

## PROFESSIONAL APPOINTMENTS

Research Scientist—University of Washington Department of Civil and Environmental Engineering	2016–Present
Postdoctoral Associate—University of Minnesota Department of Bioproducts and Biosystems Engineering	2015–2016

## EDUCATION

Ph.D., Civil, Environmental, and Geo- Engineering (public health minor)— University of Minnesota	2009–2014
B.M.E., Mechanical Engineering ( <i>cum laude</i> )—University of Minnesota	2002–2006

## PEER-REVIEWED PUBLICATIONS (\*=CORRESPONDING AUTHOR)

15. Goodkind, A.L., C.W. Tessum, J.S. Coggins, J.D. Hill, and J.D. Marshall (2019) Fine-scale, source-specific damage estimates of fine particulate matter pollution in the United States. *Proc. Natl. Acad. Sci. U.S.A.* In press.
14. Hill, J.D., A.L. Goodkind, C.W. Tessum, S. Thakrar, D. Tilman, S. Polasky, T. Smith, N. Hunt, K. Mullins, M. Clark, and J.D. Marshall (2019) Air-quality related health damages from maize production in the United States. *Nat. Sustain.* In press.
13. Tessum, C.W., J.S. Apte, A.L. Goodkind, N.Z. Muller, K.A. Mullins, D.A. Paoletta, S. Polasky, N.P. Springer, S.K. Thakrar, J.D. Marshall, and J.D. Hill. Inequity in consumption of goods and services widens racial-ethnic disparities in air pollution exposure. *Proc. Natl. Acad. Sci. U.S.A.* In press.
12. Liu, L., T. Hwang, S. Lee, Y. Ouyang, B. Lee, S.J. Smith, C.W. Tessum, J.D. Marshall, F. Yan, K. Daenzer, and T.C. Bond (2019) Health and climate impacts of future United States land freight modelled with global-to-urban models. *Nat. Sustain.* **2** [105–112 \(cover article\)](#).
11. Paoletta, D., C.W. Tessum\*, P. Adams, J.S. Apte, S. Chambliss, J.D. Hill, N. Muller, and J.D. Marshall (2018) Effect of Model Spatial Resolution on Estimates of Fine Particulate Matter Exposure and Exposure Disparities in the United States. *Environ. Sci. Technol. Lett.* **5**:7 [436–441](#).
10. Thakrar, S.K., A.L. Goodkind, C.W. Tessum, J.D. Marshall, and J.D. Hill (2018) Life cycle air quality impacts on human health from potential switchgrass production in the United States. *Biomass Bioenergy*. **114** [73–82](#).
9. Chang, K.M., J.J. Hess, J.M. Balbus, J. Buonocore, D.A. Cleveland, M.L. Grabow, R. Neff, R.K. Saari, C.W. Tessum, P. Wilkinson, A. Woodward, and K.L. Ebi (2017) Ancillary health effects of climate mitigation scenarios as drivers of policy uptake: a review of air quality, transportation and diet co-benefits modeling studies. *Environ. Res. Lett.* **12** [113001](#).
8. Tessum, C.W.\*, J.D. Hill, and J.D. Marshall (2017) InMAP: A model for air pollution interventions. *PLoS ONE*. **12**:4 [e0176131](#).
7. Keeler, B.L., J.D. Gourevitch, S. Polasky, F. Isbell, C.W. Tessum, J.D. Hill, and J.D. Marshall (2016) The social costs of nitrogen. *Science Adv.* **2** [e1600219](#).
6. Touchaei, A.G., H. Akbari, and C.W. Tessum (2016) Effect of increasing urban albedo on meteorology and air quality of Montreal (Canada) – Episodic simulation of heat wave in 2005. *Atmos. Environ.* **132** [188–206](#).

