

Jan Kleissl

Assistant Professor, University of California, San Diego
 Department of Mechanical & Aerospace Engineering
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Education

PhD. Johns Hopkins University, Department of Geography and Environmental Engineering, Baltimore, MD, 2004, Advisors: Marc B. Parlange, Charles Meneveau,

M.Sc. University of Stuttgart, Stuttgart, Germany, 2001, Water Resources Engineering and Management, Advisor: Prof. Dr.-Ing. Habil. Dr. rer. nat. A. Bardossy

Dipl. Ing. ('Diplom Ingenieur' = graduate engineer), University of Stuttgart, Stuttgart, Germany, 2000, Environmental Engineering (Umweltschutztechnik), Advisor: Prof. Dr. h.c. Dr.-Ing. Helmut Kobus, PhD.

Employment

Postdoctoral Fellow, Michigan Technological University, Advisor: Richard Honrath, 2004 – 2005, Field-experimental and numerical study of upslope and downslope flow for source attribution of ground-based trace-gas measurements.

Postdoctoral Fellow, New Mexico Tech, Advisor: Jan Hendrickx, 2006, Use of satellite imagery with scintillometer measurements to estimate evapotranspiration

Awards and Fellowships

- **2009 NSF CAREER Award**
- **2008 Trendsetters award by Public Works Magazine**
- **2008 Hellman Fellow** for tenure-track faculty of great promise
- **2008 UCSD Sustainability Award**
- **2004 UCAR Award for Outstanding Publication:**
 Horst T.W., J. Kleissl et al: Field observations to obtain spatially filtered turbulence fields from crosswind arrays of sonic anemometers in the atmospheric surface layer, *J. Atmos. Sci.*, 61, 1566-1581, 2004
- **Student Paper Award:** 15th Symposium on boundary layers and turbulence, American Meteorological Society, Wageningen, The Netherlands, July 2002

Grants (active in large font)

- J. Kleissl and J. Hendrickx, *Validation and improvement of remote sensing ET algorithms in mountainous regions*, USGS National Institute of Water Resources (NIWR), 2006-2008, \$149,589
- J. Kleissl (PI) and P.F. Linden, *Decision-Making using real-time observations for environmental sustainability (DEMROES)*, UCSD Facilities Management and Environment & Sustainability Initiative, 2007-2008, \$46,200
- J. Kleissl (PI), *Coupling Between Skin Temperature and Evapotranspiration*, **National Science Foundation**, 2007-2008, \$48,000
- M., P.F. Linden, and J. Kleissl (co-PI), *Personal perception of air pollution in the urban environment*, Set2 UK University consortium, 2008, \$40,000
- J. Kleissl (PI) and N. Lieven, *Optimizing sustainable resource use in minigrids using wireless sensor networks and decision algorithms*, Set2 UK University consortium, 2008, \$40,000
- J. Kleissl (PI) and C. Watts, *Testing models for Evapotranspiration using Large Aperture Scintillometers*, University of California Mexico-US program, 2008-2009, \$25,000
- Delson, J. Kleissl (co-PI) et al., *Microprocessor Upgrade for Mechanical and Environmental Engineering Courses*, UCSD, 2008, \$7,500
- J. Kleissl, *Radiative Modeling of Urban Heat Islands Using Wireless Sensor Network Data*, Hellman Foundation, 2008-2009, \$59,643
- Joseph Ford, Farrokh Najmabadi, J. Kleissl (co-PI), *California Solar Energy Collaborative*, \$305,000, California Energy Commission, 2009-2012
- J. Kleissl, *CAREER: Green Engineering of Urban Areas*, **National Science Foundation**, \$407,449, 2009-2014

