Faculty Vitae

Name: Jay M. Ham

Highest Degree: Ph.D. from Texas A&M University received 1990

Date of Appointment: February 1990

Rank: Associate Professor

Budgeted Time (Tenths):

Research-	.9	Teaching-	.1
Extension-		Directed Service-	

Program Area: Micrometeorology / Environmental Physics

Significant Accomplishments 1993 to Present:

Environmental physics is the study of processes that govern the movement, transformation, and fate of energy and matter within soils, plants, and the atmosphere. It is a mixture of physics, ecology, soil science, and meteorology that can be applied to a wide range of topics. My research philosophy is based on attention to first principle with strong emphasis on hypothesis formulation and testing. When starting any project our chief goal is to improve our understanding of underlying processes rather than simply observe conditions and catalog data. Furthermore, creativity coupled with communication (i.e., publication) is stressed and expected from students and staff working in environmental physics. Using this approach I have published 34 refereed journal auricles on a diverse range of topics. Of these papers: 21 have been published since 1993, 11 have appeared in journals sponsored by my primary professional organization, and nine have appeared in the Agric. Forest Meteorology. I believe that cooperation and openness are crucial in a university research program. Thus, my research has benefited from cooperation with colleagues in Agronomy, other faculty in the Colleges of Agriculture and Engineering, and scientists at Agricultural Experiment Stations in other regions of the state. Securing extramural funding is another crucial component of managing a research program. I have been author or co-author of grants totaling over $3.7 million since arriving at K-State in 1990. Of that total, over 1.0 million has actually been expended by my laboratory to conduct research (not used by Co-PIs or encumbered for indirect costs.) Between 1994 and 1999, my disposable extramural funding has averaged over $160,000 per year. These resources coupled with other funds provided by the state

and university have allowed me to equip my laboratory with state-of-the-art instrumentation and hire qualified staff. This infrastructure should help us compete for funding and attract graduate students in the future. My research program has helped develop several new sensor technologies and measurement techniques. Developments included: (1) heat balance sap flow gauges for small stems, (2) dual-probe heat capacity sensors for measuring soil moisture, (3) conditional sampling techniques for measuring mass flux in the boundary layer, and (4) large chamber techniques for measuring carbon and water fluxes under CO2 fumigation. These technologies have allowed us to build a strong program in global change research and carbon cycling in terrestrial ecosystems. Another highlight is our recent work on waste treatment lagoons and their impact on ground water quality at swine and cattle feedlots. I took leadership in this project in direct response to the needs of the state (i.e., not my personal research agenda). Our work has resulted in two major reports that are being used to help formulate new policies and laws that will affect livestock production in Kansas. By providing science-based information, we are helping to insure that new regulations are based on fact rather than fear, politics, and the influence of special interest groups (agricultural or environmental). Hopefully, our work will foster new standards for waste lagoons that will support agriculture production and protect the environment. In addition, our research on lagoons is being used across the country to help address animal-waste issues in other states. In summary, research is a team effort, and many of the above-mentioned achievements where obtained only through the effort of dedicated students and staff that have worked with me over the past ten years. Furthermore, several colleagues and administrators strongly supported my ideas and helped me build my program. Their assistance is greatly appreciated.

Goals for the Next Five Years:

The face of agriculture and agronomy is rapidly changing as we approach the new millenium. The success of agriculture will not be based on maximizing production, but will instead be dependent on developing farming systems that do not deplete natural resources or pollute the environment. An increasing world population and an expanding need for food and fiber will require farming methods that can be used safely in close proximity to urban areas while sharing the resources on which they depend. Conserving water and soil quality will be paramount for sustaining agriculture production in the 21st century. In my field of study, the impact of farming and livestock production on the atmospheric environment is especially relevant. Air quality, global climate change, and the effect of elevated atmospheric CO2 and other trace gases will continue to be important issues in the future. My overall goal is to expand my research and teaching programs at Kansas State University to address some of these needs at the state, national, and global levels.

Research Goals

Air Quality - Expand research on the emission and transport of traces gases, volatile organic compounds, and aerosols associated with agriculture production. Research topics

will include spatial and temporal variations in ammonia, hydrogen sulfide, methane, and dust near concentrated animal feeding operations (AFOs). Results from the research could lead to improved management practices for controlling odor and help determine optimal set back distances for human dwellings near AFOs.

