influences on the Stable Oxygen and Hydrogen Isotope Composition of Leaf Water in <i>Phaseolus vulgaris</i> L. (1991) | Flanagan, Lawrence B.; Comstock, Jonathan P.; and Ehleringer, James R. | <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1080811/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1080811/</a>   |
|                 | 0     | My Stable Isotope Journey in Biogeochemistry, Geocology, and Astrobiology (2019)   | Fogel, Marilyn L.  | <a href="http://www.geochemicalperspectives.org/online/v8n2">http://www.geochemicalperspectives.org/online/v8n2</a>   |
|                 | \$    | Tracing origins and migration of wildlife using stable isotopes: a review (1999)   | Hobson, Keith A.   | <a href="https://link.springer.com/article/10.1007/s004420050865">https://link.springer.com/article/10.1007/s004420050865</a>   |
|                 | 0     | Tansley Review No. 95 <sup>15</sup> N natural abundance in soil-plant systems (1997)   | Högberg, Peter   | <a href="https://nph.onlinelibrary.wiley.com/doi/10.1046/j.1469-8137.1997.00808.x">https://nph.onlinelibrary.wiley.com/doi/10.1046/j.1469-8137.1997.00808.x</a>               |

| Type            | Cost* | Title  | Author(s)   | URL   |
|-----------------|-------|--|---|---|
| Review Articles | \$    | Analytical error in stable isotope ecology (2005)  | Jardine, Tim D. and Cunjak, Rick A.                     | <a href="https://www.ncbi.nlm.nih.gov/pubmed/15761780">https://www.ncbi.nlm.nih.gov/pubmed/15761780</a>   |
|                 | \$    | Global Isotope Hydrogeology—Review (2019)  | Jasechko, Scott   | <a href="https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018RG000627">https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018RG000627</a>   |
|                 | \$    | Can Stable Isotope Ratios Provide for Community-Wide Measures of Trophic Structure? (2007)                 | Layman, Craig A.; <i>et al.</i>                         | <a href="https://esajournals.onlinelibrary.wiley.com/doi/10.1890/0012-9658%282007%2988%5B42%3ACSIRPF%5D2.0.CO%3B2">https://esajournals.onlinelibrary.wiley.com/doi/10.1890/0012-9658%282007%2988%5B42%3ACSIRPF%5D2.0.CO%3B2</a> |
|                 | \$    | Stable isotopes in tree rings (2004)   | McCarroll, Danny and Loader, Neil J.                    | <a href="https://www.sciencedirect.com/science/article/abs/pii/S0277379104000150">https://www.sciencedirect.com/science/article/abs/pii/S0277379104000150</a>   |
|                 | \$    | From stable isotope ecology to forensic isotope ecology — Isotopes’ tales (2019)                           | Meier-Augenstein, Wolfram                               | <a href="https://www.sciencedirect.com/science/article/pii/S0379073818310648">https://www.sciencedirect.com/science/article/pii/S0379073818310648</a>   |
|                 | \$    | A niche for isotopic ecology (2007)  | Newsome, Seth D.; <i>et al.</i>                         | <a href="https://esajournals.onlinelibrary.wiley.com/doi/10.1890/060150.1">https://esajournals.onlinelibrary.wiley.com/doi/10.1890/060150.1</a>   |
|                 | \$    | Uncertainty in source partitioning using stable isotopes (2001)  | Phillips, Donald L., and Gregg, Jillian W.              | <a href="https://link.springer.com/article/10.1007/s004420000578">https://link.springer.com/article/10.1007/s004420000578</a>   |
|                 | \$    | Incorporating concentration dependence in stable isotope mixing models (2002)                              | Phillips, Donald L., and Koch, Paul L.                  | <a href="https://link.springer.com/article/10.1007/s004420100786">https://link.springer.com/article/10.1007/s004420100786</a>   |
