

RICHARD H. GRANT
Professor of Agro-micrometeorology
Department of Agronomy, Purdue University

Education

B.S.	1977	Duke University (Distinction)	1974-1977
M.F.S.	1979	Yale School of Forestry	1977-1979
Ph.D.	1982	State University of New York, College of Environmental Science and Forestry	1979-1982

Professional Experience

1982-1984	Post Doctoral study, State University of New York, College of Environmental Science and Forestry.
1984-1985	Research Assistant Professor, State University of New York, College of Environmental Science and Forestry.
1985-1992	Assistant Professor, Purdue University.
1992-1998	Associate Professor, Purdue University.
1994-1995	Visiting Professor, Institute of Meteorology and Physics, Agricultural University of Austria, Vienna, Austria.
1998-present	Professor, Purdue University.

Teaching Experience

Teaching of upper level undergraduate courses in Boundary Layer Meteorology (3 yrs), Environmental Biophysics (14 yrs), Operational Meteorology (1 yr). Teaching of introductory Weather and Climate course (20 yrs). Teaching of graduate level course in Micrometeorology (5 yrs).

Memberships in Academic, Professional and Scholarly Societies

American Geophysical Union	American Meteorological Society
American Society of Agronomy	American Society for Photobiology
International Society of Biometeorology	International Solar Energy Society
Sigma Xi honorary research Society	Gamma Sigma Delta honorary agriculture research Society

Award and Honors

2001 Certificate of Excellence, Educational Materials Award, American Society of Agronomy
2004 Dean's Team Award, "Agricultural Air Quality Team", Purdue University, College of Agriculture

National and International offices held

- Chair, Board of Directors, Global Involvement through Education, 2004-present
- Chair, National Atmospheric Deposition Program (USA), 1995-1996, 2002-2003.
- American Meteorological Society Comm. on Biometeorol. and Aerobiol., 1986-1988.
- Editorial Board of the *International Journal of Biometeorology*, 1994-2004.
- Chair, Agriculture, Forest, and Climate Study Group, Int. Society of Biometeorology, 1990-1999.
- Chair, UVB Effects Study Group, Int. Society of Biometeorology, 1999-2002.
- Centennial Cooperative Weather Station Comm. organized jointly by the National Oceanic and Atmospheric Admin. and the USDA Cooperative States Research Service, 1989-1990.

University/ College Committee activity

Curriculum and Student Relations Committee, College of Agriculture, 2003-2006
Executive Committee, Purdue Climate Change Research Center, 2004-2007
Grade Appeals Committee, College of Agriculture, 1991-3
Grievance Committee, College of Agriculture, 1994

International travel experience

Austria, Australia, Canada, Czech Republic, Croatia, Egypt, England, France, Germany, Hungary, India, Japan, Kazakhstan, Morocco, Papua New Guinea, Peoples Republic of China, Russia, Singapore, Slovenia, Slovakia, Turkey, Uzbekistan

Refereed Papers

1. Grant, R.H. 1983. The scaling of flow in vegetative structures. *Boundary-Layer Meteorol.* 27:171-184.
2. Grant, R.H. 1984. The mutual interference of spruce canopy structural elements. *Agric. and Forest Meteorol.* 32:145-156.

