



## Dr. Jay Ham

Professor, College of  
Agricultural Sciences,  
Colorado State University

### Current Research Projects

- 1. Water, Carbon, and Global Climate Change:** Starting in 1997, I have operated a network of long-term eddy covariance sites as part of DOE's Ameriflux program. These towers, which provided year-round hourly measurements of carbon flux and ET, have been deployed on prairies, a cedar forest, and at livestock operations. New research is aimed at characterizing spatial variations in ET and net carbon exchange so that research done at tower sites can be scaled up to make watershed- and regional-scale estimates of water and carbon cycles.
- 2. Research on Animal Feeding Operations:** My research group has developed instrumentation to measure ammonia/ammonium ( $\text{NH}_x$ ) fluxes from feedlots using a micrometeorological technique called relaxed eddy accumulation (REA). Ultimately, research could lead to improved practices for reducing  $\text{NH}_x$  losses by allowing us to measure directly how a change in diet or waste management affects emissions. Anaerobic lagoons are widely used at AFOs to store and treat waste. My research team has been a leader in developing methods for measuring seepage losses and predicting the effects on groundwater quality.
- 3. Instrumentation Development:** I am always looking to improve our measurement capabilities such as new sensor technologies, including sap flow gauges, soil moisture probes, various chamber designs for measuring whole-canopy gas exchange, techniques for measuring seepage and gas fluxes from animal waste lagoons, new micrometeorological techniques for measuring fluxes of  $\text{NH}_3$  and other trace gases from cattle feedlots, and more recently the development of low-cost unmanned aerial vehicles (UAVs) for remote sensing of vegetation.

### Research Interests

- Environmental physics and micrometeorology
- Internet-of-Things (IoT) applications in agriculture and environmental science
- Evapotranspiration and irrigation management
- Air emissions from oil & gas operations
- Ammonia emissions from livestock operations
- Agricultural climatology

# Selected Papers

## Selected Publications

Miner, G.L, J.M. Ham, and G.J. Kluitenberg. 2017 A heat-pulse method for measuring sap flow in corn and sunflower using 3D-printed sensor bodies and low-cost electronics. *Agric. Forest Meteorol.* 246:86-97.

Peterson, K.W., D. J. Bremer, K. B. Shonkwiler and J. M. Ham. 2017. Measurement of Evapotranspiration in Turfgrass: A Comparison of Techniques. 2017. *Agronomy J.* doi:10.2134/agronj2017.02.0088

Li, Y., Thompson, T. M., Van Damme, M., Chen, X., Benedict, K. B., Shao, Y., Day, D., Boris, A., Sullivan, A. P., Ham, J., Whitburn, S., Clarisse, L., Coheur, P.-F., and Collett Jr., J. L. 2017. Temporal and spatial variability of ammonia in urban and agricultural regions of northern Colorado, United States, *Atmos. Chem. Phys.*, 17, 6197-6213.

Von Fischer, J., D. Cooley, Chamberlain, S., Gaylord, A., Griebenow, C. , Hamburg, S., Salo, J., Schumacher, R., Theobald, D., Ham, J.M. 2017. Rapid, Vehicle-Based Identification of Location and Magnitude of Urban Natural Gas Pipeline Leaks. 2017. *Environ. Sci. & Tech.* 51:4091-4099.

Hengen, T. J., H. L. Sieverding, N. A. Cole, J. M. Ham, and J. J. Stone. 2016. Eco-Efficiency Model for Evaluating Feedlot Rations in the Great Plains, United States. *J. Environ. Qual.* 45:1234-1242.

Saseendran, S., Trout, T., Ahuja, L., Ma L., McMaster, G., Neilson, D., Andales, A., Chaves J., Ham, J. 2015. Quantifying crop water stress factors from soil water measurements in a limited irrigation experiment. *Agricultural Systems.* 137:191-205.

Sun, K., L. Tao, D. Miller, M Zondlo, K Shonkwiler, C Nash, and J. Ham. 2015. Open-path eddy covariance measurements of ammonia fluxes from a beef cattle feedlot. *Agric. For. Meteorology.* 213:193-202.

Parker, D., J. Ham, B. Woodbury, L. Cai, M. Spiehs, M. Rhoades, S. Trabue, K. Casey, R. Todd, A. Cole. 2013. Standardization of flux chamber and wind tunnel flux measurements for quantifying volatile organic compound and ammonia emissions from area sources at animal feeding operations. *Atmospheric Environment.*66:72-83.

Galles K., Ham J., Westover E., Stratton J., Wagner J., Engle T., Bryant T.C. 2011. Influence of Reduced Nitrogen Diets on Ammonia Emissions from Cattle Feedlot Pens. *Atmosphere.* 2(4):655-670.