

Edward Garrett Patton

National Center for

Atmospheric Research

3450 Mitchell Lane

Boulder, Colorado 80301

+1 (303) 497-8958

patton@ucar.edu

<http://www.mmm.ucar.edu/people/patton>

3176 8th Street

Boulder, Colorado 80304

+1 (303) 415-1895

A. RESEARCH INTERESTS

Atmospheric/oceanic boundary layers and turbulence with a range of foci: 1) canopy turbulence, 2) turbulent exchange over heterogeneous surfaces, 3) coupled land-atmosphere interactions, 4) interplay between turbulence and reactive chemistry, 5) clouds, 6) air-sea interaction, and 7) dispersion. Using large-eddy simulation as a bridge to connect observations, experiments and theory into improved parameterizations for larger-scale models through process-level understanding.

B. PROFESSIONAL PREPARATION

1991 – 1997 Ph.D. Atmospheric Science, University of California, Davis, CA

- Thesis Topic: Large-eddy simulation of turbulent flow above and within a plant canopy
- Major Professor: Dr. Roger H. Shaw

1986 – 1991 B.Sc. Atmospheric Science, University of California, Davis, CA

C. APPOINTMENTS

2025 – Senior Scientist, NSF National Center for Atmospheric Research, Boulder, CO

2021 – 2025 Project Scientist IV, National Center for Atmospheric Research, Boulder, CO

2013 – 2021 Project Scientist III, National Center for Atmospheric Research, Boulder, CO

2007 – 2013 Project Scientist II, National Center for Atmospheric Research, Boulder, CO

2003 – 2007 Project Scientist I, National Center for Atmospheric Research, Boulder, CO

2000 – 2003 Long-Term Visitor, National Center for Atmospheric Research, Boulder, CO

1997 – 2000 Supercomputing Fellow, Minnesota Supercomputing Inst., Minneapolis, MN

D. METRICS

Web of Science

- *h*-index: 32
- Citations per item: 41.65

Scopus

- *h*-index: 34
- Citations per item: 42.54

Google Scholar

- *h*-index: 39
- Citations per item: 68.48

E. FIELD CAMPAIGNS

- NCAR/EOL/ISFS Lead Scientist: Stable Atmospheric Variability and Transport (SAVANT), August-November 2018, Mahomet, Illinois.
- Co-Principal Investigator: Southern Oxidant Aerosol Study (SOAS), May-July 2013, Centerville, Alabama. (renamed: Southern Atmosphere Study)
- Co-Principal Investigator: Manitou Experimental Forest Observatory (MEFO), July 2009 - September 2012, Woodland Park, Colorado.
- Principal Investigator: Canopy Horizontal Array Turbulence Study (CHATS), March-June 2007, Dixon, California.

F. PRODUCTS

Graduate Work

1. **Patton, E. G.**, 1997: Large-eddy simulation of turbulent flow above and within a plant canopy. Ph.D. thesis, University of California, Davis, California.

Peer Reviewed Papers

1. Bonan, G. B., S. P. Burns, and **E. G. Patton**, 2026: Beyond surface fluxes: Observational and computational needs of multilayer canopy models – A walnut orchard test case. *Agric. For. Meteorol.*, **378**, 110 960, doi:[10.1016/j.agrformet.2025.110960](https://doi.org/10.1016/j.agrformet.2025.110960).
2. **Patton, E. G.**, J. J. Finnigan, I. N. Harman, and P. P. Sullivan, 2026: Turbulent flow over isolated forested hills of varying shape and steepness. *J. Fluid Mech.*, **1026**, A16, doi:[10.1017/jfm.2025.10989](https://doi.org/10.1017/jfm.2025.10989).
3. Stiperski, I., M. W. Rotach, C. Ansorge, A. Baklanov, D. Belušić, E. Bou-Zeid, C. Brun, A. Christen, N. L. Dias, A. Dörnbrack, T. Foken, A. Grachev, A. A. Holtslag, M. Kelly, P. Klein, B. Kosović, C. Meneveau, L. Mortarini, **E. G. Patton**, G.-J. Steeneveld, C. Thomas, S. Trini Castelli, and D. Zardi, 2025: Open questions in atmospheric turbulence: A synthesis from the centenary workshop “100 years of turbulence: Innsbruck 1922 -2022”. *J. European Meteorol. Soc.*, **3**, 100 022, doi:[10.1016/j.jemets.2025.100022](https://doi.org/10.1016/j.jemets.2025.100022).
4. Pan, Y., S. C. Wray, and **E. G. Patton**, 2025: Signals of nonturbulent motions caused by stable stratification in near-surface sonic anemometer data. *J. Atmos. Sci.*, **82** (6), 1073–1091, doi:[10.1175/JAS-D-24-0070.1](https://doi.org/10.1175/JAS-D-24-0070.1).
5. Sullivan, P. P., J. C. McWilliams, and **E. G. Patton**, 2025: An investigation of coupled atmospheric and oceanic boundary layers using large-eddy simulation. *J. Atmos. Sci.*, **82** (4), 829–846, doi:[10.1175/JAS-D-24-0149.1](https://doi.org/10.1175/JAS-D-24-0149.1).
6. Dai, Y., A. Van Hooft, **E. G. Patton**, J. Boeke, S. Van Der Linden, M.-C. Ten Veldhuis, and B. J. Van De Wiel, 2024: Integrated large-eddy simulation for modeling plant-tissue warming induced by wind machines in an orchard canopy. *Agric. For. Meteorol.*, **356**, 110 175, doi:[10.1016/j.agrformet.2024.110175](https://doi.org/10.1016/j.agrformet.2024.110175).
7. Freire, L. S., M. Chamecki, and **E. G. Patton**, 2023: Atmospheric small-scale turbulence from three-dimensional hot-film data. *Boundary-Layer Meteorol.*, **189** (1-3), 77–101, doi:[10.1007/s10546-023-00826-w](https://doi.org/10.1007/s10546-023-00826-w).
8. Brasseur, G. P., M. Barth, J. Kazil, **E. G. Patton**, and Y. Wang, 2023: Segregation of fast-reactive species in atmospheric turbulent flow. *Atmosphere*, **14** (7), 1136, doi:[10.3390/atmos14071136](https://doi.org/10.3390/atmos14071136).
9. McWilliams, J. C., C. Meneveau, **E. G. Patton**, and P. P. Sullivan, 2023: Stable boundary layers and subfilter-scale motions. *Atmosphere*, **14** (7), 1107, doi:[10.3390/atmos14071107](https://doi.org/10.3390/atmos14071107).
10. Hiscox, A., S. Bhimireddy, J. Wang, D. A. R. Kristovich, J. Sun, **E. G. Patton**, S. P. Oncley, and W. O. J. Brown, 2023: Exploring influences of shallow topography in stable boundary layers: the SAVANT field campaign. *Bull. Amer. Meteorol. Soc.*, **104** (2), E520–E541, doi:[10.1175/BAMS-D-21-0332.1](https://doi.org/10.1175/BAMS-D-21-0332.1).