3. Grant, R.H.; G.E. Bertolin; and L.P. Herrington. 1985. Intermittent heat flux over a spruce forest canopy. *Boundary-Layer Meteorol.* 35:317-330.
4. Grant, R.H. 1985. The influence of the physical attributes of a shoot on momentum transfer. *Agric. and Forest Meteorol.* 36:7-18.
5. Grant, R.H. 1985. The influence of the sky radiance distribution on the flux density in the shadow of a tree crown. *Agric. and Forest Meteorol.* 35:59-70.
6. Gorres, J; R. Grant; T. Cresson; and P. Luner. 1986. The effect of drainage on randomly formed papers: a simulation study. *Tappi J.* 69:104-105.
7. Grant, R.H. 1987. Atmospheric wet deposition relationships to season and precipitation in SW Indiana. *Proc. Indiana Academy of Sciences.* 97:497-508.
8. Grant, R.H. 1988. Interactions between summer storms and photochemical air quality in SW Indiana. *Proc. Indiana Academy of Sciences.* 98:473-483.
9. Grant, R.H. and K. Seevers. 1989. Local and long range movement of adult western corn rootworm (*Diabrotica virgifera virgifera*) as evidenced by washup along southern Lake Michigan shores. *Environmental Entomology* 18:266-272.
10. Grant, R.H.; G.M. Heisler and L.P. Herrington. 1989. Evaluation of a technique to identify windy locations in urban areas. *J. Industrial Aerodynamics and Wind Eng.* 31:335-341
11. Grant, R.H. and W.W. McFee. 1989. The relationship between Cl, Na and SO₄ particulate concentrations and air masses. *J. Appl. Meteorol.* 28:185-193.
12. Grant, R.H. and K.S. Seevers. 1990. The vertical movement of adult Western Corn Rootworm (*Diabrotica virgifera virgifera*) relative to the transport of momentum and heat. *Agric. and Forest Meteorol.* 49:191-203
13. Grant, R.H. 1991. Ultraviolet and photosynthetically active bands: plane surface irradiance at corn canopy base. *Agron. J.* 83:391-396.
14. Flesch, T.K. and R.H. Grant. 1991. The translation of wind energy to corn motion during senescence. *Boundary-Layer Meteorol.* 55:161-176.
15. Scheidt, A.B.; L.R. Rueff; R.H. Grant; L.K. Clark; M.A. Hill; and R.F. Teclaw. 1991. Epizootic of pseudorabies among 10 swine herds. *J. Am. Vet. Med. Assoc.* 199:725-730.
16. Flesch, T.K. and R.H. Grant. 1992. Wind flow within open-top growth chambers and the gas exchange implications. *J. Environ. Qual.* 21(1):49-56.
17. Flesch, T.K. and R.H. Grant. 1992. Corn motion in the wind during senescence, I. motion characteristics. *Agron. J.* 84:742-747.
18. Flesch, T.K. and R.H. Grant. 1992. Corn motion in the wind during senescence, II. effect of dynamic plant characteristics. *Agron. J.* 84:748-751.
19. Grant, R.H.; Scheidt, A.B.; L.R. Rueff. 1994. Aerosol transmission of a viable virus affecting swine: an explanation of an epizootic of pseudorabies. *Int. J. Biometeorol.* 38:33-39
20. Grant, R.H.; M. Jenks; P. Peters; E. Ashworth. 1995. Scattering of ultraviolet and photosynthetically active radiation by sorghum bicolor: influence of epicuticular wax. *Agric. Forest Meteorol.* 75:263-281
21. Grant, R.H.; G.M. Heisler. 1996. Solar ultraviolet-B and photosynthetically-active irradiance in the urban sub-canopy: a survey of influences. *Int. J. Biometeorol.* 39:201-212.
22. Grant, R.H.; W. Gao and G.M. Heisler. 1996. Photosynthetically-active radiation: sky radiance distributions under clear and overcast conditions. *Agric. Forest Meteorol.* 82:267-292.
23. Grant, R.H.; G.M. Heisler, and W. Gao. 1996. Clear sky radiance distributions in ultraviolet wavelength bands. *J. Theor. and Applied Climatol.* 56:123-135.
24. Grant, R.H. 1997. The partitioning of biologically-active radiation in plant canopies. *Int. J. Biometeorol.* 40:26-40.
25. McPherson, E.G.; D. Nowak; G. Heisler; S. Grimmond; C. Souch; R. Grant and R. Rowntree. 1997. Quantifying urban forest structure, function and value: The Chicago Urban Forest Climate project. *Urban Ecosystems* 1: 49-61.
26. Grant, R.H. 1997. Biologically-active radiation in the vicinity of a single tree. *Photochem. Photobiol.* 65:974-982
27. Grant, R.H.; G.M. Heisler and W. Gao. 1997. Ultraviolet sky radiance distributions of translucent overcast skies. *J. Theor. and Applied Climatol.* 58:129-139.
28. Grant, R.H. 1997. Shadow-band corrections for photosynthetically -active radiation measurements under clear and overcast conditions. *Agric. Forest Meteorol.* 87:213-222.
29. Grant, R.H. and G.M. Heisler. 1997. Obscured overcast sky radiance distributions for the ultraviolet and photosynthetically-active radiation wavebands. *J. Appl. Meteorol.* 36:1336-1345.
30. Grant, R.H. 1998. Ultraviolet irradiance of inclined planes at the top of plant canopies. *Agric. Forest Meteorol.* 89: 281-293.
31. Grant, R.H. and K.L. Wong. 1999. Ozone profiles over a suburban neighborhood. *Atmos. Environ.* 33: 51-63.
32. Grant, R.H. 1999. Ultraviolet-B and photosynthetically active radiation environment of inclined leaf surfaces in a maize canopy. *Agric. Forest Meteorol.* 95:187-201.
33. Grant, R.H. 1999. Potential effect of soybean heliotropism on ultraviolet-B irradiance and dose. *Agron. J.* 91:1017-1023