Evapotranspiration and Hydrology - Conduct basic research on evaporation, transpiration, and soil moisture dynamics at the field and watershed scale. This research will support studies on water conservation and contribute to our understanding of contaminant transport in soils and ground water. The potential effects of climate change on the soil water regime will be explored.

Instrumentation Development - Many important advances in science are preceded by developments in instrumentation. New techniques will be invented for measuring the transport of energy and mass in the soil-plant-atmosphere continuum. Transport Modeling and Boundary-Layer Theory - Experimental research will be supported by the development of numerical models and improved theory for describing transport processes in the soil and the atmosphere. Models and field experiments will be used in a synergistic manner to accelerate progress and improve efficiency.

Publications:

Referee Journal Articles and Chapters	Since 1993	23	Total	37
Numbered Extension Publications	Since 1993	--	Total	--
Proceedings Papers	Since 1993	--	Total	--

Most Significant Publications Since 1993:

Ham, J.M. 1999. Measuring evaporation and seepage losses from lagoons used to contain animal waste. Transactions of the ASAE. 42:1303-1312.

Ham, J.M., and T.M. DeSutter. 1999. Seepage losses and nitrogen export from swine-waste lagoons: a water balance study. J. Environ. Qual. 28:1090-1099.

Ham, J.M., and A.K. Knapp. 1998. Fluxes of CO2, water vapor, and energy from a prairie ecosystem during the seasonal transition from carbon sink to carbon source. Agric. Forest Meteorol. 89:1-14.

Bremer, D.J., J.M. Ham, C.E. Owensby, and A.K. Knapp. 1998. Responses of soil respiration to clipping and grazing in a tallgrass prairie. J. Environ. Qual. 27:1539-1548.

Owensby, C.E., Ham, J.M., Knapp, A.K., Bremer, D.J., and L..M. Auen. 1997. Water vapor fluxes and their impact under elevated CO2 in a C4 tallgrass prairie. Global Change Biology. 3:189-195.

Tarara, J.M., and J.M. Ham. 1997. Measuring soil water content in the laboratory and field with dual probe heat capacity sensors. Agron. J. 89:535-542.

Bremer, D.J., Ham, J.M., and C.E. Owensby. 1996. Effect of elevated atmospheric CO2 and open-top chambers on transpiration in a tallgrass prairie. J. Environ. Qual. 25:691-701.

Peressotti, A., and J.M. Ham. 1996. A Dual Heater Gauge for Measuring Sap Flow with an Improved Heat Balance Method. Agron J. 88:149-155.

Senock, R.S., J.M. Ham, T.M. Loughin, B.A. Kimball, D.J. Hunsaker, P.J. Pinter, G.W. Wall, R.L. Garcia, and R.L. LaMorte. 1996. Sap flow in wheat under CO2 enrichment. Plant Cell Environ. 19:147-158.

Ham, J.M., C.E. Owensby, P.I. Coyne, and D.J. Bremer. 1995. Fluxes of CO2 and water vapor from a prairie ecosystem exposed to ambient and elevated atmospheric carbon dioxide. Agric. Forest Meteorol. 77:73-93.

Ham, J.M. and G.J. Kluitenberg. 1994. Modeling the effect of mulch optical properties and mulch-soil contact resistance on soil heating under plastic mulch culture. Agric. Forest Meteorol. 71:403-424.

Massman, W., and J.M. Ham. 1994. An evaluation of a surface energy balance method for partitioning ET data into plant and soil components for a surface with partial canopy cover. Agric. Forest Meteorol. 67:253-267.

Ham, J.M., C.E. Owensby, and P.I. Coyne. 1993. Technique for measuring air flow and CO2 exchange in large open-top chambers. J. Environ. Qual. 22:759-766.

Ham, J.M., and G.J. Kluitenberg. 1993. Positional variation in the soil energy balance beneath a row-crop canopy. Agric. Forest Meteorol. 63:73-92.

Senock, R.S., and J.M. Ham. 1993. Heat balance sap flow gauge for small diameter stems. Plant Cell Environ. 16:593-601.

Graduate Student Involvement:

Students Graduated Since 1993	M.S.	1	Ph.D.	4
Current Students	M.S.	1	Ph.D.	1
Current Member of Advisory Committee	M.S.	4	Ph.D.	3

Grant Activity:

Most Common Sources of Extramural Support (ex. NSF, Sorghum Commission, NRI, Industry, Variety Performance):

Department of Energy

USDA/NRI

State Agencies (Kansas Water Office, Dept. of Health and Environ.)