11. Pedruzo-Bagazgoitia, X., **E. G. Patton**, A. F. Moene, H. G. Ouwersloot, T. Gerken, L. A. T. Machado, S. T. Martin, M. Sörgel, P. C. Stoy, M. A. Yamasoe, and J. Vilà-Guerau de Arellano, 2023: Investigating the diurnal radiative, turbulent, and biophysical processes in the Amazonian canopy-atmosphere interface by combining LES simulations and observations. *J. Adv. Model Earth Syst.*, **15** (2), e2022MS003 210, doi:[10.1029/2022MS003210](https://doi.org/10.1029/2022MS003210).
12. Clifton, O. E., **E. G. Patton**, M. C. Barth, J. J. Orlando, S. Wang, and C. B. Baublitz, 2023: Influence of organized turbulence on OH reactivity at a deciduous forest. *Geophys. Res. Lett.*, **50**, e2022GL102 548, doi:[10.1029/2022GL102548](https://doi.org/10.1029/2022GL102548).
13. Dupont, S., and **E. G. Patton**, 2022: On the influence of large-scale atmospheric motions on near-surface turbulence: comparison between flows over low-toughness and tall vegetation canopies. *Boundary-Layer Meteorol.*, **184** (2), 195–230, doi:[10.1007/s10546-022-00710-z](https://doi.org/10.1007/s10546-022-00710-z).
14. Clifton, O. E., **E. G. Patton**, S. Wang, M. C. Barth, J. J. Orlando, and R. H. Schwantes, 2022: A large eddy simulation model for studying coupled multilayer forest canopy and turbulence influences on atmospheric chemistry. *J. Adv. Model. Earth Syst.*, **4** (10), e2022MS003 078, doi:[10.1029/2022MS003078](https://doi.org/10.1029/2022MS003078).
15. Bonan, G. B., **E. G. Patton**, J. J. Finnigan, D. D. Baldocchi, and I. N. Harman, 2021: Moving beyond the incorrect but useful paradigm: reevaluating big-leaf and multilayer plant canopies to model biosphere-atmosphere fluxes – a review. *Agric. For. Meteorol.*, **306** (108435), 1–23, doi:[10.1016/j.agrformet.2021.108435](https://doi.org/10.1016/j.agrformet.2021.108435).
16. Sullivan, P. P., J. C. McWilliams, J. C. Weil, **E. G. Patton**, and H. J. S. Fernando, 2021: Marine boundary layers above heterogeneous SST: Along-front winds. *J. Atmos. Sci.*, **78**, 3297–3315, doi:[10.1175/JAS-D-21-0072.1](https://doi.org/10.1175/JAS-D-21-0072.1).
17. Clifton, O. E., and **E. G. Patton**, 2021: Does organization in turbulence influence ozone removal by deciduous forests? *J. Geophys. Res. Biogeosci.*, **126** (6), 1–20, doi:[10.1029/2021JG006362](https://doi.org/10.1029/2021JG006362).
18. Large, W. G., **E. G. Patton**, and P. P. Sullivan, 2021: The diurnal cycle of entrainment and detrainment in LES of the Southern Ocean driven by observed surface fluxes and waves. *J. Phys. Oceanogr.*, **51** (10), 3253–3278, doi:[10.1175/JPO-D-20-0308.1](https://doi.org/10.1175/JPO-D-20-0308.1).
19. Burns, S. P., J. M. Frank, W. J. Massman, **E. G. Patton**, and P. D. Blanken, 2021: The effect of static pressure-wind covariance on vertical carbon dioxide exchange at a windy subalpine forest site. *Agric. For. Meteorol.*, **306** (108402), 1–31, doi:[10.1016/j.agrformet.2021.108402](https://doi.org/10.1016/j.agrformet.2021.108402).
20. Perret, L., and **E. G. Patton**, 2021: Stability influences on interscale transport of turbulent kinetic energy and Reynolds shear stress in atmospheric boundary layers interacting with a tall vegetation canopy. *J. Fluid Mech.*, **921** (A14), 1–49, doi:[10.1017/jfm.2021.453](https://doi.org/10.1017/jfm.2021.453).
21. Sullivan, P. P., J. C. McWilliams, J. C. Weil, **E. G. Patton**, and H. J. S. Fernando, 2020: Marine boundary layers above heterogeneous SST: Across-front winds. *J. Atmos. Sci.*, **77** (12), 4251–4275, doi:[10.1175/JAS-D-20-0062.1](https://doi.org/10.1175/JAS-D-20-0062.1).
22. Finnigan, J., K. Ayotte, I. Harman, G. Katul, H. Oldroyd, **E. Patton**, D. Poggi, A. Ross, and P. Taylor, 2020: Boundary-layer flow over complex topography. *Bound.-Layer Meteorol.*, **177**, 247–313, doi:[10.1007/s10546-020-00564-3](https://doi.org/10.1007/s10546-020-00564-3).

23. Pan, Y., and **E. G. Patton**, 2020: Determining stationary periods across multiple sensors: An application to observed canopy turbulence response to atmospheric stability. *J. Atmos. Ocean. Tech.*, **37** (4), 665–685, doi:[10.1175/JTECH-D-19-0135.1](https://doi.org/10.1175/JTECH-D-19-0135.1).
24. Clifton, O. E., A. M. Fiore, W. J. Massman, C. B. Baublitz, M. Coyle, L. Emberson, S. Fares, D. K. Farmer, P. Gentine, G. Gerosa, A. B. Guenther, D. Helmig, D. L. Lombardozzi, J. W. Munger, **E. G. Patton**, S. E. Pusede, D. B. Schwede, S. J. Silva, M. Sörgel, A. L. Steiner, and A. P. Tai, 2020: Dry deposition of ozone over land: processes, measurement, and modeling. *Rev. Geophys.*, **58** (1), doi:[10.1029/2019RG000670](https://doi.org/10.1029/2019RG000670).
25. Berg, J., **E. G. Patton**, and P. P. Sullivan, 2020: Large-eddy simulation of conditionally neutral boundary layers: A mesh resolution sensitivity study. *J. Atmos. Sci.*, **77** (6), 1969–1991, doi:[10.1175/JAS-D-19-0252.1](https://doi.org/10.1175/JAS-D-19-0252.1).
26. Brown, J. S., M. M. Shapkalijevski, M. C. Krol, T. Karl, H. G. Ouwersloot, A. F. Moene, **E. G. Patton**, and J. Vilà-Guerau de Arellano, 2020: Ozone exchange within and above an irrigated Californian orchard. *Tellus B*, **72** (1), 1–17, doi:[10.1080/16000889.2020.1723346](https://doi.org/10.1080/16000889.2020.1723346).
27. Large, W. G., **E. G. Patton**, and P. P. Sullivan, 2019: Non-local transport and implied viscosity and diffusivity throughout the boundary layer in LES of the Southern Ocean with surface waves. *J. Phys. Oceanogr.*, 2631–2652, doi:[10.1175/jpo-d-18-0202.1](https://doi.org/10.1175/jpo-d-18-0202.1).
28. **Patton, E. G.**, P. P. Sullivan, B. Kosović, J. Dudhia, L. Mahrt, M. Žagar, and T. Marić, 2019: On the influence of swell propagation angle on surface drag. *J. Appl. Meteorol. Clim.*, **58** (5), 1039–1059, doi:[10.1175/JAMC-D-18-0211.1](https://doi.org/10.1175/JAMC-D-18-0211.1).
29. Dar, A. S., J. Berg, N. Troldborg, and **E. G. Patton**, 2019: On the self-similarity of wind turbine wakes in a complex terrain using large eddy simulation. *Wind Energ. Sci.*, **4** (4), 633–644, doi:[10.5194/wes-4-633-2019](https://doi.org/10.5194/wes-4-633-2019).
30. Large, W. G., **E. G. Patton**, A. K. DuVivier, P. P. Sullivan, and L. Romero, 2019: Similarity theory in the surface layer of large-eddy simulations of the wind-, wave-, and buoyancy-forced Southern Ocean. *J. Phys. Oceanogr.*, **49** (8), 2165–2187, doi:[10.1175/JPO-D-18-0066.1](https://doi.org/10.1175/JPO-D-18-0066.1).
31. Lemone, M. A., W. M. Angevine, C. S. Bretherton, F. Chen, J. Dudhia, E. Fedorovich, K. B. Katsaros, D. Lenschow, L. Mahrt, **E. G. Patton**, J. Sun, M. Tjernström, and J. Weil, 2018: 100 Years of progress in boundary layer meteorology. *Meteorol. Monogr.*, **59**, 9.1–9.85, doi:[10.1175/AMSMONOGRAPHS-D-18-0013.1](https://doi.org/10.1175/AMSMONOGRAPHS-D-18-0013.1).
32. Wei, Z., X. Lee, and **E. G. Patton**, 2018: ISOLESC: A coupled Isotope-LSM-LES-Cloud modeling system to investigate the water budget in the atmospheric boundary layer. *J. Adv. Model. Earth Syst.*, **10**, 2589–2617, doi:[10.1029/2018MS001381](https://doi.org/10.1029/2018MS001381).
33. Bonan, G. B., **E. G. Patton**, I. N. Harman, K. W. Oleson, J. J. Finnigan, Y. Lu, and E. A. Burakowski, 2018: Modeling canopy-induced turbulence in the Earth system: A unified parameterization of turbulent exchange within plant canopies and the roughness sublayer (CLM-ml v0). *Geosci. Model Dev.*, **11** (4), 1467–1496, doi:[10.5194/gmd-11-1467-2018](https://doi.org/10.5194/gmd-11-1467-2018).
34. Pan, Y., and **E. G. Patton**, 2017: On determining stationary periods within time series. *J. Atmos. Ocean. Tech.*, **34** (10), 2213–2232, doi:[10.1175/JTECH-D-17-0038.1](https://doi.org/10.1175/JTECH-D-17-0038.1).
35. Kaser, L., **E. G. Patton**, G. G. Pfister, A. J. Weinheimer, D. D. Montzka, F. Flocke, A. M.