5. Tessum, C.W., J.D. Hill, and J.D. Marshall (2015) Twelve-month, 12 km resolution North American WRF-Chem v3.4 air quality simulation: performance evaluation. *Geosci. Model Dev.* **8**:4 [957–973](#).
4. Tessum, C.W., J.D. Hill, and J.D. Marshall (2014) Life cycle air quality impacts of conventional and alternative light-duty transportation in the United States. *Proc. Natl. Acad. Sci. U.S.A.* **111**:52 [18490–18495](#).
3. Hu, L., D.B. Millet, M. Baasandorj, T.J. Grif, K.R. Travis, C.W. Tessum, J.D. Marshall, W.F. Reinhart, T. Mikoviny, M. Müller, A. Wisthaler, M. Graus, C. Warneke, and J.D. Gouw (2014) Emissions of C6–C8 aromatic compounds in the United States: Constraints from tall tower and aircraft measurements. *J. Geophys. Res. Atmos.* [826–842](#).
2. Tessum, C.W., J.D. Marshall, and J.D. Hill (2012) A spatially and temporally explicit life cycle inventory of air pollutants from gasoline and ethanol in the United States. *Environ. Sci. Technol.* **46**:20 [11408–11417](#).
1. Millet, D.B., E. Apel, D.K. Henze, J. Hill, J.D. Marshall, H.B. Singh, and C.W. Tessum (2012) Natural and anthropogenic ethanol sources in North America and potential atmospheric impacts of ethanol fuel use. *Environ. Sci. Technol.* **46**:15 [8484–92](#).

#### MANUSCRIPTS SUBMITTED FOR REVIEW (\*=CORRESPONDING AUTHOR)

2. Gilmore, E.A., J. Heo, N.Z. Muller, C.W. Tessum, J.D. Hill, J.D. Marshall, and P.J. Adams. An inter-comparison of air quality social cost estimates from reduced-complexity models. *In revision, Environ. Res. Lett.*
1. Kelp, M., C.W. Tessum\*, and J.D. Marshall. Orders-of-magnitude speedup in atmospheric chemistry modeling through neural network-based emulation. *Submitted*. <https://arxiv.org/abs/1808.03874>.

#### MANUSCRIPTS IN PREPARATION (\*=CORRESPONDING AUTHOR)

8. Thind, M.P., C.W. Tessum, I.L. Azevedo, and J.D. Marshall. PM<sub>2.5</sub> health impacts by race, income, and geography from electricity generation in the U.S. *In preparation*.
7. Domingo, N., S. Thakrar, S. Balasubramanian, K. Colgan, M. Clark, P. Adams, S. Pandis, D. Tilman, J. Marshall, C.W. Tessum, A.L. Goodkind, I.L. Azevedo, and J.D. Hill. Air-quality related human health effects of agriculture in the United States. *In preparation*.
6. Paoletta, D.A., C.W. Tessum\*, J.D. Hill, and J.D. Marshall. Sources of racial inequity in fine particulate air pollution exposure in the United States. *In preparation*.
5. Tessum, C.W.\* Increasing the accuracy of atmospheric chemistry surrogate modeling with a graph neural network. *In preparation*.
4. Chambliss, S., C.W. Tessum, J.D. Marshall, and J.S. Apte. Connecting emissions and PM<sub>2.5</sub> exposures in an intake fraction framework. *In preparation*.
3. Dimantchev, E., N. Selin, M. Yuan, S. Paltsev, C.W. Tessum, and J.D. Marshall. Integrated assessment of renewable energy policy in the Rust Belt region. *In preparation*.
2. Muller, N.Z., E. Gilmore, C.W. Tessum, P. Adams, J. Heo, and J.D. Marshall. Reduced complexity models: methods and policy applications. *In preparation*.
1. Thakrar, S.K., C.W. Tessum, D. Sharma, D.B. Millet, J.D. Marshall, and J.D. Hill. Global reduced form air quality impact modelling using the InMAP model. *In preparation*.

#### REPORTS AND OTHER PUBLICATIONS

2. Tessum, C.W., J.D. Marshall, and J.D. Hill (2010) "Tank-to-wheel emissions of ethanol and biodiesel powered vehicles as compared to petroleum alternatives", tech. rep.: Center for Transportation Studies, University of Minnesota, Minneapolis, MN, USA.

1. Tessum, C.W., A.M. Boies, J.D. Hill, and J.D. Marshall (2010) "Assessing the sustainability of biofuels: Metrics, models, and tools for evaluating the impact of biofuels", in *Expanding Biofuel Production: Sustainability and the Transition to Advanced Biofuels: Summary of a Workshop*, ed. by Koshel, Patricia and McAllister, Kathleen, National Research Council, 117–140, [https://download.nap.edu/catalog.php?record\\_id=12806](https://download.nap.edu/catalog.php?record_id=12806).