34. Grant, R.H. and G.M. Heisler. 2000. Estimation of ultraviolet-B radiant flux density under variable cloud conditions. *J. Appl. Meteorol.* 39:904-916.
35. O'Neal, M.R.; J.R. Frankenberger; D.R. Ess; and R.H. Grant. 2000. Precipitation variability at the farm scale during crop phenological stages. *Trans., Amer. Soc. Agric. Engineers* 43:1449-1458.
36. Heisler, G.M. and R.H. Grant. 2000. Ultraviolet radiation in urban ecosystems with consideration of effects on human health. *Urban Ecosystems* 4: 195-231.
37. Grant, R.H. and G.M. Heisler. 2001. Multi-spectral solar irradiance on tree-shaded vertical and horizontal surfaces: cloud-free and partly-cloudy skies. *Photochem. Photobiol.* 73:24-31.
38. Grant, R.H., G.M. Heisler, and W. Gao. 2002. Estimation of pedestrian level UV exposure under trees. *Photochem. Photobiol.* 75:369-376.
39. Gao, W., R.H. Grant and G.M. Heisler. 2002. A geometric UV-B radiation transfer model applied to agricultural vegetation canopies. *Agron. J.* 94:475-482.
40. Grant, R.H. and K.L. Scheeringa. 2002. Estimating climate effects on the atmospheric contribution to potential available inorganic nitrogen in Eastern United States soils. *Atmos. Environ.* 36 :1619-1630
41. Grant, R.H. and W. Gao. 2003. Diffuse fraction of UV radiation under partly cloudy skies. *J. Geophysical Research* 108, D2, doi: 10.1029/2002JD002201
42. Grant, R.H. and J. Slusser. 2003. Interpolation of UVB radiation across the contiguous US. *Theoretical and Applied Climatology* 74:167-177, doi: 10.1007/s00704-002-0719-z
43. Grant, R.H., W. Gao, M. Jenks, and G.M. Heisler. 2003. Ultraviolet leaf reflectance of common urban trees and the prediction of reflectance from leaf surface characteristics. *Agric. Forest Meteorol.* 120: 127-139.
44. Bawhey, C.I. and R.H. Grant. 2003. Approaches to estimating soybean cultivar exposure to ambient radiation. *Agric. Forest Meteorol.* 120: 161-175
45. Gao, W., R.H. Grant, G.M. Heisler, and J.R. Slusser. 2003. Ultraviolet-B Radiation in a Row-crop Canopy: An extended 1-D Model. *Agric. Forest Meteorol.* 120: 141-151.
46. Heisler, G.M., R.H. Grant, and W. Gao 2003. Individual and scattered tree influences on ultraviolet irradiance. *Agric. Forest Meteorol.* 120: 113-126
47. Zheng, Y., W. Gao, J.R. Slusser, R.H. Grant and C. Wang. 2003. Winter wheat response to enhanced solar ultraviolet radiation. *Agric. Forest Meteorol.* 120: 279-283.
48. Heisler, G.M., R.H. Grant, W. Gao and J. Slusser. 2003. Ultraviolet radiation and its impacts on agriculture and forests: Forward. *Agric. Forest Meteorol.* 120: 3-7.
49. Grant, R.H. and J.R. Slusser. 2004. Estimation of photosynthetic photon flux density from 368 nm spectral irradiance. *J. Atmos. & Ocean. Technology* 21: 481-487.
50. Gao, W., Y. Zheng, J. Slusser, G. Heisler, R. Grant, J. Xu, D. He. 2004. Effects of supplementary ultraviolet-B irradiance on maize yield and qualities: a field experiment. *Photochem. Photobiol.* 80:127-131.
51. Grant, R.H., S.E. Hollinger, K.G. Hubbard, G. Hoogenboom, and R.L. Vanderlip. 2004. Ability to predict daily solar radiation values from interpolated climate records for use in crop simulation models. *Agric. Forest Meteorol.* 127:65-75.
52. Heisler, G.M., R.H. Grant, W. Gao, and J.R. Slusser. 2004. Solar ultraviolet-B radiation in urban environments: The case of Baltimore, Maryland. *Photochem. Photobiol.* 80: 422-428.
53. Grant, R.H. and J.R. Slusser. 2005. High UVB exposures in the continental USA: towards realistic short term exposure regimes for plant effects research. *Photochem. Photobiol.* 81: 1038-1046
54. Grant, R.H. and J.R. Slusser. 2005. Estimation of ultraviolet-A irradiance from measurements of 368-nm spectral irradiance. *J. Atmos. & Ocean. Technology* 22: 2853-2863.
55. Grant, R.H., K. Apostol, and W. Gao. 2005. Biologically effective UV-B exposures of an oak-hickory forest understory during leafout. *Agric. Forest Meteorol* 132: 28-43.
56. Grant, R.H. and G.M. Heisler. 2006. Effect of cloud cover on UVB exposure under tree canopies: will climate change affect UVB exposure? *Photochem. Photobiol.* 82: 487-494.
57. Malladi, A., R.H. Grant, and P. Hirst. Bloom delay in peach III: modeling and evaluation of reduction in risk of freeze damage by plant growth regulator applications. *Am. J. Horticultural Sci.* (accepted with revision)

