

# CURRICULUM VITAE

## *Employment History/Awards*

**NAME:** José L. Chávez

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### **EDUCATION**

2005 Ph.D. in Agricultural and Biological Engineering, Utah State University.  
1999 M.Sc. in Irrigation Engineering, Utah State University.  
1992 B.Sc. in Agricultural Engineering, Paraiba Federal University (Brazil).

### **ACADEMIC POSITIONS**

(2015-current) Associate Professor, Civil and Environmental Engineering Department, Colorado State University  
(2009-2015) Assistant Professor, Civil and Environmental Engineering Department, Colorado State University  
(2005-2006) Postdoctoral Research Associate, Washington State University

### **OTHER POSITIONS**

(2006-2008) Research Agricultural Engineer, United States Department of Agriculture (USDA), Bushland, TX  
(2000-2005) Research Assistant, Remote Sensing Services Laboratory, Utah State University, Logan, UT

### **CURRENT JOB DESCRIPTION**

25 % Teaching 40 % Research/Creative Activity 35 % Service/Outreach

### **HONORS AND AWARDS**

2014 Certificate in Recognition of Five Years of Service, Colorado State University Extension, Nov. 11, Fort Collins, CO  
2014 Prof. Dr. Iqrar Ahmad Khan (Vice-Chancellor) Award, University of Agriculture Faisalabad, Faisalabad, Pakistan  
2013 Borland Chair of Hydrology award (2013-2016), Civil and Environmental Engineering Department, Colorado State University, Fort Collins, CO  
2012 College of Agriculture Sciences Research Award, Colorado State University, Fort Collins, CO  
2010 Faculty Award for Excellence in Service/Outreach, Civil and Environmental Engineering Department, Colorado State University, Fort Collins, CO  
2009 Certificate of Merit Award for exemplary performance during the rating period January 1, 2008 through November 30, 2008. United States Department of Agriculture (USDA), ARS, CPRL, Bushland, TX  
2008 Certificate of Merit Award for exemplary performance during the rating period January 1, 2007 through December 31, 2007. USDA, ARS, CPRL, Bushland, TX  
2007 Spot Award for first regional ET mapping of the Texas Panhandle, USDA, ARS, CPRL, Bushland, TX  
2006 Certificate of Appreciation, USDA, ARS, Vegetable and Forage Crop Research, Prosser, WA  
2002 Graduate Research Scholarship, Organization of American States, Washington, D.C.  
1999 Graduate Scholarship, Biological and Irrigation Engineering Department, Utah State University, Logan, UT  
1997 Graduate Scholarship, Organization of American States, Washington, D.C.

## *Publications/Scholarly Record*

### PUBLISHED WORKS

#### Refereed Journal Articles:

Note: Authors underlined are students advised by **Dr. Chávez** as major advisor/professor. Students with an asterisk (\*) are students advised by **Dr. Chávez** as part of their Thesis/Dissertation research committee or serving as a postdoctoral fellow's supervisor (†).