- Thompson, R. M. Stauffer, and H. S. Halliday, 2017: The effect of entrainment through atmospheric boundary layer growth on observed and modeled surface ozone in the Colorado front range. *J. Geophys. Res. Atmos.*, **122** (11), 6075–6093, doi:[10.1002/2016JD026245](https://doi.org/10.1002/2016JD026245).
36. Li, Y., M. C. Barth, **E. G. Patton**, and A. L. Steiner, 2017: Impact of in-cloud aqueous processes on the chemistry and transport of biogenic volatile organic compounds. *J. Geophys. Res. Atmos.*, **122** (20), 11,131–11,153, doi:[10.1002/2017JD026688](https://doi.org/10.1002/2017JD026688).
 37. **Patton, E. G.**, P. P. Sullivan, R. H. Shaw, J. J. Finnigan, and J. C. Weil, 2016: Atmospheric stability influences on coupled boundary layer and canopy turbulence. *J. Atmos. Sci.*, **73**, 1621–1647, doi:[10.1175/JAS-D-15-0068.1](https://doi.org/10.1175/JAS-D-15-0068.1).
 38. Mahrt, L., E. L. Andreas, J. B. Edson, D. Vickers, J. Sun, and **E. G. Patton**, 2016: Coastal zone surface stress with stable stratification. *J. Phys. Oceanogr.*, **46**, 95–105, doi:[10.1175/JPO-D-15-0116.1](https://doi.org/10.1175/JPO-D-15-0116.1).
 39. Berg, J., A. Natarajan, J. Mann, and **E. G. Patton**, 2016: Gaussian vs non-Gaussian turbulence: impact on wind turbine loads. *Wind Energy*, **19** (11), 1975–1989, doi:[10.1002/we.1963](https://doi.org/10.1002/we.1963).
 40. Shapkalijevski, M., A. F. Moene, H. G. Ouwersloot, **E. G. Patton**, and J. Vilà Guerau de Arellano, 2016: Influence of canopy seasonal changes on turbulence parameterization within the roughness sublayer over an orchard canopy. *J. Appl. Meteorol. Clim.*, **55** (6), 1391–1407, doi:[10.1175/JAMC-D-15-0205.1](https://doi.org/10.1175/JAMC-D-15-0205.1).
 41. Li, Y., M. C. Barth, G. Chen, **E. G. Patton**, S. W. Kim, A. Wisthaler, T. Mikoviny, A. Fried, R. Clark, and A. L. Steiner, 2016: Large-eddy simulation of biogenic VOC chemistry during the DISCOVER-AQ 2011 campaign. *J. Geophys. Res. Atmos.*, **121** (13), 8083–8105, doi:[10.1002/2016JD024942](https://doi.org/10.1002/2016JD024942).
 42. Lenschow, D. H., D. Gurarie, and **E. G. Patton**, 2016: Modeling the diurnal cycle of conserved and reactive species in the convective boundary layer using SOMCRUS. *Geosci. Model Dev.*, **9** (3), 979–996, doi:[10.5194/gmd-9-979-2016](https://doi.org/10.5194/gmd-9-979-2016).
 43. Sullivan, P. P., J. C. Weil, **E. G. Patton**, H. J. J. Jonker, and D. V. Mironov, 2016: Turbulent winds and temperature fronts in large-eddy simulations of the stable atmospheric boundary layer. *J. Atmos. Sci.*, **73** (4), 1815–1840, doi:[10.1175/JAS-D-15-0339.1](https://doi.org/10.1175/JAS-D-15-0339.1).
 44. Su, L., **E. G. Patton**, J. Vilà Guerau de Arellano, A. B. Guenther, L. Kaser, B. Yuan, F. Xiong, P. B. Shepson, L. Zhang, D. Miller, W. H. Brune, K. Baumann, E. Edgerton, A. Weinheimer, P. Misztal, Je. H. Park, A. H. Goldstein, K. Skog, F. N. Keutsch, and J. E. Mak, 2016: Understanding isoprene photooxidation using observations and modeling over a subtropical forest in the southeastern US. *Atmos. Chem. Phys.*, **16** (12), 7725–7741, doi:[10.5194/acp-16-7725-2016](https://doi.org/10.5194/acp-16-7725-2016).
 45. Kaser, L., T. Karl, B. Yuan, R. L. Mauldin, C. A. Cantrell, A. B. Guenther, **E. G. Patton**, A. J. Weinheimer, C. Knote, J. Orlando, L. Emmons, E. Apel, R. Hornbrook, S. Shertz, K. Ullmann, S. Hall, M. Graus, J. de Gouw, X. Zhou, and C. Ye, 2015: Chemistry-turbulence interactions and mesoscale variability influence the cleansing efficiency of the atmosphere. *Geophys. Res. Lett.*, **42** (24), 10,894–10,903, doi:[10.1002/2015GL066641](https://doi.org/10.1002/2015GL066641).