Other Publications

1. Herrington, L.P. and R.H. Grant. 1982. *Wind tunnel evaluation of aerodynamic drag coefficients of spruce foliage elements*. Final Rpt., USDA Forest Service Northeast Forest Experiment Station project 23-180. SUNY-CESF. 40 p.
2. Grant, R.H. and L.P. Herrington. 1982,83,84,85. Semiannual report(s) of the *Jamesville Quarry Noise Study*. Reports to Allied Corp., Nedrow, NY. 15 p.
3. Gorres, J., P. Luner; and R. Grant. 1984. Simulation of paper structure using an image analysis system. pp 239-252 in *Research Report no. 80.*, Empire State Paper Research Institute., SUNY-CESF.
4. Grant, R.H.; L.P. Herrington; G.M. Heisler. 1984. *The simulation of radiant heat loading in the shadow of a tree*. Final Rpt., USDA Forest Service Northeast Forest Experiment Station project 23-702. 52 p.

5. Grant, R.H. 1984 and 1985. *Statistical noise study of the Clark-Dunn minesite*. Report to W.A. Aggregates, Inc. Pheonix, NY. 10 p.
6. Grant, R.H.; L.P. Herrington; and G.M. Heisler. 1985. *Test of the ability of a wind tunnel model to predict urban wind patterns*. Final Rpt., USDA Forest Service Northeast Forest Exp. Station project # 23- 599. 18p.
7. Grant, R.H. 1986. *The influence of the spatial pattern of vegetation on the Urban Heat Island*. Report to the U.S. Forest Service Northeast Forest Exp. Station. 20 p.
8. Grant, R.H. 1990. *Effects of vegetation on internal boundary layer profiles over suburban West Lafayette, Indiana*. Report to the U.S. Forest Service Northeast Forest Exp. Station project # 23-077. 22 p.
9. Westbrook, J.K.; D.M. Driscoll; R.H. Shaw; K.T. Paw U; R. Avissar; R.H. Grant; G.L. Hahn. 1992. Summary of the American Meteorological Society 10th Conference on Biometeorology and Aerobiology, 10-13 Sept. 1991, Salt Lake City, UT. *Bull. Amer Meteorological Soc.* 73: 473-476
10. Grant, R.H. 1993. Ultraviolet solar radiation: characterization and canopy distribution. p45-62 in (C. Varlet-Grancher, R. Bonhomme, & H. Sinoquet; eds.) *Crop structure and light microclimate: characterization and applications* INRA Editions, Versailles Cedex, France.
11. Grant, R.H. 1993. *Chicago, Ill climate and mesoclimate*. Report to the U.S. Forest Service Northeast Forest Exp. Station project # 23- 685, 33p.
12. Grant, R.H. 1994. *Prediction of subcanopy urban climates for Chicago Ill*. Final Rpt., USDA Forest Service Northeast Forest Exp. Station project # 23- 685. 44p
13. Grant, R.H. 1994 *UV irradiance measurements in urban environments. Sensor system response studies of the UVA and UVB irradiance sensor systems*. Rpt. to the US Forest Service Northeast Forest Exp. Station project #23-793.
14. Grimmond, S.; C. Souch; R.H. Grant; and G.M. Heisler. 1994. Local scale energy and water exchanges in a Chicago neighborhood. pp 41-62 in (McPherson, E.G.; D.J. Nowak; and R.A. Rowntree, eds.) *Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project*. USDA-FS General Tech. Rpt. NE-186.