1. **Chávez J.L.**, and López-Urrea, R. **2018**. "Modeling  $r_s$  to estimate corn water use using the P-M one step Method: Part I Model Development." Submitted to *Irrigation Science* on 23 Aug 2018. Accepted on 26 Oct 2018.
2. López-Urrea, R., and **J.L. Chávez**. **2018**. "Modeling  $r_s$  to estimate corn water use using the P-M one step Method: Part II Model Evaluation." Submitted to *Irrigation Science* on 23 Aug 2018. Accepted on 26 Oct 2018.
3. D.R. Rudnick, S. Irmak, C. West, I. Kisekka, T.H. Marek, J.P. Schneekloth, D. Mitchell McCallister, V. Sharma, K. Djaman, J. Aguilar, **J.L. Chávez**, M.E. Schipanski, D.H. Rogers, and A. Schlegel. **2018**. "Deficit Irrigation Management of Maize Above the High Plains Aquifer: A Review." Submitted to *Journal of the American Water Resources Association*, special issue "Ogallala", Submitted on Feb. 24, 2018. Accepted on 12 Oct. 2018.
4. Ming Han, Huihui Zhang, **José L. Chávez**, Liwang Ma, Thomas Trout, K. DeJong. **2018**. 'Improvement estimation of soil water deficit through the integration of canopy temperature measurements into a soil water balance model.' Submitted to *Irrigation Science* on 23 January 2017. Resubmitted in Dec. 2017. Accepted on 23 March 2018. May 2018, Volume 36, Issue 3, pp 187–201.
5. Huihui Zhang, Ming Han, **José L. Chávez**, Yubin Lan. 2017. "Improvement in estimation of soil water deficit by integrating airborne imagery data into a soil water balance model." *Int'l Journal of Agricultural and Biological Engineering*. Submitted on Jan 14, 2017. Accepted on 02 May 2017. *Int J Agric & Biol Eng*, 2017; 10(3): 37–46.
6. Subedi\* A., J.L. Chávez, and A. Andales. 2017. "ASCE-EWRI Standardized Penman-Monteith Evapotranspiration (ET) Equation Performance in Southeastern Colorado." Submitted on 10 Feb 2016. Accepted on June 30, 2016. Available on-line 24 Aug 2016. *Agricultural Water Management*, 179, 74-80.
7. Marcos Carrasco-Benavides, Samuel Ortega-Farías, Luis Morales-Salinas, Carlos Poblete-Echeverría and **José L. Chávez**. 2017. "Calibration and validation of an aerodynamic method to estimate the spatial variability of sensible and latent heat fluxes over a drip-irrigated Merlot vineyard," *Int'l Journal of Remote Sensing*. Submitted on July 18th, 2016. Accepted on 1 April 2017. Published on-line 15 May 2017. Vol. 38, 2017 – Issue 24, pg 7473-7496.
8. Hongbo Su, Yongmin Yang, Lina Xu, **José L. Chávez**, Steven R. Evett, Terry A. Howell, Jing Tian, Shaohui Chen, Jinyan Zhan. 2016. A method to correct eddy covariance flux underestimates under an advective environment for arid or semi-arid regions. *Physics and Chemistry of the Earth, Parts A/B/C*, Volume 96, Pages 2-15 (December 2016). [Submitted 17 January 2016, Revised 12 July 2016, Accepted 26 August 2016, Available online 31 August 2016]
9. Kullberg\*, E.G., DeJonge, K.C., and **J.L. Chávez**. 2016. "Evaluation of thermal remote sensing indices to estimate crop evapotranspiration coefficients." Submitted on 15 Feb 2016. Accepted on July 3, 2016. *Agricultural Water Management*, 179, 64-73.
10. DeJonge K., Mefford\*, B.S., and **J.L. Chávez**. 2016. "Assessing corn water stress using spectral reflectance," *International Journal of Remote Sensing*. Submitted on 02 Feb 2015, re-submitted on 03 Feb 2015, re-submitted on 11 Feb 2016. Accepted on 15 March 2016. Volume 37, Issue 10, 2016, pages 2294-2312. DOI:10.1080/01431161.2016.1171929.
11. Mcebisi Mkhwanazi\*, **José L. Chávez**, and Allan A. Andales, 2015, SEBAL-A: A remote sensing ET algorithm that accounts for advection with limited data. Part I: Development and validation, *Remote Sensing*, Submitted 17 May 2015, Revised 1 Oct., Accepted on 3 Nov. Published 10 Nov. 2015. *Remote Sens.* 2015, 7(11), 15046-15067;