46. Darbieu, C., F. Lohou, M. Lothon, J. Vilà-Guerau De Arellano, F. Couvreux, P. Durand, D. Pino, **E. G. Patton**, E. Nilsson, E. Blay-Carreras, and B. Gioli, 2015: Turbulence vertical structure of the boundary layer during the afternoon transition. *Atmos. Chem. Phys.*, **15** (17), 10 071–10 086, doi:[10.5194/acp-15-10071-2015](https://doi.org/10.5194/acp-15-10071-2015).
47. Ortega, J., A. Turnipseed, A. B. Guenther, T. G. Karl, D. A. Day, D. Gochis, J. A. Huffman, A. J. Prenni, E. J. T. Levin, S. M. Kreidenweis, P. J. DeMott, Y. Tobo, **E. G. Patton**, A. Hodzic, Y. Y. Cui, P. C. Harley, R. S. Hornbrook, E. C. Apel, R. K. Monson, A. S. D. Eller, J. P. Greenberg, M. C. Barth, P. Campuzano-Jost, B. B. Palm, J. L. Jimenez, A. C. Aiken, M. K. Dubey, C. Geron, J. Offenberg, M. G. Ryan, P. J. Fornwalt, S. C. Pryor, F. N. Keutsch, J. P. DiGangi, A. W. H. Chan, A. H. Goldstein, G. M. Wolfe, S. Kim, L. Kaser, R. Schnitzhofer, A. Hansel, C. A. Cantrell, R. L. Mauldin, and J. N. Smith, 2014: Overview of the Manitou Experimental Forest Observatory: site description and selected science results from 2008 to 2013. *Atmos. Chem. Phys.*, **14** (12), 6345–6367, doi:[10.5194/acp-14-6345-2014](https://doi.org/10.5194/acp-14-6345-2014).
48. Lohou, F., and **E. G. Patton**, 2014: Surface energy balance and buoyancy response to shallow cumulus shading. *J. Atmos. Sci.*, **71** (2), 665–682, doi:[10.1175/JAS-D-13-0145.1](https://doi.org/10.1175/JAS-D-13-0145.1).
49. Sullivan, P. P., J. C. McWilliams, and **E. G. Patton**, 2014: Large-eddy simulation of marine atmospheric boundary layers above a spectrum of moving waves. *J. Atmos. Sci.*, **71** (11), 4001–4027, doi:[10.1175/JAS-D-14-0095.1](https://doi.org/10.1175/JAS-D-14-0095.1).
50. Peñuelas, J., A. Guenther, F. Rapparini, J. Llusia, I. Filella, R. Seco, M. Estiarte, M. Mejia-Chang, R. Ogaya, J. Ibañez, J. Sardans, L. M. Castaño, A. Turnipseed, T. Duhl, P. Harley, J. Vila, J. M. Estavillo, S. Menéndez, O. Facini, R. Baraldi, C. Geron, J. Mak, **E. G. Patton**, X. Jiang, and J. Greenberg, 2013: Intensive measurements of gas, water, and energy exchange between vegetation and troposphere during the MONTES campaign in a vegetation gradient from short semi-desertic shrublands to tall wet temperate forests in the NW Mediterranean Basin. *Atmos. Env.*, **75**, 348–364, doi:[10.1016/j.atmosenv.2013.04.032](https://doi.org/10.1016/j.atmosenv.2013.04.032).
51. Coen, J. L., M. Cameron, J. Michalakes, **E. G. Patton**, P. J. Riggan, and K. M. Yedinak, 2013: WRF-Fire: Coupled weather–wildland fire modeling with the Weather Research and Forecasting model. *J. Appl. Meteorol. Clim.*, **52** (1), 16–38, doi:[10.1175/JAMC-D-12-023.1](https://doi.org/10.1175/JAMC-D-12-023.1).
52. Berg, J., J. Mann, and **E. G. Patton**, 2013: Lidar-observed stress vectors and veer in the atmospheric boundary layer. *J. Atmos. Ocean. Tech.*, **30** (9), 1961–1969, doi:[10.1175/JTECH-D-12-00266.1](https://doi.org/10.1175/JTECH-D-12-00266.1).
53. Jonker, H. J. J., M. van Reeuwijk, P. P. Sullivan, and **E. G. Patton**, 2013: On the scaling of shear-driven entrainment: a DNS study. *J. Fluid Mech.*, **732**, 150–165, doi:[10.1017/jfm.2013.394](https://doi.org/10.1017/jfm.2013.394).
54. Edburg, S. L., D. Stock, B. K. Lamb, and **E. G. Patton**, 2012: The effect of the vertical source distribution on scalar statistics within and above a forest canopy. *Bound.-Layer Meteorol.*, **142** (3), 365–382, doi:[10.1007/s10546-011-9686-1](https://doi.org/10.1007/s10546-011-9686-1).
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58. Lee, X., J. Huang, and **E. G. Patton**, 2012: A large-eddy simulation study of water vapour and carbon dioxide isotopes in the atmospheric boundary layer. *Bound.-Layer Meteorol.*, **145** (1), 229–248, doi:[10.1007/s10546-011-9631-3](https://doi.org/10.1007/s10546-011-9631-3).
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60. **Patton, E. G.**, T. W. Horst, P. P. Sullivan, D. H. Lenschow, S. P. Oncley, W. O. J. Brown, S. P. Burns, A. B. Guenther, A. Held, T. Karl, S. D. Mayor, L. V. Rizzo, S. M. Spuler, J. Sun, A. A. Turnipseed, E. J. Allwine, S. L. Edburg, B. K. Lamb, R. Avissar, R. J. Calhoun, J. Kleissl, W. J. Massman, K. T. Paw U, and J. C. Weil, 2011: The canopy horizontal array turbulence study. *Bull. Amer. Meteorol. Soc.*, **92** (5), 593–611, doi:[10.1175/2010BAMS2614.1](https://doi.org/10.1175/2010BAMS2614.1).
61. Vilà-Guerau de Arellano, J., **E. G. Patton**, T. Karl, K. van den Dries, M. C. Barth, and J. J. Orlando, 2011: The role of boundary layer dynamics on the diurnal evolution of isoprene and the hydroxyl radical over tropical forests. *J. Geophys. Res. Atmos.*, **116** (D07304), 1–16, doi:[10.1029/2010JD014857](https://doi.org/10.1029/2010JD014857).
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63. Huang, J., X. Lee, and **E. G. Patton**, 2011: Entrainment and budgets of heat, water vapor, and carbon dioxide in a convective boundary layer driven by time-varying forcing. *J. Geophys. Res. Atmos.*, **116** (6), doi:[10.1029/2010JD014938](https://doi.org/10.1029/2010JD014938).
64. Huang, J., X. Lee, and **E. G. Patton**, 2009: Dissimilarity of scalar transport in the convective boundary layer in inhomogeneous landscapes. *Bound.-Layer Meteorol.*, **130** (3), 327–345, doi:[10.1007/s10546-009-9356-8](https://doi.org/10.1007/s10546-009-9356-8).
65. Finnigan, J. J., R. H. Shaw, and **E. G. Patton**, 2009: Turbulence structure above a vegetation canopy. *J. Fluid Mech.*, **637**, 387–424, doi:[10.1017/S0022112009990589](https://doi.org/10.1017/S0022112009990589).
66. **Patton, E. G.**, and G. G. Katul, 2009: Turbulent pressure and velocity perturbations induced by gentle hills covered with sparse and dense canopies. *Bound.-Layer Meteorol.*, **133** (2), 189–217, doi:[10.1007/s10546-009-9427-x](https://doi.org/10.1007/s10546-009-9427-x).
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68. Huang, J., X. Lee, and **E. G. Patton**, 2008: A modelling study of flux imbalance and the influence of entrainment in the convective boundary layer. *Bound.-Layer Meteorol.*, **127** (2), 273–292, doi:[10.1007/s10546-007-9254-x](https://doi.org/10.1007/s10546-007-9254-x).

69. Held, A., **E. Patton**, L. Rizzo, J. Smith, A. Turnipseed, and A. Guenther, 2008: Relaxed eddy accumulation simulations of aerosol number fluxes and potential proxy scalars. *Bound.-Layer Meteorol.*, **129**, 451–468, doi:[10.1007/s10546-008-9327-5](https://doi.org/10.1007/s10546-008-9327-5).
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71. Wang, W., K. J. Davis, C. Yi, **E. G. Patton**, M. P. Butler, D. Ricciuto, and P. S. Bakwin, 2007: A note on the top-down and bottom-up gradient functions over a forested site. *Bound.-Layer Meteorol.*, **124** (2), 305–314, doi:[10.1007/s10546-007-9162-0](https://doi.org/10.1007/s10546-007-9162-0).
72. **Patton, E. G.**, P. P. Sullivan, and C.-H. Moeng, 2005: The influence of idealized heterogeneity on wet and dry planetary boundary layers coupled to the land surface. *J. Atmos. Sci.*, **62** (7), 2078–2097, doi:[10.1175/JAS3465.1](https://doi.org/10.1175/JAS3465.1).
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74. Fitzmaurice, L., R. H. Shaw, K. T. Paw U, and **E. G. Patton**, 2004: Three-dimensional scalar microfront systems in a large-eddy simulation of vegetation canopy flow. *Bound.-Layer Meteorol.*, **112**, 107–127, doi:[10.1023/B:BOUN.0000020159.98239.4a](https://doi.org/10.1023/B:BOUN.0000020159.98239.4a).
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76. **Patton, E. G.**, P. P. Sullivan, and K. J. Davis, 2003: The influence of a forest canopy on top-down and bottom-up diffusion in the planetary boundary layer. *Quart. J. Roy. Meteorol. Soc.*, **129**, 1415–1434, doi:[10.1256/qj.01.175](https://doi.org/10.1256/qj.01.175).
77. **Patton, E. G.**, K. J. Davis, M. C. Barth, and P. P. Sullivan, 2001: Decaying scalars emitted by a forest canopy: A numerical study. *Bound.-Layer Meteorol.*, **100**, 91–129, doi:[10.1023/A:1019223515444](https://doi.org/10.1023/A:1019223515444).
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79. Dwyer, M. J., **E. G. Patton**, and R. H. Shaw, 1997: Turbulent kinetic energy budgets from a large-eddy simulation of airflow above and within a forest canopy. *Bound.-Layer Meteorol.*, **84** (1), 23–43, doi:[10.1023/A:1000301303543](https://doi.org/10.1023/A:1000301303543).

