# Youmi Oh

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Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado Boulder (CU Boulder) and NOAA Global Monitoring Laboratory (GML), 325 Broadway, Boulder, CO 80305

EDUCATION

**Purdue University**, West Lafayette, IN

Ph.D. in Earth, Atmospheric, and Planetary Sciences                *Aug 2016 – Jul 2020*

Coursework includes Stable Isotope and Forensics, Biogeochemistry, Ecosystem Ecology, Geodata Science, Integrated Global System Modeling, and Terrestrial Ecosystem modeling.

**Princeton University**, Princeton, NJ

M.A. in Atmospheric and Oceanic Sciences                           *Aug 2013 – Jul 2015*

Coursework includes Atmospheric Science, Boundary Layer Meteorology, Radiative Transfer, Atmospheric Thermodynamics, Physical Hydrology, Climate-Biosphere Interactions, Geomicrobiology, and Inversion Methods.

**University of California Davis**, Davis, CA

Global Exchange Student                                            *Sep 2010 – Jun 2011*

**Ewha Womans University**, Seoul, South Korea

B.S. in Environmental Science and Engineering, *Magna cum laude*     *Mar 2009 – Aug 2013*

Double Major in Biological Sciences, Certification in ABEEK Advanced Engineering Program

Coursework includes Atmospheric Pollution, Water Quality, Environmental Impact Assessment, Mathematical Modeling, Organic Chemistry, Molecular Biology, and Plant ecology.

RESEARCH
EXPERIENCE

**CIRES Research Scientist, NOAA GML and CU Boulder**              *Mar 2023 – present*

Advisor: Dr. Lori Bruhwiler

Advancing CarbonTracker-$CH_4$, NOAA GML's atmospheric methane assimilation system, by implementing TROPOMI-GOSAT satellite data.

**Postdoctoral Associate, NOAA GML and CU Boulder**               *Sep 2021 – Feb 2023*

Advisor: Dr. Lori Bruhwiler

Joint $CH_4$ and $\delta^{13}C$-$CH_4$ inversion modeling of global methane using TM5 atmospheric chemistry model for NOAA's CarbonTracker-$CH_4$.

**National Research Council Postdoctoral Fellow, NOAA GML**       *Oct 2020 – Aug 2021*

Advisor: Dr. Lori Bruhwiler

Estimation of $CH_4$ fluxes and associated isotopic signatures from natural sources and sinks using an improved biogeochemistry model.

**Visiting Scholar, NOAA GML**                                    *Nov 2018 – Aug 2019*

Advisor: Dr. Edward J. Dlugokencky and Dr. Lori Bruhwiler

Biogeochemistry modeling to understand spatial and temporal variability of carbon isotopic signatures of $CH_4$ emitted from wetlands.

**NASA Earth and Space Science Fellow, Purdue University**        *Sep 2017 – Jul 2020*

Advisor: Dr. Qianlai Zhuang and Dr. Lisa Welp

Understanding importance of High Affinity Methanotroph in arctic $CH_4$ budget by using biogeochemistry and atmospheric modeling.

**Graduate Research Assistant, Purdue Isotope Laboratory**        *Jul 2016 – Jul 2020*

Advisor: Dr. Lisa Welp

Seasonal stable carbon isotope variation in temperate deciduous leaves and implications for carbon allocation and water use efficiency estimates using Elemental Analyzer Isotope Ratio Mass Spectrometry.

**Graduate Research Assistant, Princeton University**          *Aug 2013 – Apr 2016*

Advisor: Dr. David Medvigy

Developing methane microbial dynamics model of Arctic upland soils to elucidate the importance of high affinity methanotrophy.

**Undergraduate Research Assistant, Ewha Womans University**          *Sep 2011 – Aug 2013*

Advisor: Dr. Yong-Sang Choi

Statistical analysis to study how El Nino-Southern Oscillation and Tropical North Atlantic affect vegetation activity in the Amazon.

PUBLICATIONS *[Published]*

**Oh, Y.,** Bruhwiler, L., Lan, X., Basu, S., Schuldt, K., Thoning, K., Michel, S., et al. "CarbonTracker $CH_4$ 2023." *NOAA Global Monitoring Laboratory*, 2023. doi: 10.25925/40JT-QD67.