15. Heisler, G.M.; S. Grimmond; R.H. Grant; and C. Souch. 1994. Investigation of the influence of Chicago's Urban Forests on wind and air temperature within residential neighborhoods. pp 19-40 In (McPherson, E.G.; D.J. Nowak; and R.A. Rowntree, eds.) *Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project*. USDA-FS General Tech. Rpt. NE-186.
16. Grant, R.H. and R. F. Dale. 1994. *Heating degree day forecasting at Indianapolis IN and Louisville KY*. Rpt to Indiana Gas, Inc., 20p.
17. Heber, A.J.; T.T. Lim; J. Q. Ni; R.H. Grant and A.L. Sutton. 1999. Development of a Site-Specific Odor Impact Guideline for Swine Production Systems. Project No. 98-131. Final Report to the National Pork Producers Council, September 30.
18. Heisler, G.M. and R.H. Grant. 2000. *Ultraviolet radiation, human health, and the urban forest*. Northeastern Experiment Station, USDA Forest Service. USDA-FS General Tech. Rpt. NE-268.
19. O'Neal, M., J. Frankenberger, and R. Grant. 2000. Weather information systems for site-specific farming. pp. 116-124 In: J. Lowenberg-DeeBoer (Ed.) " *Precision Farming Profitability*", Agricultural Research Program, Purdue University, SSM-3.
20. Grant, R.H. and G.M. Heisler. 2000. Modeling UV irradiance in open tree canopies: estimation of pedestrian level exposure. pp 9-14 in DeDear, R., Kalma, J., Oke, T. and Auliciems, A., Eds. *Biometeorology and urban climatology at the turn of the Millenium*, World Meteorological Organization, WCASP-50, WMO/TD No. 1026
21. National Atmospheric Deposition Program. 2000. Nitrogen in the Nation's rain. NADP Brochure. NADP Program office, Champaign, IL, 13p. (E. Kingston, V. Bowersox, G. Zorrilla, Eds.; E. Porter, K. Tonneson, J. Sherwell, R. Grant, contributors)
22. Grant, R.H. and D. Toby. 2001. Cellular communications for automated weather stations. pp. 41-48 In: (Hubbard K.G. and M.V.K. Sivakumar, Eds.) *Automated Weather Stations for Applications in Agriculture and water Resource Management: Cuurent use and future perspectives*. Lincoln, Nebraska: High plains climate center and Geneva Switzerland: World Meteorological Organization, AGM-3, WMO/TD No. 1074.
23. Heber, A; R. Grant; C.C. Wu; N. Zimmerman; P. Du; T. Lim; K. Fakhoury; and J. Ni. 2001 Atmospheric dispersion of pathogens from ventilation exhausts (#99-234). Final report to the National Pork Producers Council, February, 2001, 8p.
24. Madronich, S.; S. Britz; J. Frederick and R. Grant. 2001. Panel Report: Review of the USDA Ultraviolet Radiation Monitoring and Research Program, April 2001, USDA Ultraviolet Radiation Monitoring and Research Program, NREL, Fort Collins, CO. , 11p.
25. Grant, R.H. 2004. UV radiation penetration in plant canopies. In: (R. Goodman, Ed.) *Encyclopedia of Plant and Crop Science*, Marcel Dekker, Inc. DOI: 10.1081/E-EPCS-120010624.
26. Grant, R.H. 2006. Quality Assurance Project Plan for the National Air Emissions Monitory Study: Open Source Emissions Component. Purdue Agricultural Air Quality Laboratory, Purdue University. 731p.