|                 | \$    | Source partitioning using stable isotopes: coping with too many sources (2003)                             | Phillips, Donald L., and Gregg, Jillian W.              | <a href="https://link.springer.com/article/10.1007/s00442-003-1218-3">https://link.springer.com/article/10.1007/s00442-003-1218-3</a>   |
|                 | 0     | Best practices for use of stable isotope mixing models in food web studies (2014)                          | Phillips, Donald L.; <i>et al.</i>                      | <a href="https://www.nrcresearchpress.com/doi/10.1139/cjz-2014-0127#.XpXoyfhKg-c">https://www.nrcresearchpress.com/doi/10.1139/cjz-2014-0127#.XpXoyfhKg-c</a>   |
|                 | \$    | $\delta^{15}\text{N}$ as an integrator of the nitrogen cycle (2001)  | Robinson, David   | <a href="https://www.sciencedirect.com/science/article/abs/pii/S016953470002098X">https://www.sciencedirect.com/science/article/abs/pii/S016953470002098X</a>   |
|                 | \$    | A mechanistic model for interpretation of hydrogen and oxygen isotope ratios in tree-ring cellulose (2000) | Roden, John S.; Lin, Guanghui; and Ehleringer, James R. | <a href="https://www.sciencedirect.com/science/article/abs/pii/S0016703799001957">https://www.sciencedirect.com/science/article/abs/pii/S0016703799001957</a>   |
|                 | \$    | Carbon isotopes and water use efficiency: sense and sensitivity (2008)                                     | Seibt, Ulli; <i>et al.</i>                              | <a href="https://link.springer.com/article/10.1007/s00442-007-0932-7">https://link.springer.com/article/10.1007/s00442-007-0932-7</a>   |
|                 | \$    | Oxygen and Hydrogen Isotope Measurements in Plant Cellulose Analysis (1989)                                | Sternberg, Leonel d. S. L.                              | <a href="https://link.springer.com/chapter/10.1007/978-3-642-83349-6_5">https://link.springer.com/chapter/10.1007/978-3-642-83349-6_5</a>   |
|                 | 0     | Oxygen stable isotope ratios of tree-ring cellulose: the next phase of understanding (2009)                | Sternberg, Leonel d. S. L.                              | <a href="https://nph.onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2008.02661.x">https://nph.onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2008.02661.x</a>   |

| Type           | Cost* | Title   | Author(s)                          | URL   |
|----------------|-------|---|------------------------------------|---|
|                | \$    | Stable isotopes as one of nature’s ecological recorders (2006)                | West, Jason B.; <i>et al.</i>      | <a href="https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(06)00126-1">https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(06)00126-1</a>                               |
| Online courses | \$    | Practical Laboratory Automation with Autoit – Basic Course (2019)             | Carvalho, Matheus C.               | <a href="https://www.udemy.com/course/practical-laboratory-automation-with-autoit-basic-course/">https://www.udemy.com/course/practical-laboratory-automation-with-autoit-basic-course/</a>           |
|                | \$\$  | Isotope Tracers in Catchment Hydrology (2020)                                 | University of Saskatchewan         | <a href="https://water.usask.ca/hillslope/teaching/isotope-tracers-in-catchment-hydrology-2020.php">https://water.usask.ca/hillslope/teaching/isotope-tracers-in-catchment-hydrology-2020.php</a>     |
|                | 0     | IsoCamp at the University of Utah   | Jim Ehleringer et al               | <a href="http://ehleringer.net/IsoCamp">http://ehleringer.net/IsoCamp</a>   |
| Videos         | 0     | Spatial Carbon (2017)   | Bowen, Gabriel J.                  | <a href="https://www.youtube.com/playlist?list=PLRZ8Hm8xomV6PCM3sdvaVGqvmOCjn8OTC">https://www.youtube.com/playlist?list=PLRZ8Hm8xomV6PCM3sdvaVGqvmOCjn8OTC</a>                                       |
