

# Sian Kou-Giesbrecht

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Pronouns: she/her

## Research Interests

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- Terrestrial ecosystems and biogeochemistry (carbon and nitrogen cycling)
- Climate / global change
- Terrestrial biosphere modelling and Earth system modelling

## Education & Appointments

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<b>Dalhousie University</b> <b>Department of Earth and Environmental Sciences</b> Assistant professor	09/2023 - present
<b>Environment and Climate Change Canada</b> <b>Canadian Centre for Climate Modelling and Analysis</b> Postdoctoral researcher	04/2021 – 08/2023
<b>Columbia University</b> PhD – Ecology, Evolution, and Environmental Biology (2021) MPhil - Ecology, Evolution, and Environmental Biology (2019) MA - Ecology, Evolution, and Environmental Biology (2018)	09/2016 – 05/2021
<b>Princeton University</b> IvyPlus Exchange Scholar	07/2019 – 12/2019
<b>McGill University</b> BSc - Joint Major in Mathematics and Biology, Minor in Field Studies	09/2012 – 05/2016

## Funding and fellowships

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- **NSERC Discovery Grant (2024-2029)**. \$175,000 CAD.
- **NSERC Discovery Grant Launch Supplement (2024)**. \$12,500 CAD.
- **NSERC Northern Research Supplement (2024-2029)**. \$70,000 CAD.
- **NSERC Research Tools and Instruments (2024)**. \$150,000 CAD.
- **NSERC Postgraduate Scholarship - Doctoral Program (2017-2020)**. \$70,000 CAD.
- **Columbia University Earth Institute Research Assistantship Grant (2018)**. \$2,000 USD.
- **Columbia University Department of Ecology, Evolution, and Environmental Biology Research Grant (2017)**. \$3,000 USD.
- **Sigma Xi Grant-in-Aid of Research Award (2017)**. \$1,000 USD.
- **Gwen Buchanan Scholarship at McGill University (2012-2016)**. \$12,000 CAD.
- **NSERC Undergraduate Student Research Award (2015)**. \$6,000 CAD.

## Awards

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- **Dalhousie Belong Research Fellowship Award (2023)**. \$5,000 CAD.  
Award to support and enhance research excellence of a new faculty members of an equity-seeking group.
- **Don Jay Melnick Award (2021)**  
Award for outstanding PhD dissertation work and departmental service at the Department of Ecology, Evolution, and Environmental Biology at Columbia University.
- **Frank Rigler Prize in Ecology (2016)**  
Award for excellence in ecology to a graduating undergraduate student at McGill University.

## Publications

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### *Submitted journal articles*