Research Abstracts

1. Grant, R.H. 1978. A nitrogen budget for the marram grass community of Cape Cod, Massachusetts. *Biological Bull.* 155:440-441.
2. Grant, R.H. and W.W. McFee. 1986. A Comparison between the wet-bucket and bulk sulfate and nitrate deposition samplers. p. 10 in *NADP Technical Committee meeting Abstracts of poster papers, October 1986.*, NADP/NTN Coordinator's office, Fort Collins, CO.
3. Grant, R.H. and W.W. McFee. 1986. The relationship between Cl and SO₄ particulate concentrations and air masses. p. 57 in *Indiana Academy of Sciences Abstracts, 102nd Annual Meeting.*, Indiana Acad. of Sci.
4. Wold, D.; R.H. Grant and W.W. McFee. 1987. The estimation of wet deposition based on rainfall volume. p88 in *Indiana Academy of Sciences Programs and Abstracts, 103rd Annual Meeting.*, Indiana Acad. of Sci.
5. Grant, R.H. and W.W. McFee. 1987. Wet and dry deposition estimates for Southwest Indiana. *NADP Technical Committee meeting Abstracts of poster papers, October 1987.*, NADP/NTN Coordinator's office, Fort Collins, CO. p. 22-23.
6. Grant, R.H. 1988. Photochemical air quality of SW Indiana and its contribution to acid rain. p75 in *Indiana Academy of Sciences Programs and Abstracts, 104rd Annual Meeting.*, Indiana Acad. of Sci.
7. Seevers, K.P; R.H. Grant and L.W. Bledsoe. 1988. The appearance of western corn rootworm beetles, *Diabrotica virgifera virgifera*, on the shores of Lake Michigan. p35 in *Indiana Academy of Sciences Programs and Abstracts, 104rd Annual Meeting*, Indiana Acad. of Sci.
8. Grant, R.H. and T.K. Flesch. 1988. Spatial and temporal coherence of reflectivity in waving corn. p 19 in *Agronomy Abstracts*, Amer. Soc. Agron.
9. Flesch, T.K. and R.H. Grant. 1988. The influence of corn dynamics on stalk motion. p 17 in *Agronomy Abstracts*, Amer. Soc. Agron.
10. Grant, R.H. 1990. Tropical storm influences on the precipitation chemistry in the Central US. (in press) in *NADP Technical Committee meeting Abstracts of poster papers, October 1990.*, NADP/NTN Coordinator's office, Fort Collins, CO.
11. Grant, R.H. 1990. Acidic wet deposition in the Midwest: impacts of tropical storms. *Indiana Academy of Sciences Programs and Abstracts, 106th Annual Meeting.*, Indiana Acad. Sci.
12. Grant, R.H. 1990. UV Radiation within agricultural plant canopies. p 7 in *Abstracts- 12th International congress of Biometeorology*, Int. Soc. of Biometeorology
13. Grant, R.H.; D.G. Schulze; S.R. Sutton and M.L. Rivers. 1991. Background trace element aerosol climatology of rural Indiana. *NADP Technical Committee meeting Abstracts of poster papers*, NADP/NTN Coordinator's office, Fort Collins, CO.
14. Grant, R.H. 1991. UV Radiation in winter wheat canopies: present and future. *Agronomy Abstracts*, Amer. Soc. Agron.
15. Schulze, D.G.; R.H. Grant; S.R. Sutton and M.L. Rivers. 1991. Trace element analysis of atmospheric aerosols using synchrotron radiation-induced x-ray fluorescence. *Agronomy Abstracts*, Amer. Soc. Agron.
16. Schulze, D.G.; R.H. Grant; S.R. Sutton and M.L. Rivers. 1991. Trace element analysis of atmospheric aerosols using synchrotron radiation-induced x-ray fluorescence. *Abstracts, Annual meeting of the Clay minerals Society.*
17. Grant, R.H.; D.G.Schultz and S.R. Sutton. 1992. Trace element composition of background mid-continental atmospheric Aerosols. *Agronomy Abstracts*, Amer. Soc. Agron.
18. Grant, R.H.; M. Jenks; P. Peters 1993. Ultraviolet radiation in sorghum canopies. in *Abstracts-13th International congress of Biometeorology*, Int. Soc. of Biometeorology
19. Grant, R.H. 1993. An analysis of sources of high cation levels in aerosols over SW Indiana. *NADP Technical Committee meeting Abstracts of poster papers*, NADP/NTN Coordinator's office, Fort Collins, CO.
20. Grant, R.H.; J. Wright and W. Bland. 1993. Microclimatic effects on the susceptibility of early season frost damage on corn. *Agronomy Abstracts*, Amer. Soc. Agron.
21. Heisler, G.M.; S. Grimmond; R.H. Grant and C. Souch. 1994. Modeling tree and building effects on microclimate in residential areas: an overview of methodology. *1994 Amer. Assoc. Geographers. Annual Meeting Abstracts*
22. Heisler, G.M.; R.H. Grant and X. Yang. 1995. Climatology of ultraviolet radiation in urban environments. *1995 Amer. Assoc. Geographers. Annual Meeting Abstracts*
23. Haskell, N.H.; R.H. Grant; D.A. Hawley and J.E. Mischler. 1995. The estimation of heat unit requirements of developing larvae using statistical regression of temperature measurements from a death scene. *Abstracts, Annual Meeting, Amer. Assoc. of Forensic Sci.*
24. Driejana and R.H. Grant. 1995. Impacts of reduced network density on NH₄, NO₃, and SO₄ depositions during dry, wet, and 'normal' years. *NADP Tech. Comm. meeting Abstracts*, NADP/NTN Coordinator's office, Fort Collins, CO.
25. Grant, R.H. and G.M. Heisler. 1998. Ultraviolet irradiance below a single tree crown: spatial pattern and influence of receptor orientation. 26th Annual Mtg, Amer. Soc. Photobiology, Snowbird, Utah, July 11-15,1998. *Photochem. Photobiol.* 67: 39S-40S.
26. Gao, W. and R.H. Grant. 1996. Influence of epicuticular waxes on UV and PAR leaf reflectance. p. 13 In: *Agron. Abstracts*, Amer. Soc. Agron.