- Washom, B., J. Kleissl (co-PI), *Improved Modeling Tools Development for High Penetration Solar*, **Department of Energy**, \$2,402,069, 2009-2012
- J. Kleissl, *Improving Economics of Solar Power Through Resource Analysis, Forecasting, and Dynamic System Modeling*, **California Public Utilities Commission Solar Initiative**, \$548,148, 2011-2013
- J. Kleissl, *Improving remote sensing algorithms for evapotranspiration using Large Aperture Scintillometry*, **NASA**, \$349,916, 2010-2013
- J. Kleissl, *Solar Forecasting for Energy Storage Applications*, **Sanyo Electric Corporation**, \$749,000, 2010-2013
- J. Kleissl, *Total Sky Imager Testing for Solar Forecasting at Sempra Generation 48 MW PV Plant*, **National Renewable Energy Laboratory**, \$128,820, 2011-2012
- J. Kleissl, B. Washom, *Smart-grid research and demonstration*, **California Energy Commission**, \$1,358,000, 7/2011 – 12/2013
- Enernex, J. Kleissl, Utility Scale Renewable Energy, **California Energy Commission**, \$442,136, 8/2011 – 7/2014
- AWS Truepower, J. Kleissl, Utility Scale Renewable Energy, **California Energy Commission**, \$450,000, 8/2011 – 7/2014
- Hal Slater, J. Kleissl, Geothermal Water Heater, **California Energy Commission Energy Innovations Small Grant**, \$95,000, 12/2011 – 9/2012
- Joseph Ford, Farrokh Najmabadi, J. Kleissl (co-PI), *California Solar Energy Collaborative*, \$144,994, **California Energy Commission**, 7/2012-6/2014
- J. Kleissl, *High-fidelity solar forecasting demonstration for grid-integration*, **California Public Utilities Commission Solar Initiative**, \$1,548,148, 2012-2014
- Sonia Martinez, J. Kleissl, *Optimal sizing and control of distributed storage devices in grid-connected photovoltaic systems*, National Science Foundation, \$449,720, 2013-2015
- J. Kleissl, *Sky Imager Deployment for Solar Forecasting on Maui*, **Office of Naval Research** Subcontract through University of Hawai'i, \$16,600, 2013
- Carlos Coimbra, J. Kleissl, *Intra-Hour Dispatch and Automatic Generator Control Demonstration with Solar Forecasting*, **US Department of Energy**, \$450,000, 10/2013-9/2015
- J. Kleissl, Carlos Coimbra, *Net Load Forecasting in California*, **US Department of Energy** subcontract through Clean Power Research, \$125,000, 10/2013-9/2015
- J. Kleissl, William Torre, *Grid Engineering for Accelerated Renewable Energy Deployment*, **Department of Energy** subcontract through Electricore, \$460,000, 10/2013 – 9/2018
- J. Kleissl, *Economic Benefits of Firm Concentrated PV Energy for the Grid*, **California Energy Commission** subcontract through Maxwell Inc., \$329,381, 7/2013 – 6/2016
- J. Kleissl, *PV Performance Modeling and Forecasting*, **San Diego Gas & Electric**, \$8,369, 2013
- J. Kleissl, *Energy-Efficient Refrigerator*, **US Department of Energy** subcontract through Lawrence Berkeley National Laboratory, \$40,000, 9/2013-6/2014.

Editorial Activities

Associate Editor – Solar Energy

Associate Editor – Urban Climate

Book Editor: Solar Resource Assessment and Forecasting, Elsevier, 2013

Publications - accepted

1. **Kleissl, J.**, C. Meneveau, and M.B. Parlange, 'On the magnitude and variability of subgrid-scale eddy-diffusion coefficients in the atmospheric boundary layer,' *J. Atmospheric Sciences*, 60, 2372-2388, 2003
2. **Kleissl, J.**, M.B. Parlange, and C. Meneveau, 'Field experimental study of dynamic Smagorinsky models in the atmospheric surface layer,' *J. Atmos. Sci.*, 61, 2296-2307, 2004
3. Horst, T.W., **J. Kleissl**, D.H. Lenschow, C. Meneveau, C.-H. Moeng, M.B. Parlange, P.P. Sullivan, and J.C. Weil, 'Field observations to obtain spatially-filtered turbulence fields from transverse arrays of sonic anemometers in the atmospheric surface layer,' *J. Atmos. Sci.*, 61, 1566-1581, 2004