1. Burton, C., S. Lampe, D. Kelley, W. Thiery, S. Hantson, N. Christidis, L. Gudmundsson, M. Forrest, E. Burke, J. Chang, H. Huang, A. Ito, **S. Kou-Giesbrecht**, G. Lasslop, W. Li, L. Nieradzick, F. Li, Y. Chen, J. Randerson, C. Reyer, and M. Mengel. Global burned area increasingly explained by climate change. In review, *Nature Climate Change*, 01/2024.
2. S. Heinicke, J. Volkholz, J. Schewe, S. Gosling, H. Schmied, S. Zimmermann, M. Mengel, I. Sauer, P. Burek, J. Chang, **S. Kou-Giesbrecht**, M. Grillakis, L. Guillaumot, N. Hanasaki, A. Koutroulis, K. Otta, W. Qi, Y. Satoh, T. Stacke, T. Yokohata, and K. Frieler. Global hydrological models overestimate river discharge. In review, *Environmental Research Letters*, 12/2023.
3. Gong, C., H. Tian, H. Liao, N. Pan, S. Pan, A. Ito, A. Jain, **S. Kou-Giesbrecht**, F. Joos, Q. Sun, H. Shi, N. Vuichard, Q. Zhu, C. Peng, F. Maggi, F. Tang, and S. Zaehle. Global net climate effects of anthropogenic reactive nitrogen. In review, *Nature*, 12/2023.
4. **Kou-Giesbrecht, S.**, V. K. Arora, C. Seiler, and L. Wang. The impacts of modelling prescribed vs. dynamic land cover on greening of the Arctic and Amazonian dieback in a high CO<sub>2</sub> future scenario. In review, *Biogeosciences*, 11/2023.
5. Park, C., K. Takahashi, S. Fujimori, T. Jansakoo, C. Burton, H. Huang, **S. Kou-Giesbrecht**, C. Reyer, M. Mengel, E. Burke, F. Li, S. Hantson, J. Takakura, D. Kun Lee, and T. Hasegawa. Attributing human mortality from fire PM<sub>2.5</sub> to climate change. In revision, *Nature Climate Change*, 10/2023.
6. Tian, H., N. Pan, R. Thompson, J. Canadell, P. Suntharalingam, P. Regnier, ..., **S. Kou-Giesbrecht**, ... and Q. Zhu. Global Nitrous Oxide Budget 1980-2020. In review, *Earth System Science Data*, 10/2023.
7. Sun, Q., F. Joos, S. Lienert, S. Berthet, D. Carroll, C. Gong, A. Ito, A. Jain, **S. Kou-Giesbrecht**, A. Landolfi, M. Manizza, N. Pan, M. Prather, P. Regnier, L. Resplandy, R. Séférian, H. Shi, P. Suntharalingam, R. Thompson, H. Tian, N. Vuichard, S. Zaehle, and Q. Zhu. The modeled seasonal cycles of land biosphere and ocean N<sub>2</sub>O fluxes and atmospheric N<sub>2</sub>O. In review, *Global Biogeochemical Cycles*, 10/2023.
8. Qin, X., H. Shi, B. Fu, **S. Kou-Giesbrecht**, A. Ito, N. Lu, F. Maggi, Z. Ouyang, N. Pan, S. Pan, F. Tang, S. Wang, S. Zaehle, Q. Zhu, J. Ma, and H. Tian. Recent increase of biological nitrogen fixation in terrestrial natural ecosystems. In review, *National Science Review*, 09/2023.