12. Mcebisi Mkhwanazi\*, **José L. Chávez**, Allan A. Andales and Kendall DeJonge, 2015, SEBAL-A: A remote sensing ET algorithm that accounts for advection with limited data. Part II: Test for transferability, *Remote Sensing*, Submitted 17 May 2015, Revised 16 Sept, accepted on 18 Sept 2015. Published 10 Nov. 2015. Remote Sens. 2015, 7(11), 15068-15081; doi:10.3390/rs71115068.
13. Abhinaya Subedi\*, and **José L. Chávez**, 2015, “Crop evapotranspiration (ET) estimation models: A review and discussion of the applicability and limitations of ET methods, *Journal of Agricultural Science*, V7, No 6, 2015, Submitted on 23 Feb 2015, Accepted 10 Apr 2015, On-line publication 15 May 2015.
14. Saseendran Anapalli\*, Ph. D; Thomas J Trout, Ph. D; Lajpat R Ahuja, Ph. D. ; Liwang Ma, Ph. D; Gregory S McMaster, Ph. D.; David C Nielsen, Ph. D; Allan A Andales, Ph. D.; **José L Chávez**, Ph. D; Jay Ham, Ph. D. (2015). Quantifying crop water stress factors from soil water measurements in a limited irrigation experiment, *Agricultural Systems*, 137 (2015) 191 - 205.
15. Saseendran\*, S. A, L.R. Ahuja, L. Ma, T.J. Trout, G.S. McMaster, D. C. Nielsen, A.A. Andales, and A. D. Halvorson, **José L. Chávez**, J. Ham, and Q.X. Fang, 2015, “Developing and generalizing average corn crop water production functions across years and locations using a system model.” *Agricultural Water Management*, Volume 157, 31 July 2015, Pages 65--77, doi:10.1016/j.agwat.2014.09.002, Submitted on 08 Jan 2014. Approved 04 Sept 2014.
16. Rambikur\*, E., and **J.L. Chávez**, 2014, “Assessing Inter-Sensor Variability and Sensible Heat Flux Derivation Accuracy for a Large Aperture Scintillometer,” *Sensors*, 14(2), 2150-2170.
17. Taghvaeian†, S., **J.L. Chávez**, W.C. Bausch, K.C. DeJonge, and T.J. Trout, 2014, “Minimizing instrumentation requirement for estimating crop water stress index and transpiration of maize,” *Irrigation Science*, 32, 53-65.
18. Saseendran\*, S.A., L.R. Ahuja, L. Ma, D.C. Nielsen, T.J. Trout, A.A. Andales, **J.L. Chávez**, and J. Ham, 2014, “Enhancing the water stress factors for simulation of corn (*Zea mays* L.) in RZWQM2,” *Agronomy Journal*, 106 (1), 81-94.
19. Gleason\*, D.J., A.A. Andales, T.A. Bauder, and **J.L. Chávez**, 2013, “Performance of atmometers in estimating reference evapotranspiration in a semi-arid environment,” *Agricultural Water Management*, 130, 27-35.
20. Formetta, G., R. Rigon, **J.L. Chávez**, and O. David, 2013, “Modeling shortwave solar radiation using the JGrass-NewAge System,” *Geoscientific Model Development*, 6, 915-928.
21. Taghvaeian†, S., **José Chávez**, Mary Hattendorf, Mark Crookston, 2013, “Optical and Thermal Remote Sensing of Turfgrass Quality, Water Stress, and Water Use under Different Soil and Irrigation Treatments,” *Remote Sensing*, 5, 2327-2347.
22. Agam, N., S.R. Evett, J.A. Tolk, W.P. Kustas, P.D. Colaizzi, J.G. Alfieri, L.G. McKee, K.S. Copeland, T.A. Howell, and **J.L. Chávez**, 2012, “Evaporative loss from irrigated interrows in a highly advective semi-arid agricultural area,” *Advances in Water Resources*, 50, 20-30.
23. **Chávez, J.L.**, Gowda, P.H., Howell, T.A., Garcia, L.A., Copeland, K.S., and Neale, C.M.U., 2012, “ET mapping with high resolution airborne remote sensing data in an advective semi-arid environment,” *Journal of Irrigation and Drainage Engineering*, 138(5), 416-423.
24. Vicente-Guillén J., Ayuga-Telléz E., Otero D., **Chávez J.L.**, Ayuga F., and García A.I., 2012, “Performance of a monthly streamflow prediction model for ungauged watershed in Spain,” *Water Resources Management*, 26(13), 3767-3784.
25. Anderson, M.C., Kustas, W.P., Alfieri, J., Gao, F., Hain, C., Prueger, J.H., Evett, S., Colaizzi, P., Copeland, K., Howell, T., and **Chávez, J.L.**, 2012, “Mapping Daily Evapotranspiration at Landsat Spatial Scales During the BEAREX'08 Field Campaign,” *Advances in Water Resources*, 50, 162-177.
26. French, A.N., J.G. Alfieri, W.P. Kustas, J.H. Prueger, L.E. Hips, **J.L. Chávez**, S.R. Evett, T.A. Howell, P. Gowda, D. Hunsaker, and K. Thorp, 2012, “Estimation of surface energy fluxes using surface renewal and flux variance techniques over an advective irrigated agricultural site.” *Advances in Water Resources*, 50, 91-105.
27. Kustas, W.P., J.G. Alfieri, M.C. Anderson, P.D. Colaizzi, J.H. Prueger, S.R. Evett, C.M.U. Neale, A.N. French,