Invited Peer Reviewed Book Chapters

1. **Patton, E. G.**, and J. J. Finnigan, 2013: Canopy turbulence. *Handbook of Environmental Fluid Dynamics, Volume One*, H. J. S. Fernando, Ed., CRC Press, Boca Raton, FL, chap. 24, 311–328, doi:[10.1201/b14241](https://doi.org/10.1201/b14241).
2. Shaw, R. H., **E. G. Patton**, and J. J. Finnigan, 2013: Coherent eddy structures over plant canopies. *Coherent Flow Structures at Earth's Surface*, John Wiley & Sons, Ltd, Chichester, UK, chap. 10, 149–159, doi:[10.1002/9781118527221.ch10](https://doi.org/10.1002/9781118527221.ch10).

Peer Reviewed Conference Proceedings

1. Weil, J., P. Sullivan, **E. Patton**, and A. Wyszogrodski, 2018: Concentration fluctuations and variability at local and regional scales: Use of a Lagrangian two-particle dispersion model coupled with LES fields. *Air Pollut. Model. Its Appl. XXV*, C. Mensink, and G. Kallos, Eds., Springer, Cham, 281–285, doi:[10.1007/978-3-319-57645-9_44](https://doi.org/10.1007/978-3-319-57645-9_44).
2. Berg, J., N. Troldborg, R. Menke, **E. G. Patton**, P. P. Sullivan, J. Mann, and N. N. Sørensen, 2018: Flow in complex terrain - a large eddy simulation comparison study. *J. Phys. Conf. Ser.*, **1037**, 072 015, doi:[10.1088/1742-6596/1037/7/072015](https://doi.org/10.1088/1742-6596/1037/7/072015).
3. Berg, J., N. Troldborg, N. N. Sørensen, **E. G. Patton**, and P. P. Sullivan, 2017: Large-eddy simulation of turbine wake in complex terrain. *J. Phys. Conf. Ser.*, **854**, 012 003, doi:[10.1088/1742-6596/854/1/012003](https://doi.org/10.1088/1742-6596/854/1/012003).
4. Weil, J., P. Sullivan, **E. Patton**, and C.-H. Moeng, 2014: Statistical Variability of Dispersion at Local and Regional Scales: LPDM-LES Model Ensembles and Observations. *NATO Sci. Peace Secur. Ser. C Environ. Secur.*, D. Steyn, P. Builtjes, and R. Timmermans, Eds., Springer, Dordrecht, doi:[10.1007/978-94-007-5577-2_108](https://doi.org/10.1007/978-94-007-5577-2_108).
5. Jonker, H. J. J., M. van Reeuwijk, P. P. Sullivan, and **E. G. Patton**, 2012: Interfacial layers in clear and cloudy atmospheric boundary layers. *Turbul. Heat Mass Transf.* 7, Palermo, Sicily, Italy, 1–12, doi:[10.1615/ICHMT.2012.ProcSevIntSympTurbHeatTransfPal.10](https://doi.org/10.1615/ICHMT.2012.ProcSevIntSympTurbHeatTransfPal.10).
6. Saini, M. S., J. W. Naughton, **E. Patton**, and P. Sullivan, 2010: Compact representation of LES simulations of the atmospheric boundary layer using POD. *48th Am. Inst. Aeronaut. Astronaut. Aerosp. Sci. Meet.*, Orlando, Florida, Paper 18A.1, doi:[10.2514/6.2010-1374](https://doi.org/10.2514/6.2010-1374).
7. Ayotte, K. W., P. P. Sullivan, and **E. G. Patton**, 2010: LES and wind tunnel modelling over hills of varying steepness and roughness. *5th Inter Symp Comp Wind Eng Chap. Hill NC*, Chapel Hill, NC.
8. **Patton, E. G.**, P. P. Sullivan, and K. W. Ayotte, 2006: Flow and transport above and within forests in complex topography. *Prepr. 1st Integr. Land Ecosyst. - Atmosphere Process. Study ILEAPS Sci. Conf.*, A. Reissell, and A. Aarflot, Eds., Report Series in Aerosol Science, no. 79, Boulder, CO.
9. **Patton, E. G.**, M. C. Barth, K. J. Davis, and P. P. Sullivan, 2000: The interactions between turbulence and photochemistry in the planetary boundary layer. *Int. Symp. Meas. Toxic Relat. Air Pollut.*, Air and Waste Management Association, Research Triangle Park, NC.
10. Cho, H. G., **E. G. Patton**, R. H. Shaw, and B. R. White, 1995: Simulation of flow around multiple fences. *6th Int. Symp. Comput. Fluid Dyn.*, Lake Tahoe, NV.

Non-Refereed Reports or Technical Notes

1. **Patton, E. G.**, P. P. Sullivan, and J. C. Weil, 2021: Terrain and canopy-distribution influences on seed dispersal. Final Report: Winning Against Wildings - Scion Contractor Agreement QT-5846, NCAR, 44 pp.
2. Harman, I. N., J. J. Finnigan, and **E. G. Patton**, 2020: Comparing observations and models of wind over complex forested terrain: Methodological considerations with respect to the Scion

- conifer wilding wind tunnel experiments. Tech. rep., CSIRO, 25 pp. doi:[10.25919/3fr1-n128](https://doi.org/10.25919/3fr1-n128).
3. **Patton, E. G.**, 2018: Project Report: Winning against wildings. Tech. rep., Scion Contractor Agreement QT-5846, 15 pp.
 4. **Patton, E. G.**, 2015: Final Report: Impacts of stratification and non-equilibrium winds and waves on hub-height winds. Tech. rep., Department of Energy, 48 pp. doi:[10.2172/1322012](https://doi.org/10.2172/1322012).
 5. **Patton, E. G.**, 2009: Atmospheric boundary layer studies. *Large Scale Computing and Storage Requirements for Biological and Environmental Research*, Workshop Report, DOE Office of Science Biological and Environmental Research Program Office and National Energy Research Scientific Computing Center, LBNL Report: LBNL-2710E, chap. 6.2.5, 29–32.
 6. Weil, J. C., **E. G. Patton**, and P. P. Sullivan, 2009: Collaborative Research: Lagrangian modeling of dispersion in the stable boundary layer and canopy environments. Final Report to the Army Research Office. Tech. rep., CIRES, University of Colorado and National Center for Atmospheric Research, 10 pp.
 7. **Patton, E. G.**, 2008: Planetary boundary layer research and development. *U.S. Department of Energy Workshop Report: Research Needs for Wind Resource Characterization*, NREL/TP-500-43521, chap. 7, 45–53.
 8. **Patton, E. G.**, P. P. Sullivan, and C.-H. Moeng, 2004: The influence of idealized heterogeneity on wet and dry planetary boundary layers coupled to the land surface. Tech. Rep. TN-462+STR, NCAR Technical Report, 71 pp. doi:[10.5065/D6G15XTF](https://doi.org/10.5065/D6G15XTF).
 9. Kelley, N., M. Shirazi, M. Buhl, D. Jager, S. Wilde, J. Adams, J. Bianchi, P. Sullivan, and **E. Patton**, 2003: Lamar Low-Level Jet Project Interim Report. Tech. Rep. NREL/TP-500-34593, Department of Energy.

G. SUCCESSFUL PROPOSALS AND GRANTS

- **Patton, E. G.**, Vive la résistance: Achieving long-term success in managing wilding conifer invasions, Scion Research. Award: \$546,378, Period: 2022-2026.
- Meneveau, C. V., R. Burns, T. Haine, A. S. Szalay, T. A. Zaki, P. P. Sullivan, **E. G. Patton**, P. K. Yeung: Advanced Cyberinfrastructure for Sustainable Community Usage of Big Data from Numerical Fluid Dynamics Simulations, Award: \$3,992,109, Period: 2020-2025.
- **Patton, E. G.**, B. Kosović, S. Madronich (replaced by M. Barth), R. Neale, S. Oncley: Turbulence-resolving simulation toward defining the functional requirements to characterize atmospheric boundary layers over complex surfaces, NCAR Reinvestment. Award: \$1.2M (reinvestment) + ~\$500K (co-sponsorship) for two years spread across ACOM, CGD, EOL, MMM, and RAL, Period: 2019-2021.
- **Patton, E. G.**, B. Kosović, S. Madronich, R. Neale, S. Oncley, The Atmospheric Boundary Layer: Integrating Complexity Across Disciplines, NCAR's Advanced Study Program (ASP) 2020 Summer Colloquium, Period: 2022.
- **Patton, E. G.**, Conifer wilding spread in New Zealand, Scion Research. Award: \$307,000, Period: 2017-2021.
- **Patton, E. G.**, Turbulence over two and three-dimensional canopy covered hills, NCAR

Strategic Capability. Award: ~8M CPU hours, Period: 2018-2019.