D'Imperio, L., Li, B., Tiedje, J.M., **Oh, Y.,** Christiansen, J.R., Kepfer-Rojas, S., WestergaardNielsen, A., Brandt, K.K., Holm, P.E., Wang, P., Ambus, P., and Elberling, B. "Spatial controls of potential methane oxidation in upland top soils across climatic and geological regions in Greenland." *Nature Communications Earth and Environment*, 2023. doi:10.1038/s43247-023-01143-3.

Lee, J., **Oh, Y.,** Lee, S., Seo, Y., Yun, J., Yang, Y., Kim, J., Zhuang, Q. and Kang, H. "Soil organic carbon is a key determinant of $CH_4$ sink in global forest soils." *Nature Communications*, 2023. doi: 10.1038/s41467-023-38905-8.

Nisbet, E.G., Manning, M.R., Dlugokencky, E.J., Michel, S.E., Lan, X., Roeckmann, T., Gon, H.A.D.V.D., Palmer, P., **Oh, Y.,** Fisher, R. and Lowry, D. "Atmospheric methane: Comparison between methane's record in 2006-2022 and during glacial terminations." *Global Biogeochemical Cycles*, 2023. doi: 10.1029/2023GB007875.

Zhou, L., Warner, J., Nalli, N.R., Wei, Z., **Oh, Y.,** Bruhwiler, L., Liu, X., Divakarla, M., Pryor, K., Kalluri, S. and Goldberg, M.D. "Spatiotemporal Variability of Global Atmospheric Methane Observed from Two Decades of Satellite Hyperspectral Infrared Sounders." *Remote Sensing*, 2023. doi: 10.3390/rs15122992.

Zhuang, Q., Guo, M., Melack, J.M., Lan, X., Tan, Z., **Oh, Y.,** and Leung, L.R. "Current and future global lake methane emissions: A process-based modeling analysis." *JGR Biogeosciences*, 2023. doi.org/10.1029/2022JG007137.

**Oh, Y.,** Zhuang, Q., Welp, L., Liu, L., Lan, X., Basu, S., Dlugokencky, E., Bruhwiler, L., Miller, J., Michel, S., Schwietzke, S., Tans, P., Ciais, P., and Chanton, J. "Improved global wetland carbon isotopic signatures support post-2006 microbial methane emission increase." *Nature Communications Earth and Environment*, 2022. doi: 10.1038/s43247-022-00488-5.

Basu, S., Lan, X., Dlugokencky, E., Bruhwiler, L., **Oh, Y**. "Estimating sources of methane consistent with atmospheric measurements of $CH_4$ and $\delta^{13}C$-$CH_4$." *Atmospheric Chemistry and Physics Discussions*, 2022. doi: 10.5194/acp-2022-317.

Malone, S., **Oh, Y.,** Arndt, K., Burba, G., Commane, R., Contosta, A., Goodrich, J., Loescher, H., Starr, G., Varner, R. "Gaps in Network Infrastructure limit our understanding of biogenic methane emissions in the United States." *Biogeosciences*, 2021. doi: 10.5194/bg-2021-256.

Lan, X., Basu, S., Schwietzke, S., Bruhwiler, L.M.P., Dlugokencky, E.J., Michel, S.E., Sherwood, O.A., Tans, P.P., Thoning, K., Etiope, G. and Zhuang, Q., Liu, L., **Oh, Y.,** Miller, J. B., Petron, G., Vaughn, B. H., and Crippa, M. "Improved Constraints on Global Methane Emissions and Sinks Using $\delta^{13}C$-$CH_4$." *Global Biogeochemical Cycles*, 2021. doi: 10.1029/2021GB007000.

**Oh, Y.,** Zhuang, Q., Liu, L., Welp, L., Lau, M., Onstott, T., Medvigy, D., Bruhwiler, L., Dlugokencky, D., Hugelius, G., D'Imperio, L., and Elberling, B. "Reduced net methane emissions due to microbial methane oxidation in a warmer Arctic." *Nature Climate Change*, 2020. doi: 10.1038/s41558-020-0734-z.

Abbasi, A. O., A. Salazar, **Oh, Y.**, Reinsch, S., Uribe, M., Li, J., Rashid, I., and Dukes, J. "Soil responses to manipulated precipitation changes: A synthesis of meta-analyses." *Biogeosciences*, 2020. doi: 10.5194/bg-17-3859-2020.

Liu, L., Zhuang, Q., **Oh, Y.**, Shurpali, N.J., Kim, S. and Poulter, B. "Uncertainty Quantification of Global Net Methane Emissions from Terrestrial Ecosystems Using a Mechanistically-based Biogeochemistry Model." *Journal of Geophysical Research: Biogeosciences*, 2020. doi: 10.1029/2019JG005428.