4. Pahlow, M, **J. Kleissl**, M.B. Parlange, J.M. Ondov, and D. Harrison, 'Atmospheric boundary layer dynamics as observed during a haze event due to forest fire smoke,' *Boundary Layer Meteorology*, 114 (1), 53-70, 2005
5. A. Sapkota, J. M. Symons, **J. Kleissl**, L. Wang, M.B. Parlange, J. Ondov, P.A. Eggleston, T.J. Buckley, 'Impact of the 2002 forest fires on PM air quality in Baltimore City,' *Environmental Science and Technology*, 39 (1): 24-32, 2005
6. R.E. Honrath, R.C. Owen, M. Val Martin, J.S. Reid, K. Lapina, P. Fialho, M.P. Dziobak, **J. Kleissl**, D.L. Westphal, 'Regional and hemispheric impacts of anthropogenic and biomass burning emissions on summertime CO and O₃ in the North Atlantic lower free troposphere,' *J. Geophysical Res.–Atmospheres*, 109, D24310, 2005
7. **Kleissl, J.**, V. Kumar, M.B. Parlange, and C. Meneveau, 'Numerical study of dynamic Smagorinsky models in Large Eddy Simulation of the atmospheric boundary layer: Validation in stable and unstable conditions,' *Water Resources Research*, 42 (6), W06D10, 2006
8. Kumar, V., **J. Kleissl**, M.B. Parlange, and C. Meneveau, 'Large-Eddy Simulation of the diurnal cycle of the turbulent Atmospheric Boundary Layer: Atmospheric stability and scaling issues,' *Water Resources Res.*, 42(6), W06D09, 2006
9. **Kleissl, J.**, R.E. Honrath, D.V. Henriques, 'Analysis and application of Sheppard's airflow model to predict mechanical orographic lifting and the occurrence of mountain clouds,' *J. Applied Meteorology*, 45(10), pp. 1376–1387, 2006
10. Park, S.S., **J. Kleissl**, D. Harrison, N.P. Nair, V. Kumar, J. Ondov, 'Investigation of PM_{2.5} Episodes Using Semi-Continuous instruments at the Baltimore Supersite,' *Aerosol Sci. Tech.*, 40 (10): 845-860, 2006
11. **Kleissl, J.**, R.E. Honrath, M.P. Dziobak, D. Tanner, M. Val-Martin, R.C. Owen, D. Helmig, 'The occurrence of upslope flows at the Pico mountaintop atmospheric observatory: a case study of orographic flows on small, volcanic islands,' *J. of Geophysical Research – Atmospheres*, 112, D10S35, doi:10.1029/2006JD007565, 2007
12. Van Hout, R., W. Zhu, L. Luznik, J. Katz, **J. Kleissl**, M.B. Parlange: PIV measurements in the atmospheric boundary layer within and above a mature corn canopy. Part A: statistics and small scale isotropy,' *J. Atmos. Sci.*, 64(8), 2805-2824, 2007
13. **Kleissl, J.**, J. Gomez, S.-H. Hong, J.M.H. Hendrickx, T. Rahn, W.L. Defoor, 'Large Aperture Scintillometer Intercomparison Study', *Bound.-Layer Meteorol.*, 128(1), 133-150, 2008
14. **Kleissl, J.**, S.-H. Hong, J.M.H. Hendrickx, 'New Mexico Scintillometer Network in Support of Remote Sensing, and Hydrologic and Meteorological Models', *Bull. Amer. Meteorol. Society*, 90(2): 207-218, 2009
15. **Kleissl, J.**, C. Watts, J. Conrod, S. Naif, 'Large Aperture Scintillometer Intercomparison Study - continued', *Boundary Layer Meteorology*, **130**: 437–443, 2009
16. Zeweldi, D.A., M. Gebremichael, J. Wang, T. Sammis, **J. Kleissl** and D. Miller, Intercomparison of Sensible Heat Flux from Large Aperture Scintillometer and Eddy Covariance methods: Field Experiment over a Homogeneous Semiarid Region, *Boundary-Layer Meteorol.*, DOI: 10.1007/s10546-009-9460-9, 2010
17. Yaghoobian N, **Kleissl J**, Krayenhoff ES, 'Modeling The Thermal Effects of Artificial Turf on the Urban Environment', *J. Applied Meteorology and Climatology*, 49(3), 332–345, 2010
18. Lave M, **Kleissl J**, 'Solar Intermittency of Four Sites Across the State of Colorado', *Renewable Energy*, 35:2867-2873, 2010
19. Nottrott A, **Kleissl J**, Validation of the SUNY NSRDB global horizontal irradiance in California, *Solar Energy*, 84:1816–1827, 2010
20. Garai A, **Kleissl J**, Llewellyn-Smith SG, Estimation of biomass heat storage using thermal infrared imagery: Application to a walnut orchard, *Boundary-Layer Meteorology*, 137:333–342, 2010
21. Lave M, **Kleissl J**, Optimum fixed orientations and benefits of tracking for capturing solar radiation in the continental United States, *Renewable Energy*, 36:1145-1152, 2011
22. **Kleissl J**, O.K. Hartogensis, J.D. Gomez, Test of scintillometer saturation correction methods using field experimental data, *Boundary-Layer Meteorology*, DOI 10.1007/s10546-010-9540-x, 2010
23. E.G. Patton, 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**, The Canopy Horizontal Array Turbulence Study (CHATS), *Bulletin of the American Meteorological Society*, 593-611, May 2011