- L.E. Hipps, **J.L. Chávez**, K.S. Copeland, and T.A. Howell, 2012, "Evaluating the two-source energy balance model using local thermal and surface flux observations in a strongly advective irrigated agricultural area" *Advances in Water Resources*, 50, 120-133.
28. Prueger, J.H., J.G. Alfieri, L.E. Hipps, W.P. Kustas, **J.L. Chávez**, S.R. Evett, M.C. Anderson, A.N. French, C.M.U. Neale, L.G. McKee, J.L. Hatfield, T.A. Howell, and Nurit Agam, 2012, "Patch scale turbulence over dryland and irrigated surfaces in a semi-arid landscape during BEAREX08," *Advances in Water Resources*, 50, 106-119.
  29. Neale, C.M.U., H. Geli, W.P. Kustas, J. Alfieri, P.H. Gowda, S.R. Evett, J.H. Prueger, L.E. Hipps, W.P. Dulaney, **J.L. Chávez**, A.N. French, and T.A. Howell, 2012, "Soil water content estimation using a remote sensing based hybrid evapotranspiration modeling approach," *Advances in Water Resources*, 50, 152-161.
  30. Mkhwanazi, M., **Chávez, J.L.**, and Rambikur, E.H., 2012, "Comparison of Large Aperture Scintillometer and Satellite-based Energy Balance Models in Sensible Heat Flux and Crop Evapotranspiration Determination," *International Journal of Remote Sensing Applications (IJRSA)*, 2(1), 19-25.
  31. Alfieri, J.G, W.P. Kustas, J.H. Prueger, L.E. Hipps, S.R. Evett, J.B. Basara, C.M.U. Neale, A.N. French, P. Colaizzi, N. Agam, M.H. Cosh, **J.L. Chávez**, and T.A. Howell, 2012, "On the discrepancy between eddy covariance and lysimeter-based surface flux measurements under strongly advective conditions," *Advances in Water Resources*, 50, 62-78.
  32. Taghvaeian<sup>†</sup>, S., **J.L. Chávez**, and N.C. Hansen, 2012, "Infrared Thermometry to Estimate Crop Water Use and Stress Index of Irrigated Maize in Northeastern Colorado," Special issue: Advances in Remote Sensing of Crop Water Use Estimation, *Remote Sensing*, 4(11), 3619-3637.
  33. Canelón D. and **Chávez J.L.**, 2011, "Soil heat flux modeling using artificial neural networks and multispectral airborne remote sensing imagery," *Remote Sensing*, 3(8), 1627-1643.
  34. Varble, J.L, and **J.L. Chávez**, 2011, "Performance evaluation and calibration of soil water content and potential sensors for agricultural soils in eastern Colorado," *Agricultural Water Management*, 101, 93-106.
  35. Elhaddad, A., L.A. Garcia, and **J.L. Chávez**, 2011, Using a Surface Energy Balance Model to Calculate Spatially Distributed Actual ET, *Irrigation and Drainage Engineering*, 137(1), 17-26.
  36. Alfieri, J.G., Kustas, W.P., Prueger, J.H., Hipps, L.E., **Chávez, J.L.**, French, A.N., and Evett, S.R., 2011, "Intercomparison of nine micrometeorological stations during the BEAREX08 field campaign," *Journal of Atmospheric and Oceanic Technology (JTECHA)*, 28(11), 1390-1406.
  37. **Chávez J.L.**, T.A. Howell, P.H. Gowda, K.S. Copeland, and J.H. Prueger, 2010, "Surface aerodynamic temperature modeling over rainfed cotton," *Transactions of ASABE*, 53(3), 759-767.
  38. **Chávez J.L.**, F.J. Pierce, T.V. Elliot, R.G. Evans, Y. Kim, and W.M. Iversen, 2010, "A remote irrigation monitoring and control system (RIMCS) for continuous move systems. Part B: Field testing and results," *Precision Agriculture*, 11(1), 11-26.
  39. **Chávez J.L.**, F.J. Pierce, and R.G. Evans, 2010, "Compensating inherent Linear Move water application errors using a variable rate irrigation system," *Irrigation Science*, 28, 203-210.
  40. **Chávez J.L.**, F.J. Pierce, T.V. Elliot, and R.G. Evans, 2010, "A remote irrigation monitoring and control system (RIMCS) for continuous move systems. Part A: Description and Development," *Precision Agriculture*, 11, 1-10.
  41. **Chávez J.L.**, P.H. Gowda, T.A. Howell, C.M.U. Neale, and K.S. Copeland, 2009, "Estimating hourly crop ET using a two source energy balance model and multispectral airborne imagery," *Irrigation Science*, 38, 79-91.
  42. **Chávez J.L.**, T.A. Howell, and K.S. Copeland, 2009, "Evaluating eddy covariance cotton ET measurements in an advective environment with weighing lysimeters," *Irrigation Science*, 28, 35-50.
  43. **Chávez J.L.**, P.H. Gowda, T.A. Howell, and K.S. Copeland., 2009, "Radiometric Surface Temperature Calibration Effects on Satellite based Evapotranspiration Estimation," *International Journal of Remote Sensing*, 30(9), 2337-2354.
  44. **Chávez, J.L.**, C.M.U. Neale, J.H. Prueger and W.P. Kustas, 2008, "Daily Evapotranspiration estimates from extrapolating instantaneous airborne remote sensing ET values," *Irrigation Science*, 27, 67-81.