*Peer-reviewed journal articles*

1. Gong, C., **S. Kou-Giesbrecht**, and S. Zaehle. 2024. Anthropogenic-driven perturbations on nitrogen cycles and interactions with climate changes. *Current Opinion in Green and Sustainable Chemistry*.
2. Seiler, C., **S. Kou-Giesbrecht**, V. K. Arora, and J. Melton. 2024. The impact of climate forcing biases and the nitrogen cycle on land carbon balance projections. *Journal of Advances in Modeling Earth Systems*.
3. Menge, D. N. L., **S. Kou-Giesbrecht**, B. N. Taylor, P. R. Akana, A. Butler, K. A. Carreras Pereira, S. S. Cooley, V. M. Lau, and E. L. Lauterbach. 2023. Terrestrial Phosphorus Cycling: Responses to Climatic Change. *Annual Review of Ecology, Evolution, and Systematics*.
4. Carreras Pereira, K. A., A. A. Wolf, **S. Kou-Giesbrecht**, P. R. Akana, J. L. Funk, and D. N. L. Menge. 2023. Allometric relationships for eight species of 4–5 year old nitrogen-fixing and non-fixing trees. *PLOS ONE* 18:e0289679.
5. **Kou-Giesbrecht, S.**, V. K. Arora, C. Seiler, A. Arneth, S. Falk, A. K. Jain, F. Joos, D. Kennedy, J. Knauer, S. Sitch, M. O’Sullivan, N. Pan, Q. Sun, H. Tian, N. Vuichard, and S. Zaehle. 2023. Evaluating nitrogen cycling in terrestrial biosphere models: a disconnect between the carbon and nitrogen cycles. *Earth System Dynamics* 14:767–795.
6. **Kou-Giesbrecht, S.**, and V. K. Arora. 2023. Compensatory Effects Between CO<sub>2</sub>, Nitrogen Deposition, and Nitrogen Fertilization in Terrestrial Biosphere Models Without Nitrogen Compromise Projections of the Future Terrestrial Carbon Sink. *Geophysical Research Letters* 50:e2022GL102618.
  - Media coverage: Carbon Sink Models Need Nitrogen, Eos (<https://eos.org/research-spotlights/carbon-sink-models-need-nitrogen>).
7. Arora, V. K., C. Seiler, L. Wang, and **S. Kou-Giesbrecht**. 2023. Towards an ensemble-based evaluation of land surface models in light of uncertain forcings and observations. *Biogeosciences* 20:1313–1355.
8. Menge, D. N. L., A. A. Wolf, J. L. Funk, S. S. Perakis, P. R. Akana, R. Arkebauer, T. A. Bytnerowicz, K. A. Carreras Pereira, A. M. Huddell, **S. Kou-Giesbrecht**, and S. K. Ortiz. 2023b. Tree symbioses sustain nitrogen fixation despite excess nitrogen supply. *Ecological Monographs* 93:e1562.
9. **Kou-Giesbrecht, S.**, and V. K. Arora. 2022. Representing the Dynamic Response of Vegetation to Nitrogen Limitation via Biological Nitrogen Fixation in the CLASSIC Land Model. *Global Biogeochemical Cycles* 36:e2022GB007341.
10. **Kou-Giesbrecht, S.**, S. Malyshev, I. M. Cano, S. W. Pacala, E. Shevliakova, T. A. Bytnerowicz, and D. N. L. Menge. 2021b. A novel representation of biological nitrogen fixation and competitive dynamics between nitrogen-fixing and non-fixing plants in a land model (GFDL LM4.1-BNF). *Biogeosciences* 18:4143–4183.
11. **Kou-Giesbrecht, S.**, and D. N. L. Menge. 2021. Nitrogen-fixing trees increase soil nitrous oxide emissions: a meta-analysis. *Ecology* 102:1–8.
12. **Kou-Giesbrecht, S.**, J. L. Funk, S. S. Perakis, A. A. Wolf, and D. N. L. Menge. 2021a. N supply mediates the radiative balance of N<sub>2</sub>O emissions and CO<sub>2</sub> sequestration driven by N-fixing vs. non-fixing trees. *Ecology* 102:e03414.
  - Media coverage: Greenhouse gas effects of nitrogen-fixing trees, *The Bulletin of the Ecological Society of America* (<https://esajournals.onlinelibrary.wiley.com/doi/10.1002/bes2.1909>).

13. Staccone, A. P., **S. Kou-Giesbrecht**, B. N. Taylor, and D. N. L. Menge. 2021. Nitrogen-fixing trees have no net effect on forest growth in the coterminous United States. *Journal of Ecology* 109:877–887.
14. **Kou-Giesbrecht, S.**, and D. Menge. 2019a. Nitrogen-fixing trees could exacerbate climate change under elevated nitrogen deposition. *Nature Communications* 10:1–8.
15. Lira, J. J. P. R. de, F. Pérez-Jvostov, K. M. Gotanda, **S. Kou-Giesbrecht**, S. K. Pease, M. Jackson, S. Jersch, and A. P. Hendry. 2018. Testing for a whole-organism trade-off between natural and sexual selection ; are the male guppies preferred by females more likely to be eaten by predators ? *Evolutionary Ecology Research* 19:441–453.

#### *Other*

- **Sian Kou-Giesbrecht**. Asian Americans: the forgotten minority in ecology. *The Bulletin of the Ecological Society of America* 2020.

#### *PhD dissertation*

- How do nitrogen-fixing trees influence the extent to which forests mitigate and exacerbate climate change? PhD dissertation, Columbia University, 2021.