Lau, M., Harris, R., **Oh, Y.**, Yi, M., Behmard, A., and Onstott, T. "Taxonomic and functional compositions impacted by the quality of metatranscriptomic assemblies." *Frontiers in Microbiology*, 2018. doi:10.3389/fmicb.2018.01235.

**Oh, Y.,** Stackhouse, B., Lau, M., Xu, X., Trugman, A., Moch, J., Onstott, T., Jørgensen, C., D'Imperio, L., Elberling, B., Emmerton, C., St Louis, V., and Medvigy, D. "A scalable model for methane consumption in arctic mineral soils." *Geophysical Research Letters*, 2016. doi:10.1002/2016GL069049.

Lau, M., Kieft, T., Kuloyo, O., Linage, B., Heerden, E., Lindsay, M., Magnabosco, C., Wang, W., Wiggins, J., Guo, L., Perlman, D., Kyin, S., Shwe, H., Harris, R., **Oh, Y.**, Yi, M., Purtschert, R., Slater, G., Ono, S., Wei, S., Li, L., Lollar, B., and Onstott, T. "An oligotrophic deep-subsurface community dependent on syntrophy is dominated by sulfur-driven autotrophic denitrifiers." *Proceedings of the National Academy of Sciences*, 2016. doi: 10.1073/pnas.1612244113.

*[In Review / Revision]*

Treat, C., Virkkala, A., Burke, E., Bruhwiler, L., Chatterjee, A., Fisher, J., Hashemi, J., Parmentier, F., Rogers, B.M., Westermann, S., Watts, J., Blanc-Betes, E., **Oh, Y.,** Fuchs, M., Kruse, S., Malhotra, A., Miner, K., Schuur, E., Hugelius, G. "Permafrost carbon: progress understanding controls, stocks, and fluxes across terrestrial ecosystems." *Invited review for JGR-Biogeosciences*, in review.

Lyu Z., P. Sommers, S. K. Schmidt, M. Magnani, M. Cimpoiasu, Q. Zhuang, **Oh, Y.,** M. Cramm, J. A. Bradley. "Seasonal dynamics of Arctic soils: capturing year-round processes in measurements and soil biogeochemical models." *Earth Science Reviews*, in review

**Oh, Y.,** L Bruhwiler, X. Lan, S. Basu, S. E. Michel, J. B. Miller, E. Dlugokencky, L. Hu, and A. E. Andrews. "What is driving the recent large increases in global atmospheric methane in 2020-20201 informed by methane isotope information." *Proceedings of the National Academy of Sciences of the United States of America*, in revision.

**Oh, Y.,** Liu, L., Lee, J., Zhuang, Q. "Revising the magnitude and trends of global methane soil sink with three independent bottom-up and top-down approaches." *Geophysical Research Letters*, in revision.

**Oh, Y.,** Welp, L., Yi, K., Benson, M., Novik, K., Zhuang, Q., and Lombardozzi, D. "Carbon allocation affects seasonal leaf carbon isotopic signatures and inferred water use efficiency of temperate deciduous trees." *JGR: Biogeosciences*, in revision.

Welp, L., **Oh, Y.,** Griffis, T. "Isotopes of modern atmospheric greenhouse gases." *Treatise of Geochemistry*, in revision.

Ying Q., Zhang, Z., Watts, J., Arndt, K., Virkkala, A., Poulter, B., Bruhwiler, L., Schiferl, L., **Oh, Y.,** Rogers, B., Natali, S., Elder, C., Sullivan, H., and Peltola, O. "WetCH4: A Physics-Informed Machine Learning Framework for Upscaling Wetland CH$_4$ Fluxes at High Latitudes." *Earth System Science Data*, in revision.

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| TEACHING& MENTORING EXPERIENCE | |

**Research Advisor, NOAA GML and CU Boulder** *Mar 2024 – present*
Postdoc: Chris C. Smith
Knowledge-guided machine learning estimation of global methane soil sinks.

**Research Mentor and Advisor, NOAA GML and CU Boulder** *Sep 2022 – present*
Student: Matt Ziminski, Master student at University of Illinois Chicago (Now at NOAA GML)
4-D visualization of CarbonTracker-CH$_4$.

**Research Mentor, NOAA GML and CU Boulder** *Sep 2022 – present*
Student: Kevin Rozmiarek, Ph.D. student at CU Boulder
Biogeochemistry modeling of Arctic wetland isotope signatures.