#### INVITED PRESENTATIONS

12. Tessum, C., J. Hill, and J. Marshall (2017) Spatially explicit life cycle assessment for air pollution health impacts. Presented at International Emissions Inventory Conference, Baltimore, Maryland, USA.
11. Tessum, C.W., J.D. Hill, and J.D. Marshall (2017) Spatially and chemically explicit life cycle assessment for conventional and alternative vehicles. Presented at Coordinating Research Council (CRC) Mobile Source Air Toxics Workshop, Sacramento, California, USA.
10. Tessum, C.W., J.D. Marshall, and J.D. Hill (2015) Renewable Fuel Standard: Impacts on American Consumers. Presented at U.S. House of Representatives, Washington, D.C..
9. Tessum, C.W., J.D. Hill, and J.D. Marshall (2015) Air Pollution, Health, and Environmental Justice Implications of Shifting Transportation Fuels in the United States. Presented at Minnesota Environmental Health Association Annual Conference, Alexandria, MN.
8. Tessum, C.W., J.D. Hill, and D.M. Julian (2014) Air pollution, health, and environmental justice implications of shifting transportation fuels in the United States. Presented at Lawrence Berkeley National Laboratory Environmental Energy Technologies Division Seminar Series, Berkeley, CA, USA.
7. Tessum, C., J. Hill, and J. Marshall (2014) A reduced-complexity, variable grid resolution model for air pollution transport and transformation. Presented at 2014 Natural Capital Annual Meeting and Training, Stanford, CA.
6. Tessum, C.W., J.D. Hill, and J.D. Marshall (2013) Public health implications of alternative transportation fuels in the United States. Presented at Peking University, Beijing, China.
5. Tessum, C.W., J.D. Hill, and J.D. Marshall (2013) Public health implications of alternative transportation fuels in the United States. Presented at China Center for Disease Control and Prevention, Beijing, China.
4. Tessum, C.W., J.D. Marshall, and J.D. Hill (2013) Life cycle air pollutant emission and impact accounting for transportation fuels. Presented at Air and Waste Management Association 106th Annual Conference and Exhibition, Chicago, IL, USA.
3. Tessum, C.W., J.D. Hill, and J.D. Marshall (2012) A spatially and temporally explicit life cycle inventory of air pollutants from transportation fuels in the United States. Presented at Society for Environmental Toxicology and Chemistry North America Annual Conference, Long Beach, CA, USA.
2. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2011) Air quality and public health impacts of biofuel production and use in the United States. Presented at Peking University, Beijing, China.
1. Tessum, C.W., and J.D. Hill (2011) Assessing biofuel sustainability: Lessons from growth of the U.S. industry. Presented at Minnesota Academy of Science Annual Meeting, Minneapolis, MN, USA.

#### CONFERENCE PRESENTATIONS

21. Tessum, C.W., J.S. Apte, A.L. Goodkind, N.Z. Muller, K.A. Mullins, D.A. Paoletta, S. Polasky, N.P. Springer, S.K. Thakrar, J.D. Marshall, and J.D. Hill (2018) Inequity in consumption widens racial-ethnic disparities in air pollution exposure. Presented at Community Modeling and Analysis System (CMAS) Annual Conference, Chapel Hill, North Carolina.
20. Tessum, C.W., J.D. Hill, and J.D. Marshall (2018) Modeling air pollution health impacts with InMAP. Presented at Community Modeling and Analysis System (CMAS) Annual Conference, Chapel Hill, North Carolina.

