Debra Wunch

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Education

Ph.D.: Atmospheric Physics, University of Toronto, Supervisor: J.R. Drummond, 2007
M.Sc.: Atmospheric Physics, University of Toronto, Supervisor: J.R. Drummond, 2002
B.Sc.: Physics, University of Toronto, 2000

Current Appointments

Assistant Professor January 2016–present
University of Toronto

Cross-appointed tenure-stream faculty in the Department of Physics (51%) and School of the Environment (49%).

TCCON Chair January 2020–present
University of Toronto

I serve as Chair for the Total Carbon Column Observing Network (TCCON). The TCCON chairs organize the network and set data quality control standards, with input from all TCCON partners. The TCCON provides the primary validation dataset for several satellites, including the Orbiting Carbon Observatory (OCO-2), the Greenhouse Gases Observing Satellite (GOSAT), and the Tropospheric Monitoring Instrument (TROPOMI).

Science Team Memberships

GeoCarb Science Team: July 2018–present
Orbiting Carbon Observatory (OCO-2&3) Science & Validation Teams: 2014–present
Atmospheric CO_2 from Space (ACOS) Team: 2009–2014
Total Carbon Column Observing Network (TCCON) Science Team: 2007–present

Research Endeavours

To use atmospheric measurements to better understand the carbon cycle, including the role of urban regions, and the role of the forests.

Honours

August 2018: NASA Group Achievement Award for the OCO-2 Science Team "For exceptional achievement in processing and using data from the Orbiting Carbon Observatory-2 mission to produce unprecedented insight into the global carbon cycle."

October 2016: NASA Group Achievement Award for the OCO-2 Validation Team "For Outstanding achievement in developing and executing an overall program for the validation of the Orbiting Carbon Observatory-2 science measurements from space."

Selected Publications

Roche, S., et al.: Retrieval of atmospheric CO_2 vertical profiles from ground-based near-infrared spectra, Atmos. Meas. Tech., 14, 30873118, doi:10.5194/amt-14-3087-2021, 2021.

Nasrin Mostafavi Pak, N., et al.: The Facility Level and Area Methane Emissions inventory for the Greater Toronto Area (FLAME-GTA), Atmospheric Environment, 252, 118319, doi:10.1016/j.atmosenv.2021.118319, 2021.

Hedelius, J. K., et al.: Regional and urban column CO trends and anomalies as observed by MOPITT over 16 years. Journal of Geophysical Research: Atmospheres, 126, e2020JD033967, doi:https://doi.org/10.1029/2020JD033967, 2021

Ars, S., et al.: Investigation of the Spatial Distribution of Methane Sources in the Greater Toronto Area Using Mobile Gas Monitoring Systems, Environmental Science & Technology, 54 (24), 15671-15679, doi:10.1021/acs.est.0c05386, 2020.

Hedelius, J. K., et al.: Evaluation of MOPITT Version 7 joint TIR-NIR XCO retrievals with TCCON, Atmos. Meas. Tech., 12, 55475572, doi: 10.5194/amt-12-5547-2019, 2019.

Wunch, D., et al.: Emissions of methane in Europe inferred by total column measurements, Atmos. Chem. Phys., 19(6), 3963-3980, doi:10.5194/acp-19-3963-2019, 2019.

Byrne, B., et al.: Evaluating GPP and Respiration Estimates Over Northern Midlatitude Ecosystems Using Solar-Induced Fluorescence and Atmospheric CO_2 Measurements, J. Geophys. Res., doi:10.1029/2018JG004472, 2018.

Wunch, D., et al.: Comparisons of the Orbiting Carbon Observatory-2 (OCO-2) XCO_2 measurements with TCCON, Atmos. Meas. Tech., doi: 10.5194/amt-10-2209-2017, 2017.

Liu, J. et al.: Contrasting carbon cycle responses of the tropical continents to the 2015-2016 El Niño, Science, doi: 10.1126/science.aam5690, 2017.

Eldering, A. et al.: The Orbiting Carbon Observatory-2 early science investigations of regional carbon dioxide fluxes, Science, doi: 10.1126/science.aam5745, 2017.

Hedelius, J. K. et al.: Intercomparability of XCO_2 and XCH_4 from the United States TCCON sites, Atmos. Meas. Tech., doi: 10.5194/amt-10-1481-2017, 2017.

Hedelius, J. K., et al.: Assessment of errors and biases in retrievals of XCO_2, XCH_4, XCO, and XN_2O from a 0.5 cm^{-1} resolution solar-viewing spectrometer, Atmos. Meas. Tech., 9(8), 3527-3546, doi:10.5194/amt-9-3527-2016, 2016.

Hedelius, J. K, et al.: Emissions and topographic effects on column CO_2 (XCO_2) variations, with a focus on the Southern California Megacity, J. Geophys. Res., doi: 10.1002/2017JD026455, 2017.

Viatte, C., et al.: Methane emissions from dairies in the Los Angeles Basin, Atmospheric Chemistry and Physics, doi: 10.5194/acp-17-7509-2017, 2017.

Wunch, D., et al.: Quantifying the Loss of Processed Natural Gas Within California's South Coast Air Basin Using Long-term Measurements of Ethane and Methane, Atmos. Chem. Phys., doi: 10.5194/acp-16-14091-2016, 2016.

Wunch, D., et al.: The covariation of Northern Hemisphere summertime CO_2 with surface temperature in boreal regions, Atmos. Chem. Phys., doi: 10.5194/acp-13-9447-2013, 2013.

Wunch, D., et al., A method for evaluating bias in global measurements of CO_2 total columns from space, Atmos. Chem. Phys., doi: 10.5194/acp-11-12317-2011, 2011.

Wunch, D., et al.: The total carbon column observing network, Philos. Trans. R. Soc. – Ser. A Math. Phys. Eng. Sci., doi: 10.1098/rsta.2010.0240, 2011.

Wunch, D., et al.: Calibration of the Total Carbon Column Observing Network using aircraft profile data, Atmos. Meas. Tech., 3(5), 13511362, doi:10.5194/amt-3-1351-2010, 2010.

Wunch, D., et al.: Emissions of greenhouse gases from a North American megacity, Geophys. Res. Lett., 36(15), 15, doi:10.1029/2009GL039825, 2009.