24. Dominguez A., **Kleissl J**, Luvall JC, Rickman DL, Development of a High-resolution Urban Thermal Sharpener (HUTS), *Remote Sensing of Environment*, 115(7):1772-1780, 2011
25. Nikolopoulou M, **Kleissl J**, Linden PF, Pedestrians' perception of environmental stimuli through field surveys: focus on particulate pollution, *Science of the Total Environment*, 409(13), 2493-2502, 2011
26. A. Nottrott, S. Onomura, M. Kanda, A. Inagaki and **J. Kleissl**, Convective heat transfer regime on leeward building walls in an urban environment, *International Journal of Heat and Mass Transfer*, 54(15):3128-3138, 2011
27. Mathiesen P, **Kleissl J**, Evaluation of numerical weather prediction for intra-day hourly solar irradiance forecasting in the CONUS, *Solar Energy*, 85(5): 967-977, 2011
28. Dominguez A, **Kleissl J**, Luvall JC, Effects of Solar Photovoltaic Panels on Roof Heat Transfer, *Solar Energy*, doi:10.1016/j.solener.2011.06.010, 85(9): 2244-2255, 2011
29. Lave, M., **J. Kleissl**, Arias-Castro, E., High-frequency fluctuations in clear-sky index, *Solar Energy*, doi:10.1016/j.solener.2011.06.031, 2011
30. Garai, A, **Kleissl J**, Air and surface temperature coupling in the convective atmospheric boundary layer, *J. Atmospheric Sciences*, doi: 10.1175/JAS-D-11-057.
31. Luoma, J, **J Kleissl**, K Murray, Optimum inverter sizing considering cloud enhancement, *Solar Energy*, 86(1):421-429.
32. Chow CW, Urquhart B, **Kleissl J**, Lave M, Dominguez A, Shields J, Washom B, Intra-hour forecasting with a total sky imager at the UC San Diego solar energy testbed, *Solar Energy*, doi:10.1016/j.solener.2011.08.025, 2011
33. Sun, L., Nottrott, A., **J Kleissl**, Effect of hilly urban morphology on dispersion characteristics in the urban boundary layer, *Buildings and Environment*, 48:195-205, 2012.
34. Yaghoobian, N., **J Kleissl**, An Indoor-Outdoor Building Energy Simulator to Study Urban Modification effects on Building Energy Use – Model Description and Validation, *Energy and Buildings*, 54: 407-417, 2012, <http://dx.doi.org/10.1016/j.enbuild.2012.07.019>
35. Yaghoobian, N., **J Kleissl**, Effect of Reflective Pavements on Building Energy Use, *J. Urban Climate*, <http://dx.doi.org/10.1016/j.uclim.2012.09.002>
36. Lave M, **J Kleissl**, J Stein, A Wavelet-based Variability Model (WVM) for Solar PV Powerplants, *IEEE Transactions on Sustainable Energy*, 99, 2012, 10.1109/TSTE.2012.2205716
37. M Jamaly, JL Bosch, **J Kleissl**, Aggregate Ramp Rates of Distributed Photovoltaic Systems in San Diego County, *IEEE Transactions on Sustainable Energy*, 99, 2012, [10.1109/TSTE.2012.2201966](http://dx.doi.org/10.1109/TSTE.2012.2201966)
38. Mathiesen, P, J Brown, **J Kleissl**, Regime-Based California NWP Probabilistic Irradiance Forecasts, *IEEE Transactions on Sustainable Energy*, 99, 2012 [10.1109/TSTE.2012.2200704](http://dx.doi.org/10.1109/TSTE.2012.2200704).
39. Ru, Y, **J Kleissl**, S Martinez, Storage Size Determination for Grid-Connected Photovoltaic Systems, *IEEE Transactions on Sustainable Energy*, 99, 2012 [10.1109/TSTE.2012.2199339](http://dx.doi.org/10.1109/TSTE.2012.2199339)
40. Hoff, T. E., Perez, R., Kleissl, J., Renne, D. and Stein, J. (2012), Reporting of irradiance modeling relative prediction errors. *Prog. Photovolt: Res. Appl.* doi: 10.1002/pip.2225
41. Ghonima, M, **J Kleissl**, A Method for Cloud Classification Based on Ground Based Sky Imagery, *Atmospheric Measurement Technology*, 5, 2881-2892, 2012.
42. Luoma, J, **J Kleissl**, Determination of forecast value considering energy pricing in California, submitted to *Applied Energy*
43. Nottrott, A, **J Kleissl**, Energy dispatch schedule optimization and cost benefit analysis for grid-connected, photovoltaic-battery storage systems, *Renewable Energy*, 55:230-240, 2013.
44. Bosch JL, Y Zheng, **J Kleissl**, Deriving cloud velocity from an array of solar radiation measurements, *Solar Energy*, 87: 196-203, 2013, 10.1016/j.solener.2012.10.020.
45. Carrasco-Benavides M, S. Ortega-Farías, LO Lagos, **J Kleissl**, L Morales, C Poblete-Echeverría, RG Allen, Crop coefficients and actual evapotranspiration for a drip-irrigated Merlot vineyard using multispectral satellite images, *Irrigation Science*, DOI: 10.1007/s00271-012-0379-4, 2012
46. Garai A, **J Kleissl**, Surface temperature and surface layer turbulence in a convective boundary layer, *Boundary-Layer Meteorology*, in press
47. Mathiesen, P, C Collier, J Kleissl, A high-resolution, cloud-assimilating numerical weather prediction model for solar irradiance forecasting, *Solar Energy*, 92:47-61, 10.1016/j.solener.2013.02.018., 2013.