## **Presentations**

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#### *Invited*

- Waterloo Climate Institute. 2024.
- Atlantic Geoscience Society Speaker Tour 2023-2024:
  - Memorial University of Newfoundland. St. John's, NL, Canada.
  - Saint Francis Xavier University. Antigonish, NS, Canada.
  - Saint Mary's University. Halifax, NS, Canada.
- Scientific Seminar at the Cary Institute of Ecosystem Studies. 2023.
- University of Victoria Centre for Forest Biology Seminar Series. 2022.

#### *Conference*

- Dynamic land cover in CLASSIC: a historical evaluation and future projections. Poster. Canadian Optimized High-Resolution Representation of the National Terrestrial Carbon Cycle (COHERENT-C) / CLASSIC workshop. Victoria, BC, Canada. 2023.
- Calibrating land models to reproduce the historical terrestrial carbon sink in the absence of nitrogen cycling compromises future projections. Oral presentation. Canadian Meteorological and Oceanographic Society (CMOS) Congress, the Canadian Geophysical Union (CGU) Annual Meeting, and the Eastern Snow Conference (ESC). Virtual. 2022.
- Calibrating land models to reproduce the historical terrestrial carbon sink in the absence of nitrogen cycling compromises future projections. Poster. Canadian Optimized High-Resolution Representation of the National Terrestrial Carbon Cycle (COHERENT-C) workshop. Virtual. 2022.
- Nitrogen-fixing trees increase soil nitrous oxide emissions: a meta-analysis. Oral presentation. Canadian Society for Ecology and Evolution (CSEE) Annual Meeting. Virtual. 2021.
- A novel representation of biological nitrogen fixation in GFDL-LM4.1. Oral presentation. Ecological Society of America (ESA) Annual Meeting. Virtual. 2020.
- Should nitrogen-fixing trees be planted during assisted forest restoration? Oral presentation. Canadian Society for Ecology and Evolution (CSEE) Annual Meeting. Fredericton, NB, Canada. 2019.

- Should nitrogen-fixing trees be planted during assisted forest restoration? Poster. Black Rock Forest – Hudson Highlands Research Symposium, Cornwall, NY, USA. 2019.
- Climate effects of nitrogen-fixing trees. Oral presentation. Columbia-Rutgers-Princeton-Penn-Yale Annual Ecology, Evolution and Behavior Graduate Student Symposium. Princeton University, NJ, USA. 2019.
- How do nitrogen-fixing trees influence soil nitrous oxide emissions? Poster. Graduate Climate Conference. University of Washington, WA, USA. 2018.
- How do nitrogen-fixing trees influence soil nitrous oxide emissions? Oral presentation. Ecological Society of America (ESA) Annual Meeting. New Orleans, LA, USA. 2018.
- Can nitrogen-fixing trees increase the capacity of the regenerating forest carbon sink? Poster. Graduate Climate Conference. Massachusetts Institute of Technology / Woods Hole Oceanographic Institution, MA, USA. 2017.
- Can nitrogen-fixing trees increase the capacity of the regenerating forest carbon sink? Oral presentation. Ecological Society of America (ESA) Annual Meeting. Portland, OR, USA. 2017.

## Teaching

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- **Dalhousie University**  
Global Biogeochemical Cycles (Winter 2024)
- **Sessional Lecturer at University of Victoria**  
Plant Physiology (Winter 2023)
- **Guest Lecturer at Columbia University**  
Theoretical Ecology (Winter 2019)
- **Teaching Assistant at Columbia University**  
Theoretical Ecology (Winter 2019)  
Statistical Modelling in Ecology and Evolutionary Biology (Fall 2018)  
Introduction to Statistics for Ecology and Evolutionary Biology (Fall 2017)
- **Teaching Assistant at McGill University**  
Ecological Dynamics (Fall 2015)