|                | 0     | Spatial Water (2015)  | Bowen, Gabriel J.                  | <a href="https://www.youtube.com/playlist?list=PLRZ8Hm8xomV7JMLY9dGJGVT-ENbHCvusq">https://www.youtube.com/playlist?list=PLRZ8Hm8xomV7JMLY9dGJGVT-ENbHCvusq</a>                                       |
|                | 0     | A Primer in Stable Isotope Ecology (2016)                                     | Hayden, Brian                      | <a href="https://sites.google.com/view/brianhayden/teaching/stable-isotope-ecology">https://sites.google.com/view/brianhayden/teaching/stable-isotope-ecology</a>                                     |
|                | 0     | Introduction to Mass Spectrometry (2015)                                      | Knowbee                            | <a href="https://www.youtube.com/watch?v=2oPUyIbPxLo">https://www.youtube.com/watch?v=2oPUyIbPxLo</a>   |
|                | 0     | Mass spectrometry   Atomic structure and properties   AP Chemistry (2019)     | Khan Academy                       | <a href="https://www.youtube.com/watch?v=myoIF-h1kKI">https://www.youtube.com/watch?v=myoIF-h1kKI</a>   |
|                | 0     | IsoCamp at the University of Utah   | Jim Ehleringer et al.              | <a href="https://www.youtube.com/channel/UC1s5oNmyp0SkF0WIO1FG38w">https://www.youtube.com/channel/UC1s5oNmyp0SkF0WIO1FG38w</a>   |
| Memoir         | 0     | Queen of the Isotopes: Memoir of a journey in bio-geo-chemical science (2020) | Fogel, Marilyn L.                  | <a href="https://drive.google.com/file/d/1CXM_j7DfFZyhOoNTTEepFKHP7rlha0m3/view">https://drive.google.com/file/d/1CXM_j7DfFZyhOoNTTEepFKHP7rlha0m3/view</a>   |
| Models         | 0     | Stable Isotope Mixing Models for Estimating Source Proportions                | Phillips, Donald L.; <i>et al.</i> | <a href="https://www.epa.gov/eco-research/stable-isotope-mixing-models-estimating-source-proportions">https://www.epa.gov/eco-research/stable-isotope-mixing-models-estimating-source-proportions</a> |
|                | 0     | Bayesian Mixing Models for Stable Isotope Analysis in R (MixSIAR R Package)   | Stock, Brian; <i>et al.</i>        | <a href="https://cran.r-project.org/package=MixSIAR">https://cran.r-project.org/package=MixSIAR</a>   |

| Type                            | Cost* | Title  | Author(s)                | URL   |
|---------------------------------|-------|--|--------------------------|---|
| Original Equipment Manufactures | 0     | Instrument manuals, method papers and references | ThermoFisher Scientific  | <a href="https://www.thermofisher.com/us/en/home/industrial/mass-spectrometry/isotope-ratio-mass-spectrometry-irms.html">https://www.thermofisher.com/us/en/home/industrial/mass-spectrometry/isotope-ratio-mass-spectrometry-irms.html</a> |
|                                 |       |  | Elementar                | <a href="https://www.elementar.com/en/products/stable-isotope-analysis.html">https://www.elementar.com/en/products/stable-isotope-analysis.html</a>   |
|                                 |       |  | ABB (Los Gatos Research) | <a href="http://www.lgrinc.com/analyzers/isotope/">http://www.lgrinc.com/analyzers/isotope/</a>   |
|                                 |       |  | Picarro                  | <a href="https://www.picarro.com/products/gas_isotope_analyzers">https://www.picarro.com/products/gas_isotope_analyzers</a>   |
|                                 |       |  | nu Instruments           | <a href="https://www.nu-ins.com/products/irms">https://www.nu-ins.com/products/irms</a>   |
|                                 |       |  | Sercon Instruments       | <a href="https://sercon-instruments.com/">https://sercon-instruments.com/</a>   |