45. Gowda, P.H., **J.L. Chávez**, P.D. Colaizzi, S.R. Evett, T.A. Howell, and J.A. Tolck, 2008, "ET mapping for agricultural water management: present status and challenges," *Irrigation Science*, 26(3), 223-237.
46. Gowda P.H., **J.L. Chavez**, T.A. Howell, T.H. Marek, and L.L. New, 2008, "Surface Energy Balance Based Evapotranspiration Mapping in the Texas High Plains," *Sensors*, 8, 5186-5201.
47. Gowda P.H., T.A. Howell, P. D. Colaizzi, S.R. Evett, **J.L. Chavez**, and L. New, 2008, "Remote Sensing of Contrasting Tillage practices in the Texas Panhandle," *International Journal of Remote Sensing*, 29(12), 3477-3487.
48. Gowda, P.H., **J.L. Chávez**, P.D. Colaizzi, S.R. Evett, T.A. Howell, and J.A. Tolck, 2007, "Remote Sensing based Energy Balance Algorithms for Mapping ET: Current Status and Future Challenges," *Transactions of the ASABE*, 50(5), 1639-1644.
49. **Chávez J.L.**, C.M.U. Neale, L.E. Hipps, J.H. Prueger, and W.P. Kustas, 2005, "Comparing aircraft-based remotely sensed energy balance fluxes with eddy covariance tower data using heat flux source area functions," *Journal of Hydrometeorology*, 6(6), 923-940.
50. Anderson, M.C., C.M.U. Neale, F. Li, J.M. Norman, W.P. Kustas, H. Jayanthi, **J. Chavez**, 2004, "Upscaling ground observations of vegetation water content, canopy height, and leaf area index during SMEX02 using aircraft and Landsat imagery," *Remote Sensing of Environment*, 92, 447-464.