19. Tessum, C.W., M. Kelp, and J.D. Marshall (2018) Orders-of-Magnitude Speedup in Atmospheric Chemistry Modeling with a Neural Network-Based Surrogate Model. Presented at Community Modeling and Analysis System (CMAS) Annual Conference, Chapel Hill, North Carolina.
18. Tessum, C.W., J.S. Apte, A.L. Goodkind, N.Z. Muller, K.A. Mullins, D.A. Paoletta, S. Polasky, N.P. Springer, S.K. Thakrar, J.D. Marshall, and J.D. Hill (2018) Inequity in consumption compounds racial-ethnic disparities in air pollution exposure. Presented at International Society for Environmental Epidemiology Annual Conference, Ottawa, Canada.
17. Tessum, C., J. Marshall, J. Hill, and A. Goodkind (2016) Reduced form modeling of health impacts of air pollution. Presented at University of Washington Center for Health & the Global Environment Conference on Health Benefits of Climate Change Mitigation Policies and Technologies, Seattle, WA, USA.
16. Tessum, C., K. Mullins, N. Springer, J. Marshall, and J. Hill (2016) Air pollution-related health damages and environmental justice impacts by economic sector in the United States. Presented at International Society for Environmental Epidemiology Annual Conference, Rome, Italy.
15. Tessum, C.W., J.D. Hill, and J.D. Marshall (2016) InMAP: A new model for air pollution health impact assessments. Presented at International Society for Environmental Epidemiology Annual Conference, Rome, Italy.
14. Marshall, J., L. Clark, M. Bechle, N. Nguyen, K. Swor, C. Tessum, J. Hill, and D. Millet. (2016) Environmental justice aspects of transportation-related air pollution in the U.S.: evidence from national-scale longitudinal analyses, case studies, and life cycle assessment. Presented at Health Effects Institute Annual Conference, Denver, Colorado, USA.
13. Tessum, C.W., K. Mullins, J.D. Marshall, and J.D. Hill (2015) Economic input-output life cycle assessment of PM<sub>2.5</sub> health impacts and environmental injustice. Presented at American Association for Aerosol Research Annual Conference, Minneapolis, MN, USA.
12. Tessum, C.W., J.D. Hill, and J.D. Marshall (2015) Environmental Justice and Equality Aspects of Conventional and Alternative Light-Duty Transportation in the United States. Presented at Minnesota Supercomputing Institute Research Exhibition, Minneapolis, MN.
11. Tessum, C.W., J.D. Hill, and J.D. Marshall (2014) A reduced-complexity, variable grid resolution model for PM<sub>2.5</sub> transport and transformation. Presented at American Association for Aerosol Research Annual Conference, Orlando, Florida, USA.
10. Tessum, C.W., J.D. Hill, and J.D. Marshall (2014) Environmental justice and equality aspects of conventional and alternative light-duty transportation in the United States. Presented at International Society for Environmental Epidemiology Annual Conference, Seattle, WA, USA.
9. Tessum, C.W., J.D. Hill, and D.M. Julian (2013) Air pollution, health, and environmental justice implications of shifting transportation fuels. Presented at Annual Conference of the International Society for Environmental Epidemiology, International Society for Exposure Science and International Society for Indoor Air Quality, Basel, Switzerland.
8. Tessum, C.W., J.D. Hill, and J.D. Marshall (2013) Public health implications of alternative transportation fuels: Synergies between climate and air quality policies. Presented at Minnesota Supercomputing Institute Research Exhibition, Minneapolis, MN, USA.
7. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2011) Air quality and public health impacts of biofuel production and use in the United States. Presented at Initiative for Renewable Energy and the Environment E3 Conference, Minneapolis, MN, USA.
6. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2011) Air quality and public health impacts of biofuel production and use in the United States. Presented at Institute on the Environment Student Sustainability Symposium, St. Paul, MN, USA.

5. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2011) Air quality and public health impacts of biofuel production and use in the United States. Presented at American Center for Life Cycle Analysis Annual Conference, Chicago, IL, USA.
4. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2011) Air quality and public health impacts of biofuel production and use in the United States. Presented at International Society for Environmental Epidemiology Annual Conference, Barcelona, Spain.
3. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2011) Air quality implications of alternative fuels: A spatially and temporally explicit life cycle modeling approach. Presented at Minnesota Supercomputing Institute Research Exhibition, Minneapolis, MN, USA.
2. Tessum, C.W., K. Wagstrom, J.D. Hill, and J.D. Marshall (2010) Air quality implications of alternative fuels: A spatially and temporally explicit life cycle modeling approach. Presented at Initiative for Renewable Energy and the Environment E3 Conference, St. Paul, MN, USA.
1. Tessum, C.W., J.D. Hill, and J.D. Marshall (2009) Spatially and temporally explicit life-cycle analysis of biofuels. Presented at First Annual Fulbright US-Brazil Biofuels Short Course, São Paulo, Brazil.

#### TEACHING EXPERIENCE

Guest lectures in life cycle assessment, air pollution, and health to undergraduate and graduate students	2015–Present
Teaching Assistant: Civil Engineering 5561: Air Quality Engineering, University of Minnesota	2013
English Teacher: Instituto Cultural Peruano Norteamericano, Chiclayo, Peru	2008

#### PROFESSIONAL EXPERIENCE

Owner: CT Consulting	2008–Present
Engineer: Energy Management Solutions, Inc.	2007–2008
Aerodynamics Intern: Volvo Car Corporation	2006
Automation Intern: Voith Paper AG	2006

#### PROFESSIONAL SERVICE

Grant Application Reviewer: NSF, Health Effects Institute, and US EPA
Report Peer-Reviewer: US Department of Energy
Journal Peer-Reviewer: <i>Environmental Science and Technology</i> , <i>Atmospheric Environment</i> , <i>Environmental Research Letters</i> , <i>Proceedings of the Royal Society of London A</i>
Member: International Society for Environmental Epidemiology and American Association for Aerosol Research