**Guest Lecture, School of the Environment, Yale University** *Sep 2023*
Course: ENV 623- The role of Methane in Global Climate Disruption: The search for solutions
Recent Atmospheric Methane Growth, Global Methane Pledge, and the CarbonTracker-CH$_4$.

**Guest Lecture, Earth, Atmospheric, and Planetary Sciences, Purdue University** *Oct 2019*
Course: EAPS 591 – Stable Isotopes
Global methane cycle and the stable isotopes.

**Guest Lecture, Earth, Atmospheric, and Planetary Sciences, Purdue University** *Oct 2019*
Course: EAPS 529 : Modeling Ecosystems and Biogeochemical Cycles
Microbial methane oxidation projects reduced net methane emissions in a warmer Arctic.

**Research Mentor, Princeton University** *Sep 2016 – May 2017*
Student: Christianese Kaiser, Senior Student at Princeton University
Estimating annual CH$_4$ sinks in the Arctic of the 2000s using regional-level methane microbial dynamics model.

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| GRANT & FELLOWSHIP | |

**Principal Investigator**, U.S. Department of Energy *Aug 2023*
Collaborator: L. Liu, S. Malone, Q. Zhu, G. McNicol, and Z. Jin *Total $400,000*
Estimation of global methane soil sink using synthesized datasets and knowledge-guided machine learning.

**Collaborator**, National Oceanic and Atmospheric Administration (NOAA) *June 2023*
Principal Investigator: Lori Bruhwiler and Daniel Jacobs *Total $700,000*
Advancing NOAA's CarbonTracker-CH$_4$ Budget.

**Collaborator**, National Oceanic and Atmospheric Administration (NOAA) *June 2023*
Principal Investigator: Benjamin Gaubert *Total $700,000*
Role of atmospheric chemistry in monitoring changes in the CH$_4$ Budget.

**Collaborator**, Department of Defense *May 2023*
Principal Investigator: Merritt Turetsky *Total $6,250,000*
Synoptic measurement of stream and atmospheric indicators to improve the monitoring and prediction of climate-induced permafrost degradation across Alaska.

**Co-investigator**, National Science Foundation *pending*
Principal Investigator: Sparkle Malone *Total $1,500,000*
MRA: Evaluation of natural biogenic methane emissions across scales.

**Co-investigator**, Spark Climate Solutions *pending*
Principal Investigator: Licheng Liu *Total $300,000*
Potential of global methane soil sink as an atmospheric methane removal method.

**Principal Investigator**, National Research Council Postdoctoral Fellowship     *Oct, 2020*
Joint CH$_4$ and $\delta^{13}$C-CH$_4$ inversion modeling of global methane budget.     *Total $60,000.*

**Principal Investigator**, NASA Earth and Space Science Fellowship     *Sep 2017*
B-U and T-D modeling of Arctic CH$_4$ budget by considering novel microbes.  *Total $150,000.*

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| **HONORS & AWARDS** | Global Monitoring Annual Conference Early Career Award, NOAA GML     *May 2022* |

CESM Polar Modeling Workshop, NCAR, Boulder, CO     *Aug 2018*

Henry Silver Graduate Scholarship, Purdue University     *May 2018*

Ross Fellowship in Natural Sciences and Engineering, Purdue University *Aug 2016 – Jul 2017*

Purdue Climate Change Research Center Award     *Aug 2016*

Research Fellowship in Natural Science and Engineering, Princeton University   *Sep 2013 – Feb 2016*

**SELECTED RECENT PRESENTATION**

*Invited, Jan 2024.* Earth Lab Environmental Data Science Seminar Series, Boulder, CO.

*Contributed, Dec 2023.* American Geophysical Union Fall Meeting (2 talks and 1 poster), San Francisco, CA.

*Contributed, Nov 2023.* NASA Jet Propulsion Laboratory Carbon Club Seminar, Pasadena, CA.

*Invited, Oct 2023.* Atmoschem GitHub Seminar, São Paulo, Brazil.

*Invited, Sep 2023.* Yale Observation Infrastructure for Natural Methane Emissions Workshop, New Haven, CT.

*Contributed, Jul 2023.* NOAA National Environmental Satellite, Data, and Information Service (NESDIS) Workshop, Washington, D.C.

*Invited, Jul 2023.* Seoul National University - Department of Landscape Architecture and Rural Systems Engineering, Seoul, Korea.