### Journal Articles Submitted

Subedi A., **J.L. Chávez**, and A. Andales. "Hourly Alfalfa Evapotranspiration Estimation using Variable Bulk Surface Resistance." Submitted to ASCE Irrigation and Drainage Engineering, on Aug 23, 2018.

Camilo Riveros-Burgos, B.Sc; Samuel Ortega-Farias, PhD; Rafael López-Olivari, PhD; **José Luis Chávez**, PhD. "Parameterization of a clumped model to directly simulate actual evapotranspiration over a super intensive drip-irrigated olive orchard." Submitted to Journal of Hydrometeorology, May 23th, 2018.

Jones, A. S., A. Andales, J.L. **Chávez**, C. McGovern, G. E. B. Smith, and Steven J. Fletcher, 2018. "An Assessment of Numerical Weather Prediction (NWP) Quantitative Precipitation Forecast (QPF) Uncertainties for use with the WISE Irrigation Scheduling Tool." Submitted to *J. Amer. Water Resources Assoc.*, special issue "Ogallala", Aug. 1<sup>st</sup>.

### Journal Articles In preparation

**Chávez J.L.**, A. Masih, H. Zhang, D.R. Rudnick, et al. "A framework to integrate UAS multispectral data into a Center Pivot Precision Water Management Decision Support System (DSS)." To be submitted to Journal of the American Water Resources Association, special issue "Ogallala." In preparation.

Subedi A., **J.L. Chávez**, and A. Andales. "Effective daytime surface resistance (rs) value for alfalfa reference crop in Southeast Colorado." In preparation.

P. Paredes, L.S. Pereira, S. Kang, R. López-Urrea, D. Hunsaker, **J.L. Chávez**. "Updated standard Kc and Kcb for field and vegetable crops." To be submitted to Agricultural Water Management, Special Issue on Crop Coefficients, In preparation.

### Refereed Chapters in Books:

Prueger J., J. Alfieri, W. Kustas, L. Hipps, C. Neale, S. Evett, J. Hatfield, L. McKee, and J.L. **Chávez**, 2012, Thermal radiation and energy closure assessment in evapotranspiration estimation for remote sensing validation, In: Multi-Scale Hydrology Remote Sensing: Prospects and Applications, (Eds. Yang Chang and Ni-Bin Hong), CRC Press 2012, Taylor & Francis Group, pp. 87-110.