- Large, W. G., T. Ringler, P. P. Sullivan, **E. G. Patton**, G. Danabasoglu, M. Long, Southern Ocean Uptake in the MPAS-Ocean Model, DOE ESM-SciDAC. Award: \$1,464,762, Period: 2016-2019.
- Lee, X., and **E. G. Patton**, Deuterium excess of water vapor in the atmospheric boundary layer, NSF Hydrology. Award: \$468,000, Period: 2016-2019.
- **Patton, E. G.**, P. P. Sullivan, B. Kosović, J. Dudhia, L. Mahrt, M. Žagar, L. Gulstad, Impacts of stratification and non-equilibrium winds and waves on hub-height winds, DOE Office of Energy Efficiency and Renewable Energy. Award: \$702,000, Period: 2013-2015.
- **Patton, E. G.**, P. P. Sullivan, B. Kosović, J. Dudhia, L. Mahrt, M. Žagar, L. Gulstad, Impacts of stratification and non-equilibrium winds and waves on hub-height winds, Vestas Technology R&D, 1M CPU hours. Award: \$175,000, Period: 2013-2015.
- **Patton, E. G.**, Turbulence over complex surfaces: a wind energy perspective, DOE National Energy Research Scientific Computing (NERSC) Center. Award: ~5M CPU hours/year, Period: 2007-2018.
- **Patton, E. G.**, Weil, J. C and P. P. Sullivan, Collaborative Research: Effects of stability, canopies, and non-stationarity on dispersion in the stable boundary layer, Subcontract from CU Boulder on US Army Research Office. Award: \$130,853, Period: 2008-2011.
- Sullivan, P. P. and **E. G. Patton**, Large-eddy simulation of canopy wind data, Windlab Systems. Award: \$23,800, Period: 2008.
- **Patton, E. G.**, The Canopy Horizontal Array Turbulence Study (CHATS), NSF Biocomplexity. Award: \$40,742, Period: 2006-2007.
- **Patton, E. G.**, Numerical simulation of sub-canopy drainage flows and their influence on above canopy observations, National Institute for Global Environmental Change, Department of Energy. Award: \$20,000, Period: 2006.
- **Patton, E. G.** and P. P. Sullivan, Flow and transport above and within forests in complex topography, NCAR/TIIMES/Biocomplexity. Award: \$40,000, Period: 2006.
- Weil, J. C., **E. G. Patton** and P. P. Sullivan, Collaborative Research: Lagrangian Modeling of Dispersion in the Stable Boundary Layer, Army Research Office. Award: \$130,853, Period: 2003-2006.
- Sullivan, P. P., **E. G. Patton**, and C.-H. Moeng, Heat and Moisture Transport in a Coupled Land-Atmosphere System, National Aeronautics and Space Administration, Award: \$330,242, Period: 2000-2003.
- **Patton, E. G.**, P. P. Sullivan, and D. H. Lenschow, Simulation of Kelvin-Helmholtz Instability for Obtaining Inflow Conditions for Wind Turbine Design, Department of Energy, National Renewable Energy Laboratory. Award: \$21,937, Period: 2002.

H. AWARDS AND FELLOWSHIPS

- UCAR Leadership Academy graduate, 2020
- NCAR/MMM Special Recognition Award, 2020
- NCAR/MMM Paper of the Year Award, 2019

- NCAR/MMM Mentoring Award, 2016
- NCAR/TIIMES Incentive Award, 2007
- Supercomputing Fellow, Minnesota Supercomputing Institute, University of Minnesota, 1997 – 2000.

I. SERVICE

Mentoring

- Kevin Ferguson, NCAR Scientist V
- Sean Burns, NCAR Scientist V
- Aditya Choukulkar, Arizona State University, Tempe, AZ, *ASP Student Visitor*
- Olivia Clifton, *ASP Postdoctoral Scholar*
- Steven Edburg, Washington State University, Pullman, WA, *ASP Graduate Student Fellow*
- Lisa Kaser, *ASP Postdoctoral Scholar*
- Yang Li, Visiting Ph.D. Student, University of Michigan, Ann Arbor, MI
- Ying Pan, *ASP Postdoctoral Scholar*
- Tyson Randall, California State University at Chico, Chico, CA
- Luping Su, Visiting Ph.D. Student, State University of New York, Stonybrook

Ph.D. Thesis Committee Member

- Louis-Etienne Boudreault, Danish Technical University, Roskilde, Denmark
- Sean Burns, University of Colorado at Boulder, Boulder, CO
- Yulong Ma, Washington State University, Pullman, WA
- Huug Ouwersloot, Wageningen University, Wageningen, The Netherlands
- Zhao Xue, University of Connecticut, Storrs, CT

Visitors hosted (from one week to one year, some for multiple visits)

- Keith Ayotte, Windlab Systems, Canberra, Australia
- Jacob Berg, Risø/Technical University of Denmark, Roskilde, Denmark
- Elie Bou-Zeid, Princeton University, Princeton, NJ
- Ronald Calhoun, Arizona State University, Tempe, AZ, *ASP Faculty Fellow*
- Marcelo Chamecki, University of California at Los Angeles, Los Angeles, CA
- Omduth Coceal, University of Reading, Reading, United Kingdom
- Sylvain Dupont, INRA, France
- John Finnigan, CSIRO, Canberra, Australia
- Line Gulstad, Vestas Wind Systems, Arhaus, Denmark
- Ian Harman, CSIRO, Canberra, Australia
- Chiyoko Hirose, Kyushu University, Fukuoka, Japan
- Jianping Huang, NOAA/NCEP, College Park, MD
- Thomas Karl, University of Innsbruck, Innsbruck, Austria
- Gabriel Katul, Duke University, Durham, NC
- Xuhui Lee, Yale University, New Haven, CT
- Fabienne Lohou, CNRS, Lannemezan, France, *ASP Faculty Fellow*
- Arnold Moene, Wageningen University, Wageningen, The Netherlands, *ASP Faculty Fellow*
- Ikegaya Naoki, Kyushu University, Fukuoka, Japan
- Ying Pan, The Pennsylvania State University, University Park, PA

- Laurent Perret, École Centrale de Nantes, Nantes, France
- Jakob Mann, Risø/Technical University of Denmark, Roskilde, Denmark
- Yardena Raviv, Israel Institute for Biological Research, Ness-Ziona, Israel
- Roger Shaw, University of California, Davis, CA
- Ivana Stiperski, University of Innsbruck, Innsbruck, Austria
- Jordi Vilà-Guerau de Arellano, Wageningen University, Wageningen, The Netherlands
- Mark Žagar, Vestas Wind Systems, Arhaus, Denmark

Journal Editorial Board Member

- Agricultural and Forest Meteorology (2008 – 2020)

Managing Guest Editor

- Agricultural and Forest Meteorology Special Issue, [Wind and Trees: Meteorological Phenomena Impacting Windthrow](#), 2019, 8 articles.