48. Lave, M, J Kleissl, Cloud Speed Impact on Solar Variability Scaling - Application to the Wavelet Variability Model, *Solar Energy*, 91:11-21, 10.1016/j.solener.2013.01.023., 2013.
49. Bosch JL, Kleissl J, Cloud motion vectors from a network of ground sensors in a solar power plant, *Solar Energy*, 95:13-20, 10.1016/j.solener.2013.05.027, 2013.
50. Mejia F, J Kleissl, Soiling Losses for Solar Photovoltaic Systems in California, *Solar Energy*, 95:357-363, 2013.
51. Nottrott A, J Kleissl, R Keeling, Modeling passive scalar dispersion in the atmospheric boundary layer with WRF large eddy simulation, *Atmospheric Environment*, 82:172-182, 2014.
52. Garai A, **J Kleissl**, Surface temperature and surface layer turbulence in a convective boundary layer, *J. Turbulence*, 14(8):1-23, 2013.
53. Ery Arias Castro, Jan Kleissl, Matthew Lave, Jason Schweinsberg, Ruth Williams, A Poisson model for anisotropic solar ramp rate correlations, accepted pending revisions in *Solar Energy*, 2013.
54. Fung, V., JL Bosch, S Roberts, J Kleissl, Cloud Speed Sensor, *Atmospheric Measurement Techniques*, 2013.
- 55-59. papers currently under review.

Book Chapters

60. Bryan Urquhart, Mohamed Ghonima, Dung Nguyen, Ben Kurtz, Chi Wai Chow and Jan Kleissl, Sky Imaging Systems for Short-term Forecasting, in: *Solar Resource Assessment and Forecasting* (Editor Jan Kleissl), Elsevier, 2013
61. Patrick Mathiesen, Craig Collier, and Jan Kleissl, Solar Forecasting Case Studies with the Weather and Research Forecasting Model at GL-Garrad Hassan, in: *Solar Resource Assessment and Forecasting* (Editor Jan Kleissl), Elsevier, 2013
62. Coimbra, C., J Kleissl, R Marquez, in: *Solar Resource Assessment and Forecasting* (Editor Jan Kleissl), Elsevier, 2013
63. Lave M., J. Stein, J Kleissl, Quantifying and Simulating Solar Power Plant Variability using Irradiance Data, in: *Solar Resource Assessment and Forecasting* (Editor Jan Kleissl), Elsevier, 2013