## Refereed Proceedings/Transactions:

1. Mkhwanazi, M.M., J.L. Chávez, and A.A. Andales, 2013, "Evaluating the performance of SEBAL ET algorithm under advective conditions," In Proceedings of the Seventh International Conference on Irrigation and Drainage, USCID. Phoenix, AZ, April 16-19, 2013, pp. 119-128.
2. Taghvaeian<sup>†</sup> S., **Chávez J.L.**, and Hansen N., 2012, "Evaluating Crop Water Stress under Limited Irrigation Practices," In Proceedings of the 2012 ASCE EWRI World Congress, May 21-24, Albuquerque, NM, pp. 2149-2159.
3. Joy, S.L., Chávez J.L., and Howell T.A., 2011, "Improving crop water use determination using adjusted eddy covariance heat fluxes," USCID Water Management Conference, Albuquerque, NM, April 26-29, pp. 335.
4. Varble, J.L., Chávez J.L., Andales A.A., Butters G.L, and Trout T.J., (2011), "Performance evaluation of TDT soil water content and watermark soil water potential sensors," USCID Water Management Conference, Albuquerque, NM, April 26-29, pp. 351.
5. **Chávez, J.L.**, Straw D., Garcia L.A., Ley T.W., Andales, A.A., Simmons L., Bartolo M.E., and Neale C.M.U., 2010, "Remote sensing ET of alfalfa using a surface aerodynamic temperature model." In Proceeding of the 5th National Decennial Irrigation Conference, ASABE and Irrigation Association, Paper No. IRR10-8513, St. Joseph, Mich: ASABE.
6. **Chávez, J.L.**, T.A. Howell, D. Straw, P.H. Gowda, L.A. Garcia, S. Evett, T. Ley, L. Simmons, M. Bartolo, P. Colaizzi, and A. Andales, 2010, "Surface Aerodynamic Temperature Derived from Wind/Temperature Profile Measurements over Cotton and Alfalfa in a Semi-Arid Environment," In Proceedings of the 2010 World & Water Congress, EWRI-ASCE, Reston, VA, pp. 2090-2101.
7. **Chávez, J.L.**, D. Straw, L. A. Garcia, T. W. Ley, A. A. Andales, L. H. Simmons, and M. E. Bartolo, 2010, "Mapping ET in Southeastern Colorado Using a Surface Aerodynamic Temperature Model," In Proceedings of the U.S. Commission on Irrigation and Drainage (USCID), Meeting Irrigation Demands in a Water-Challenged Environment, CD-ROM, pp. 297-308.
8. Andales, A.A., Simmons, L.H., Bartolo, M.E., Straw, D., **Chávez, J.L.**, Ley, T.W., AlWahaibi, H.S., 2010, "Alfalfa ET from a weighing lysimeter in the Arkansas Valley of Colorado," In: Proceedings of the 5th National Decennial Irrigation Conference (Dukes, M.). Phoenix, AZ. 5-8 December 2010. American Society of Agricultural and Biological Engineers, St. Joseph, MI.
9. AlWahaibi\*, H., A. Andales, D. Straw, L. Simmons, M. Bartolo, T. Ley, T. Trout, **J. Chávez**, and N. Hansen, 2010, "Alfalfa Crop Coefficients Developed Using a Weighing Lysimeter in Southeast Colorado," In Proceedings of the 2010 U.S. Committee on Irrigation and Drainage (USCID), Meeting Irrigation Demands in a Water-Challenged Environment, CD-ROM, pp. 309-317.
10. **Chávez, J.L.**, F.J. Pierce, and T.V. Elliott, 2010, "Precision irrigation with wireless monitoring and control system technology," In Proceedings of the 5th National Decennial Irrigation Conference, ASABE, Irrigation Association, Paper No. IRR10-1044, St. Joseph, Mich: ASABE.
11. **Chávez, J.L.**, P.H. Gowda, T.A. Howell, L.A. Garcia, and K.S. Copeland, 2009, "Mapping ET at high resolution in an advective semi-arid environment with airborne multispectral imagery," In Proceedings of the 2009 World & Water Congress, EWRI-ASCE, Reston, VA, pp. 441-4421.
12. Elhaddad, A., L.A. Garcia, and **J.L. Chávez**, 2009, "Using a surface energy balance model to calculate spatially distributed actual ET," In: Proceedings of the 5th Int'l Conference on Irrigation and Drainage. United States Commission on Irrigation and Drainage (USCID), Nov. 4-7, Salt Lake City, UT.
13. Gowda, P.H., T.A. Howell, **J.L. Chavez**, K.S. Copeland, and P. George, 2008, "Comparing SEBAL ET with lysimeter data in the semi-arid Texas High Plains," In: Proceedings of the World Environment and Water Resources Institute Congress 2008 Ahupua'a. ASCE-EWRI, May 12-16, 2008. Honolulu, Hawai'i, pp. 1-10.
14. Hargreaves, G.H., **J.L. Chávez**, D. Jensen, 2001, "Reconnaissance Evaluations of Transbasin Water Transfers. Paper presented at the Transbasin Water Transfer Conference," In Proceedings of the 2001 USCID