## International Networks

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- **Fresh Eyes on CMIP:** New working group of early career researchers to offer a fresh perspective on the Coupled Model Intercomparison Project (CMIP).  
Core member.
- **Inter-sectoral Impact Model Intercomparison Project (ISIMIP):** International network of modellers aimed at advancing a comprehensive understanding of the impacts of politically and scientifically relevant climate change scenarios.  
Liaison between CLASSIC and ISIMIP.
- **Global Nitrogen/N<sub>2</sub>O Model Intercomparison Project (NMIP):** International network of modellers under the umbrella of the Global Carbon Project (GCP) and the International Nitrogen Initiative (INI) aimed at understanding and quantifying the historical budgets of global nitrogen fluxes.  
Liaison between CLASSIC and NMIP.

- **Investigating Nutrient Cycling in Terrestrial Ecosystems (InCYTE):** National Science Foundation (NSF) Research Coordination Network aiming to enhance our understanding of nutrient cycling influences on the global carbon cycle to improve the representation of nutrients in Earth system models.  
Core member.
- **Novel multi-scale synthesis of nitrogen fixation rates and drivers across the terrestrial biosphere:** United States Geological Survey (USGS) Wesley Powell Center for Analysis and Synthesis project to synthesize rates of biological nitrogen fixation across terrestrial niches.  
Core member.

## Service

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### *Equity*

- Publication: Asian Americans: the forgotten minority in ecology. Sian Kou-Giesbrecht. The Bulletin of the Ecological Society of America 2020.
  - Featured in *Perspectives on Diversity and Inclusion in ESA Journal Articles* ([https://esajournals.onlinelibrary.wiley.com/doi/toc/10.1002/\(ISSN\)9999-0005.perspectives-on-diversity-and-inclusion](https://esajournals.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)9999-0005.perspectives-on-diversity-and-inclusion)).
  - Featured in “Where do I even start?” *Recommendations for faculty diversifying syllabi in ecology, evolution, and the life sciences* (<https://onlinelibrary.wiley.com/doi/full/10.1002/ece3.9719>).
  - Media coverage: Why the Environmental Movement Should Stop Ignoring Asian Americans, EcoWatch (<https://www.ecowatch.com/environmental-racism-asian-americans-2652886634.html>).
  - Media coverage: Asian Americans left out of climate movement, Axios (<https://www.axios.com/2023/05/07/asian-americans-climate-movement>).
- Lead organiser of the Section Working for Equity in Ecology and Evolution Today (SWEEET) at the Canadian Society for Ecology and Evolution (CSEE) Annual Meeting.
  - Past recruiting: How can we support a diverse workforce? (workshop at the 2021 CSEE Annual Meeting)
  - Reflecting on equity, diversity, and inclusion initiatives in Canada and the US: What can we learn from each other? (workshop at the 2022 CSEE and ESA Joint Annual Meeting)
- Organiser of the Diversity Forum (networking event at the 2022 Canadian Society for Ecology and Evolution (CSEE) and Ecological Society of America (ESA) Joint Annual Meeting)

### *STEM outreach*

- Organiser for Women in Science at Columbia University. Organised community outreach events focused on encouraging and supporting girls and women in science (e.g., Girls’ Science Day for students at local middle schools).
- Consultant for the Compost Education Centre (non-profit organisation that provides composting and ecological gardening education to Greater Victoria, Canada). Developed a workshop on ecology for local high schools (“Under the Microscope: Living Soil”).

### *Professional service*

- Early-Career Researcher Board member at Biogeochemistry.

- Reviewer for Biogeosciences, Ecological Applications, Journal of Advances in Modeling Earth Systems, Journal of Theoretical Biology, New Phytologist, Plant and Soil, Restoration Ecology, Science of the Total Environment, and Soil Biology and Biochemistry.
- Judge for the Canadian Society for Ecology and Evolution (CSEE) student talk award.

## **Skills**

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- Languages: English (native) and French (proficient)
- Remote First Aid (Canadian Red Cross)

## **References**

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- Dr. Duncan Menge  
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