Manuscript Reviews

Reviewer for the following journals (about four to eight manuscripts per year):

- Agricultural and Forest Meteorology
- Atmospheric Chemistry and Physics
- Atmospheric Environment
- Boundary-Layer Meteorology
- Environmental Fluid Mechanics
- Geophysical Research Letters
- Journal of Advances in Modeling Earth Systems
- Journal of Atmospheric and Oceanic Technology
- Journal of Applied Meteorology and Climatology
- Journal of Computational Physics
- Journal of Fluid Mechanics
- Journal of Geophysical Research - Atmospheres
- Journal of Hydrometeorology
- Journal of the Atmospheric Sciences
- Monthly Weather Review
- Nature Communications
- Quarterly Journal of the Royal Meteorological Society
- Theoretical and Computational Fluid Dynamics
- Water Resources Research

Proposal Reviews

Reviewer for the following institutions (about one to two proposals per year):

- Dutch Research Council (NWO)
- Swiss National Science Foundation (SNF)
- UK Natural Environment Research Council
- US National Science Foundation
- US Department of Energy
- US Army Research Office

- Wageningen University's class on Land-Surface Interactions
- Wiley-Blackwell

Committees

Served (or serving) on the following:

- 2025 NCAR SHINE Project Scientist II Hiring Committee (Lead)
- 2023 NCAR/EOL Scientist II Hiring Committee
- 2021 – present University of Florida NHERI Experimental Facility Advisory Committee
- 2018 – 2020 Chair NCAR Boundary Layer Coordination Group
- 2020 NCAR/EOL LOTOS/Boundary-Layer Postdoctoral Scientist Hiring Committee
- 2018 – 2022 NCAR/EOL LOTOS Scientific Advisory Committee
- 2017 – 2020 Scientific Steering Committee member for NCAR's Community Terrestrial Systems Model (CTSM) project
- 2018 MMM representative to NCAR's Singletrack: Unified Physics Steering Committee
- 2017 NCAR/EOL Scientist I Hiring Committee
- 2014 NCAR/MMM System Administrator II Hiring Committee
- 2012 – 2018 NCAR/EOL CentNet Scientific Advisory Committee
- 2012 NCAR/MMM System Administrator III Hiring Committee
- 2011 – present Chair, MMM Computing Advisory Committee
- 2008 – 2011 Department of Energy, National Energy Research Scientific Computing Users Group Executive Committee
- 2006 – 2014 NCAR/BEACHON Scientific Steering Committee
- 2004 – 2006 NCAR/BioComplexity Scientific Steering Committee
- 2003 – 2006 American Meteorological Society Scientific and Technology Activities Commission (STAC) on Boundary Layers and Turbulence

Conferences / Workshops / Summer Schools

Lead / Chair:

- AGU Chapman Conference, Energy Balance Closure, September 2025
- NCAR Boundary Layer Research Workshop, August 2018
- 8th IUFRO Conference on Wind and Trees, July 2017
- 17th AMS Symposium on Boundary Layers and Turbulence, May 2006

Invited participant / Co-convenor:

- NCAR/ASP Summer Colloquium on Atmospheric Boundary Layers, Boulder, CO, July 2023, co-convenor and invited speaker
- NCAR/GTP workshop 'New Horizons in Environmental Mechanics, A Festschrift in Honour of John Finnigan', Boulder, CO, July 2023, co-convenor and invited speaker
- 100 years of turbulence: Innsbruck 1922-2022, Innsbruck, Austria, November 2022, invited speaker
- NSF sponsored NCAR/NEON workshop, Boulder, CO, April 2019, invited speaker.

- NSF workshop on: ‘Long-term biosphere-atmosphere chemical fluxes’, UC Irvine, November 2017, Irvine, CA, invited speaker.
- French National Institute for Agricultural Research (INRA) workshop on: ‘Mathematical Modelling of Wind Damage to Forests’, November 2015, Aracachon, France, invited speaker.
- EGU International Workshop on Land Atmosphere Interactions at the Regional Scale, Madrid, Spain, October 2012, invited speaker.
- North American Wind Energy Academy, Boulder, CO, August 2012, invited participant.
- Complex Flow Workshop, DOE Office of Energy Efficiency and Renewable Energy, Boulder, Colorado, January 2012, invited theme leader.
- Emerging remote sensing techniques and associated modeling for air pollution applications, 48th OHOLO Conference, Eilat, Israel, November 2011, invited speaker.
- NCAR/CISL/IMAGE/GTP Summer School on Geophysical Turbulence, July 2008, invited speaker.
- CarboEurope-Intergrated Project ADVEX Advection Workshop, Gembloux, Belgium, 30 June - 1 July 2008, invited speaker.
- International Summer School Session on Atmospheric Boundary Layers, Les Houches, France, June 2008, invited lecturer.
- Research Needs for Wind Resource Characterization, US Department of Energy, Broomfield, CO, January 2008, invited participant, wrote final report on Boundary-Layer Research Needs for the Micrositing and Array theme.
- Computational Research Needs in Alternative and Renewable Energy, US Department of Energy, Rockville, MD, September 2007, invited participant.
- On the Relevance of Surface and Boundary Layer Processes for the Exchanges of Reactive and Greenhouse Gases, Wageningen, The Netherlands, October 2007, invited speaker.
- Sedona International Workshop on Stable Boundary Layers, Sedona, AZ, November 2006, invited speaker.
- Planning a New Direction for Research Biogenic Hydrocarbons: Emissions, Aerosol Formation, and Climate Impacts, Boulder, CO, October 2006, invited.
- Turbulence and Scalar Transport in Roughness Sublayers, Boulder, CO, September, 2006, co-convenor.

J. INVITED PRESENTATIONS

1. Turbulence above and within vegetation canopies: insights from measurements and models, Workshop on Turbulence 1922-2022, Innsbruck, Austria, November 2022.
2. NCAR’s Boundary Layer Reinvestment Effort, MMM meeting with NSF AGS division director (Anjali Bamzai) and NSF Facilities Section Head (Sarah Ruth), February 2020.
3. Turbulence-resolving simulation of atmospheric boundary layers. NIST-UCAR collaboration meeting, December 2019.
4. Turbulent flow over 2D and 3D canopy-covered hills. CSIRO, Canberra, Australia, November 2019.
5. On the influence of wave propagation direction on surface stress. Whiffle Weather Finecasting, Delft, The Netherlands, August 2019.
6. Buoyancy influences on the interaction between canopy and boundary-layer scale turbulence. Whiffle Weather Finecasting, Delft, The Netherlands, August 2019.

7. Turbulent flow over 2D and 3D canopy-covered hills. TU Delft, Delft, The Netherlands, August 2019.
8. Turbulence resolving simulation. UCAR-NIST-Earth Networks collaboration meeting, July 2019.
9. Using turbulence-resolving simulations to understand biosphere/atmosphere exchange. NCAR/NEON workshop, Boulder, CO, April 2019.
10. NCAR's Boundary Layer Coordination Group, NCAR/RAL Thematic Internal Program Review, April 2019.
11. Turbulent flow over 2D and 3D canopy-covered hills. SCION, Christchurch, NZ, December 2018.
12. Biosphere-Atmosphere Exchange: Insights from Measurements and Models, The Pennsylvania State University, November 2018.
13. NCAR's Boundary Layer Working Group, NCAR/MMM Advisory Panel Meeting, August 2018.
14. NCAR's Boundary Layer Working Group, NCAR/ACOM Workshop on LES and Chemistry, August 2018.
15. Biosphere-Atmosphere Exchange: Insights from Measurements and Models, NCAR/ACOM Workshop on LES and Chemistry, August 2018.
16. Measuring sources and sinks aerodynamically. At: National Science Foundation sponsored workshop on: 'Long-term biosphere-atmosphere chemical fluxes', UC Irvine, November 2017, Irvine, CA.
17. Atmosphere-vegetation coupling: Implications for in-situ observations and modeling of energy, water and trace-gas exchange, 5th iLEAPS Conference, September 2017, Oxford, United Kingdom.
18. Large-eddy simulation of turbulent flow over canopy-covered hills. At: Scion Research, April 2017, Christchurch, New Zealand.
19. Biosphere-atmosphere exchange: insights from measurements and models. At: National Center for Atmospheric Research, Earth Observing Laboratory, October 2016, Boulder, Colorado.
20. Stability influences on transport of turbulent kinetic energy within a canopy: insight from simulations, observations, and... Bill Massman, American Meteorology Society's joint 32nd Conference on Agricultural and Forest Meteorology and the 18th Symposium on Boundary Layers and Turbulence session honoring Bill Massman, June 2016, Salt Lake City, UT.
21. Stability influences on canopy turbulence, Laboratoire d'Aérodynamique, Centre de Recherches Atmosphériques, National Institute for Earth Sciences and Astronomy, November 2015, Lannemezan, France.
22. Linking models from global- to forest-scales. At: French National Institute for Agricultural Research (INRA) sponsored workshop on 'Mathematical Modelling of Wind Damage to Forests', November 2015, Arcachon, France.
23. Stability influences on canopy turbulence. At: Technical University of Denmark, Risø Campus, June 2015, Roskilde, Denmark.
24. Non-equilibrium winds and waves: Impact on hub-height winds and surface stress. At:

- Technical University of Denmark, Risø Campus, June 2015, Roskilde, Denmark.
25. Impacts of stratification and non-equilibrium winds and waves on hub-height winds, At: U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Wind Power Peer Review March 2014, Arlington, Virginia,.
 26. Planetary boundary layer control of canopy turbulence; Impact of atmospheric stability, 7th IUFRO Conference on Wind and Trees, Águas de São Pedro, São Paulo, Brazil.
 27. Diabatic influences on canopy exchange. At: Department of Meteorology and Air Quality, Wageningen University, November 2013, Wageningen, The Netherlands.
 28. Non-equilibrium winds and waves: Impact on hub-height winds offshore, At: International Conference on Future Technologies for Wind, October 2013, Laramie, WY.
 29. Flow over complex terrain, At: Perdigão Experiment planning meeting, University of Notre Dame, July 2013, South Bend, Indiana.
 30. Canopy turbulence. At: Departamento de Engenharia Mecânica, University of Porto, October 2012, Porto, Portugal.
 31. The role of tall canopies and their interaction with atmospheric turbulence. At: The EGU's International Workshop on Land Atmosphere Interactions at the Regional Scale, October 2012, Madrid, Spain.
 32. Field and observing programs. At: MMM's Strategic Planning Retreat, August 2012, Allenspark, CO.
 33. The Canopy Horizontal Array Turbulence Study: Influence of canopy density and atmospheric stability on turbulent exchange. At: AGU Fall Meeting, December 2011, San Francisco, CA.
 34. Canopy Horizontal Array Turbulence Study. At: Emerging Remote Sensing Techniques and Associated Modeling for Air Pollution Applications, 48th OHOLO Conf., November 2011, Eilat, Israel.
 35. Coherent eddy structure over plant canopies. At: Coherent Flow Structures in Geophysical Flows at Earth's Surface, Simon Fraser University, August 2011, Burnaby, British Columbia, Canada.
 36. The Canopy Horizontal Array Turbulence Study (CHATS). At: Commonwealth Scientific and Industrial Research Organisation, April 2011, Canberra, Australia.
 37. Large-eddy simulation for wind characterization. At: Center for Research and Education in Wind (CREW), January 2011, Boulder, CO.
 38. Impact of a coupled canopy-soil model on canopy-resolving turbulence simulation. At: NASA Goddard Space Flight Center, Land-Surface Hydrology, January 2011, Greenbelt, MD.
 39. Organized motion in canopy turbulence. At: Centre National de la Recherche Scientifique (CNRS), November 2010, Toulouse, France.
 40. Canopy turbulence: Linking scales from the leaf to the boundary layer. At: NCAR BEACHON Open House, August 2010, Manitou Experimental Forest, Woodland Park, CO.
 41. Large-eddy simulation for wind characterization. At: NCAR Wind Energy Prediction - Research and Development Workshop, May 2010, Boulder, CO.
 42. Turbulent flow over orography; Impact of vegetation. At: Global Ecology Unit, CREAM-

- CEAB-CSIC, Universitat Autònoma de Barcelona, April 2010, Barcelona, Spain.
43. Scalar transport in the turbulent atmospheric boundary layer; Interactions with vegetation, land-surface heterogeneity, and reactivity. At: Global Ecology Unit, CREAM-CEAB-CSIC, Universitat Autònoma de Barcelona, April 2010, Barcelona, Spain.
 44. Simulation of geophysical boundary layers; Development of fundamental understanding and improved parameterizations for climate modeling. At: DOE Workshop on Large Scale Computing and Storage Requirements for Biological and Environmental Research, May 2009, Rockville, MD.
 45. Turbulent flow over orography; Impact of vegetation. At: University of California at Berkeley, Department of Civil and Environmental Engineering Seminar Series, May 2009, Berkeley, CA.
 46. Canopy turbulence. At: Iowa State University, April 2009, Ames, IA.
 47. WRF Modeling: Wind energy research and development. At: Wind Forecasting Workshop, Utility Wind Integration Group (UWIG), February 2009, Phoenix, AZ.
 48. An atmosphere-canopy-soil model for atmospheric simulation with land-surface coupling. At: Army Research Office - Atmospheric Sciences Overview, February 2009, Research Triangle Park, NC.
 49. Wind energy support at NCAR. At: NREL's National Wind Technology Center's meeting on National Laboratory Support for the wind energy forecasting industry. January 2009, NOAA Earth Systems Laboratory, Boulder, CO.
 50. Turbulence-vegetation interactions. At: NCAR's Institute for Integrative and Multidisciplinary Earth Studies (TIIMES) External Advisory Panel, November 2008, Boulder, CO.
 51. Turbulence-vegetation interactions. At: Briefing for Steve Nelson (NSF's Atmospheric Science Program Manager) representing NCAR's Institute for Integrative and Multidisciplinary Earth Studies (TIIMES), October 2008, Boulder, CO.
 52. Canopy turbulence. At: NCAR/CISL/IMAGE/GTP Theme of the Year Summer School on Geophysical Turbulence, July 2008, Boulder, CO.
 53. Large-eddy simulation (LES); Momentum and scalar transport in canopy-covered terrain. At: ADVEX Workshop, Faculté Universitaire des Sciences Agronomiques, July 2008, Gembloux, Belgium.
 54. Turbulence in canopies and orography. Lecture one: Canopy turbulence. At: Atmospheric Boundary Layers: Concepts, Observations and Numerical Simulations, Les Houches Summer School, École de Physique, June 2008, Les Houches, France.
 55. Turbulence in canopies and orography. Lecture two: Canopy-covered hills, At: Atmospheric Boundary Layers: Concepts, Observations and Numerical Simulations, Les Houches Summer School, École de Physique, June 2008, Les Houches, France.
 56. Canopy Turbulence: Impact of isolated ridges and other recent adventures. At: Wageningen University, October 2007, Wageningen, The Netherlands.
 57. Canopy Horizontal Array Turbulence Study (CHATS) - Directly linking measurements and models of ecosystem atmosphere exchange. At: TIIMES Retreat, October, 2007, Estes Park, CO.
 58. Turbulent flow over isolated ridges; influence of vegetation. At: Department of Atmospheric

- Science, University of California at Davis, November 2006, Davis, CA.
59. Canopy turbulence and nighttime cooling. At: Sedona International Workshop on Stable Boundary Layers (SABLE), November 2006, Sedona, AZ.
 60. Large-eddy simulation of the planetary boundary layer. At: Department of Mechanical Engineering, Tulane University, November 2004, New Orleans, LA.
 61. Influence of idealized heterogeneity on wet and dry planetary boundary layers coupled to the land-surface. At: Chequamegon Ecosystem Atmosphere Study Meeting, June 2003, Woodruff, WI.
 62. Influence of idealized heterogeneity on coupled PBL/land-surface interactions. At: The Pennsylvania State University, May 2001, University Park, PA.
 63. The influence of a forest canopy on top-down and bottom-up diffusion. At: University of Minnesota, July 1999, St. Paul, MN.
 64. Turbulence-chemistry interactions as impacted by a forest canopy. At: University of California at Davis, February 1998, Davis, CA.
 65. Large-eddy simulation of windbreak flow. At: HortResearch, June 1994, Kerikeri, New Zealand.
 66. Large-eddy simulation of turbulent flow above and within a forest canopy. At: Center for Environmental Mechanics, CSIRO, May 1994, Canberra, Australia.