27. Grant, R.H. and K. Scheeringa. 2000. Retention of atmospherically deposited inorganic N in soil solution: differences in dry and wet deposition. In: *NADP Tech. Comm. meeting Abstracts*, October 2000, NADP/NTN Coordinator's office, Champaign, Illinois.
28. Gao, W.; R.H. Grant; G.M. Heisler and J.R. Slusser. 2000. An introduction to the USDA UV-B Monitoring Program and a geometric UV-B radiation transfer model applied to agricultural vegetation canopies. In: *Agron. Abstracts*, Amer. Soc. Agron.
29. Grant, R.H. and C. Bawhey. 2002. Climate change: are there limits to UVB effects on soybean? In: *Agron. Abstracts*, Amer. Soc. Agron.
30. Bawhey, C. and R.H. Grant. 2002. Influences of UVB light distribution and soybean leaf angles on leaf exposures. In: *Agron. Abstracts*, Amer. Soc. Agron.
31. Grant, R.H.; S. E. Hollinger; G. Hoogenboom; K. G. Hubbard; and R. L. Vanderlip. 2003. Historical Solar Radiation Estimates for the North Central Region of the U.S. In: *Agron. Abstracts*, Amer. Soc. Agron.
32. Grant, R.H. 2003. UVB radiation within vegetation canopies. 31st Annual Mtg, Amer. Soc. Photobiology, Baltimore, MD, July 5-9,2003. *Photochem. Photobiol.*
33. Grant, R.H. and A.J. Heber. 2005. Overview of the National Air Monitoring Study. In: *NADP Tech. Comm. meeting Abstracts*, Sept. 2005, NADP/NTN Coordinator's office, Champaign, Illinois.
34. Schmitz, H. and R.H. Grant 2006. Precipitation and dew in soybean canopies: An "In depth" look at the differences in wetness with canopy height.. *17th Conf. on Biometeorol. and Aerobiology*, Amer. Meteorol. Soc.
35. Grant, R.H. and W. Gao. 2006. Distribution of diffuse UV-B radiation in a maize canopy. *17th Conf. on Biometeorol. and Aerobiology*, Amer. Meteorol. Soc.
36. Vermerris, W, R.H. Grant, J. Campos, C. Bawhey, K. Apostol and T. Housley. 2006. Characteristics of the UVB-induced regulation of the PAL biosynthetic pathway in *Glycine max* (L). 33rd Annual Mtg, Amer. Soc. Photobiology *Photochem. Photobiol.*
37. Grant, R.H. and A.J. Heber. 2006. Update on the National Air Emissions Monitoring Study. *Workshop on Agricultural Air Quality: State of the Science*, May 2006, Potomac, MD.
38. Grant, R.H. 2007. Application of open path Tunable Laser Diode and UV Differential Optical Absorption Spectrometers in the measurement of agricultural gaseous emissions from open area sources. *Extended Abstracts, PITTCON 2007, The Pittsburgh Conference*, February 2007, Chicago, IL.

Conference Proceedings

1. Grant, R.H. 1983. Wind tunnel evaluation of spruce foliage aerodynamics. pp. 126-127 in *Proceedings 7th Conference on Fire and Forest Meteorology*, Amer. Meteorol. Soc.
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