Published Abstracts

- **Kleissl, J.**, C. Meneveau, and M.B. Parlange, 'A priori study of the scale-dependent dynamic model from HATS field data,' *Bulletin of the American Physical Society*, 56th Annual Meeting of the Division of Fluid Dynamics, Vol. 48, No. 10, Meadowlands, NJ, Nov 2003, p. 195
- **Kleissl, J.**, C. Meneveau, and M.B. Parlange, 'Statistical analysis of subfilter-scale model coefficients from measurements in the atmospheric surface layer,' *Bulletin of the American Physical Society*, 55th Annual Meeting of the Division of Fluid Dynamics, Vol. 47, No. 10, Dallas, TX, Nov 2002, p. 165
- **Kleissl, J.**, C. Meneveau, and M.B. Parlange, 'Effects of stability and filter size on model coefficients and intermittency of subfilter fluxes in the atmospheric boundary layer,' *AMS 15th Symposium on Boundary Layers and Turbulence*, July 2002, Wageningen, The Netherlands, pp. 467-468
- **Kleissl, J.**, C. Meneveau and M.B. Parlange, 'Field measurements for subgrid-scale modeling in the atmospheric boundary layer,' *Extended abstract CD of 3rd International Symposium on Environmental Hydraulics*, 2001, Tempe, AZ

Presentations in Conferences and Congresses

Too many to list

Teaching Experience

- **Instructor:**
 - Applied Boundary Layer Meteorology, S2005, Michigan Technol. Univ.
 - Environmental Physics for Evapotranspiration, S2006, New Mexico Tech
 - MAE125A Environmental Flows and Transport, F2007, F2008, F2009
 - MAE126B Environmental Engineering Research, S2007, S2008, S2009, S2010, S2011, S2012, S2013

- MAE199: independent research
- MAE255: Boundary Layer and Renewable Energy Meteorology, S2009, S2012
- MAE110A: Thermodynamics (F2009, W2011, W2014)
- MAE126A: Laboratory Experiments (W2011, W2012, W2013, W2014)
- **Teaching Assistant:** Applied Mathematics for Engineering (graduate, F2002, F2001, S2001), Hydrology (graduate, F2000), JHU

Field Measurement Campaigns

- **Scintillometers:** New Mexico, 2005: Sensible heat flux measurements over dry and humid transects as ground-truth for satellite estimates using SEBAL
- **Mountain Meteorology:** Azores, Summer 2004: Wireless sensors, meteorological measurements, and MODIS satellite data are collected to study upslope and down-slope flow on the slope of a mountain in the North Atlantic.
- **Evapotranspiration over vineyards:** February 2003 & October 2005, Eddy correlation studies of evaporation over vineyards in collaboration with Universidad de Talca, Chile.
- **Biocomplexity in the Environment:** Instrumentation to measure the emission and transport of biological aerosols (pollen) in the atmosphere, July 2003, Hurlock, MD.
- **SGS2002** (SubGrid-Scale experiment), Salt Flats, UT, June 2002: Deployment of sixteen 3D-sonic anemometers to study subgrid-scale physics for large eddy simulation. Other collaborators examine turbulence at high Reynolds numbers.
- **Baltimore Supersite Study**, May 2001 – February 2003: Conducted lidar measurements to determine atmospheric boundary layer height, entrainment dynamics and plume characteristics. Meteorological measurements support source attribution of highly time and size resolved concentrations of PM_{2.5}.
- **HATS** (Horizontal Array Turbulence Study), Kettleman City, CA, September 2000, in collaboration with NCAR-ATD and MMM: Deployment of fourteen 3D-sonic anemometers in the central valley of CA to study subgrid-scale physics for large eddy simulation.

Professional Affiliations

American Meteorological Society, American Geophysical Union, American Physical Society Division of Fluid Dynamics, European Geophysical Society, American Solar Energy Society (Chair, Resource Applications Division)

Special Skills

- **Private Pilot Certificate**
- **Languages:** Fluent in German, English, Spanish, French.