*Invited, Jul 2023.* Seoul National University - Department of Environmental Planning / Environmental Management, Seoul, Korea.

*Invited, Jul 2023.* Yonsei University - Department of Civil and Environmental Engineering, Seoul, Korea.

*Contributed, May 2023.* CU Boulder - CIRES Rendezvous 2023, Boulder, CO.

*Contributed, May 2023.* NOAA GML 51st Global Monitoring Annual Conference, Boulder CO.

*Invited, Apr 2023.* NOAA-NASA Joint Polar Satellite System Science Seminar Series, Washington, D.C.

*Invited, Apr 2023.* DOE Artificial intelligence for methane (AI4CH4) Workshop, Richland, WA.

*Invited, Mar 2023.* DOE Lawrence Berkeley National Laboratory - Climate & Ecosystem Sciences Division Seminar, New Haven, CT.

*Invited, Dec 2022.* American Geophysical Union Fall Meeting, Chicago, IL.

*Invited, Oct 2022.* University of Illinois Chicago - Earth and Environmental Sciences Department Seminar, Chicago, IL.

*Contributed, Sep 2022.* DOE Ameriflux Annual Meeting 2022, Pellston, MI.

*Contributed, Aug 2022.* WMO - BIPM Workshop on Metrology for Climate Action, Paris, France.

*Contributed, May 2022.* NOAA GML 50st Global Monitoring Annual Conference, Boulder CO.

*Invited, Apr 2022.* CU Boulder - Institute of Arctic and Alpine Research Department Seminar, Boulder, CO.

*Contributed, Dec 2021.* American Geophysical Union Fall Meeting, New Orleans, LA.

*Invited, Oct 2021.* The 10th Asia-Pacific GAW Workshop on GHG, Seoul, South Korea.

*Invited, Sep 2021.* Ulsan National Institute of Science & Technology, Ulsan, South Korea.

*Invited, May 2020.* NOAA GML Global Monitoring Annual Conference, Boulder CO.

*Invited, Oct 2019.* Seminar at the University of Copenhagen - Center for Permafrost, Copenhagen, Denmark.

*Invited, Jun 2016.* Korea Polar Research Institute Workshop, Incheon, South Korea.

*Invited, May 2016.* South University of Science and Technology Workshop, Shenzhen, China

COMMUNITY SERVICES

**Peer Review for more than 15 papers**　　　　　　　　　　　　　　　*2020 – present*
Journals including *Nature Climate Change, Nature Communications Earth and Environment, Journal of Climate, Nature npj Climate and Atmospheric Science, Carbon Balance and Management, Geophysical Research Letters, Global Change Biology, Proceedings of the National Academy of Sciences of the United States of America, and Waste Management.*

**Organizing Committee, CIRES mentoring program, CU Boulder**　　*Jul 2023 – present*
Mentorship program where CIRES mentor and mentee meet every month to foster professional growth and career development.

**Early Career Scientist Committee, FLUXNET Network**　　　　　*Aug 2022 – present*
The FLUXNET Early Career Network hosts seminars and provides a platform regarding research, career, and funding opportunities for early-career scientists.

**DEI Committee, Ameriflux Network**　　　　　　　　　　　　　*Aug 2022 – present*
The AmeriFlux DEI committee is a group of scientists motivated to identify and tackle issues around diversity, equity, and inclusion.

**Session Organizer, American Geophysical Union Fall Meeting**　　*Dec 2018 – present*
Organizing sessions about Terrestrial and Aquatic Methane Sinks in 2018 and Data-driven Estimation of Global Wetland Fluxes in 2023.

**Education Outreach Volunteer, Earth Science Program, Purdue University**　　*Aug 2016 – Aug 2020*
Outreach program to local elementary school where Purdue graduates host scientific programs.

**Member, Women in GeoScience Program, Princeton University**　　*Sep 2014 – Aug 2016*
Mentorship program where Princeton graduate students meet senior scientists every week to get advice on successful career as women scientists.

ET CETERA

**Modeling Skills**: Running Terrestrial Ecosystem Model (TEM), TM5 Atmospheric Chemistry Model, and Other Earth System Models (CESM, ORCHIDEE, LPJ-WhyMe) and analyzing their output with Matlab, Python, Fortran, IDL, C, C++, LaTeX(experienced)

**Laboratory Skills**: Gas chromatography/isotope ratio mass spectrometry (GC/IRMS)

**Language**: English (Fluent), Korean (Fluent), Chinese (Beginner), Japanese (Beginner)

**Updated in January 2024**