NSF

Proposals Submitted Since January 1, 1997:	Number	10	$ 1,500,000
Funded	Number	8	$ 1,008,150

Current dollars (grant or contract) available to support your work $100,000

Most Significant Funded Projects Since 1993:

Ham, J.M., C.W. Rice, and L.N. Reddi. 1999-2000. Feedlot Water Quality Study. Kansas Water Office, Topeka, KS. $70,000.

Owensby, C.E., J.M. Ham, and A.K. Knapp. 1999-2000. Landscape-Level Trace Gas Fluxes on Grazed and Ungrazed. Tallgrass Prairie I. U.S. Dept. of Energy. $166, 361.

Owensby,C.E., J.M. Ham, and A.K. Knapp. 1999-2000. Landscape-Level Trace Gas Fluxes on Grazed and Ungrazed Tallgrass Prairie II. National Institute for Global Environmental Change. $51,202.

Ham, J.M., A.K. Knapp, and C.E. Owensby. 1998-2000. Carbon, Water, and Energy Fluxes From a Tallgrass Prairie: The effect of Land Management and environmental factors on surface-atmosphere exchange. National Institute for Global Environmental Change. Dept. of Energy. $80,000

Ham, J.M., C.W. Rice, and L.N. Reddi. 1998-1999. Animal waste lagoon water quality study. Kansas Water Office, Topeka, KS. $100,000

Owensby, C.E., C.W. Rice, J.M. Ham, A.K. Knapp. 1998-1999. Processes Affecting Carbon Fluxes of Grassland Ecosystems Under Elevated Atmospheric CO2. US Department of Energy $105,400

Johnson, J., J. Blair, C. Rice, J. Ham, and R. Blake. 1997-1999. Land cover change in the great plains: predicting impacts of regional forest expansion on biogeochemical processes. NASA. $515,588.

Welch, S.M., J.M Ham, M.B. Kirkham, A.K. Knapp, and N. Zhang, 1996-1998. An instrument combining computerized 3D plant photogrammetry with automated physiological monitoring. National Science Foundation. $291,745.

Schwab, A.P., J.M. Ham, L.N. Reddi, and M.K. Banks. 1996. Evaluation of Lagoons for Containment of Solid Waste in Western Kansas. Kansas Dept. Health Environ. $100,000.

Owensby, C.E., J.M. Ham, C.W. Rice, and A.K. Knapp. Effects of elevated CO2 on carbon and water vapor fluxes of a tallgrass prairie. DOE office of Basic Energy Sciences, Terrestrial Carbon Processes. $873,265.

Ham, J.M. 1994-1997. Carbon and Water Fluxes From Irrigated Corn: A Field-Scale, Full Season Study. USDA National Research Initiative. $110,000.

Ham, J.M., and A.K. Knapp. 1993-1995. Carbon, Water, and Energy Fluxes From a Tallgrass Prairie: A Long-term Investigation of Environmental, Biological, and Land Management Factors. National Institute for Global Environmental Change. Dept. of Energy. $177,225.

Ham, J.M. 1993. Soil Respiration in Prairie Ecosystems exposed to ambient and elevated CO2. National Science Foundation. $47,000.

Teaching:

Courses Taught:

Course Number	Title	Most Recent Enrollment
AGRON 900	Biometeorology	17
AGRON 901	Environmental Instrumentation	11

Number of Undergraduate Research Assistants: N/A

Number of Undergraduate Advisees: N/A

Service Activities:

Editorial Services and Manuscript Reviews

123 total (career) 94 since 1993

National Organizations or Journals

Chair-Elect. 2000. Division A3. American Society of Agronomy. Madison, WI. Will organize Div. A3 (Agroclimatology and Agronomic Modeling) at annual meetings in 2001. Appointed by national ballot of all Div. A3 members.

Editorial Committee. Monograph on Micrometeorology in Agricultural Systems. American Society of Agronomy. Madison, WI. 1999-present

Feasibility Committee. Monograph on Micrometeorology in Agricultural Systems. American Society of Agronomy. Madison, WI. 1998-1999.

Editorial Board, Agric. Forest. Meteorology. 1995-1999

Emil Truog Award Selection Committee, American Society of Agronomy. 1993-1995

Chair, Special Symposium on Sap Flow Measurements. American Society of Agronomy Annual Meetings. Denver, CO. 1991