**Non-Refereed Journal Articles/Chapters/Proceedings/Transactions:**

1. **Chávez, J.L.**, and López-Urrea, R. 2018. Modeling corn surface resistance to estimate actual water use. In Proceedings of the 2018 ASCE EWRI World Environmental and Water Resources Congress 2018, Minneapolis, Minnesota, June 2-7, 2018, pp 62-73. Site: <https://ascelibrary.org/doi/book/10.1061/9780784481400>
2. **Chávez, J.L.**, Zhang, H., Capurro, M.C., Masih, A., Altenhofen, J. 2018. “Evaluation of multispectral unmanned aerial systems for irrigation management,” In Proceedings of the 2018 SPIE Conference Volume 10664: Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping III, 106640Q (15 May 2018); doi: 10.1117/12.2305076; <https://doi.org/10.1117/12.2305076>, Orlando, FL, 17 April, 2018.
3. **Chávez, J.L.** and H. Zhang. 2018. Determining crop soil water deficit with an UAS. In Proceedings of the 30th Annual Central Plains Irrigation Conference (CPIC), Colby, KS, February 20-21, 2018, CPIA, 760 N. Thompson, Colby, KS. Website: <http://www.k-state.edu/irrigate/oow/cpic18.html>
4. **Chávez, J.L.** 2017. Fixed-Wing Unmanned Aerial Systems for Improved Irrigation Management. In Proceedings of the 29<sup>th</sup> Annual Central Plains Irrigation Conference (CPIC), Burlington, CO, February 21-22, 2017, CPIA, 760 N. Thompson, Colby, KS.
5. Andales, A., J.L. **Chávez**, and N.C. Hansen. 2017. Management strategies for adapting semi-arid corn production to limited irrigation conditions. In Proceedings of the 2017 UCOWR/NIWR Annual Conference “Water in a Changing Environment”. June 13-15, 2017, Colorado State University, Fort Collins, CO
6. **Chávez, J.L.**, and J.C. Hathaway. 2016. Developing and Unmanned Aerial Remote Sensing of ET System. In Proceedings of the 2016 ASABE Annual Int’l Meeting, Orlando, FL, July 17-20, 2013. pp. 11.
7. Prasanna H. Gowda , Terry A. Howell , José L. **Chávez** , George Paul , Jerry E. Moorhead, Daniel Holman, Thomas H. Marek, Dana O. Porter, Gary H. Marek, Paul D. Colaizzi, Steve R. Evett, and David K. Brauer, 2015, A Decade of Remote Sensing and Evapotranspiration Research at USDA-ARS Conservation and Production Research Laboratory. In Proceedings of the 2015 ASABE/IA Irrigation Symposium: Emerging Technologies for Sustainable Irrigation, Long Beach, California November 10 – 12, 2015. Paper Number: 152141015, pp.
8. **Chávez, J.L.** and E. Kullberg, 2015, Handheld Infra-Red Thermometry Calibration: Monitoring Crop Water Stress. In Proceedings of the 2015 ASCE EWRI World Congress, May 17-21, Austin, TX, pp. 2024-2034.
9. **Chávez, J.L.**, 2015, “Using canopy temperature as an indicator of plant stress.” In Proceedings of the 27<sup>th</sup> Annual Central Plains Irrigation Conference (CPIC), Colby, KS, February 17-18, 2015, CPIA, 760 N. Thompson, Colby, KS.
10. **Chávez, J.L.**, E. Kullberg, and B. Mefford, 2014, “Using a handheld IRT to determine crop water stress and use,” In Proceedings of the 25th annual Central Plains Irrigation Conference, Burlington, CO, Feb. 25-26, 2014. CPIA, 760 N. Thompson, Colby, KS.
11. Taghvaeian<sup>†</sup>, S., and **Chávez, J.L.**, 2014, “Thermal remote sensing for estimating crop water use,” In Proc. of the ASABE Int’l Symposium on Evapotranspiration: Challenges in measurement and modeling from leaf to the landscape scale and beyond, control/ID paper 1877750, April 7-10, 2014, Raleigh, NC.
12. Alfieri, J.G., Kustas, W.P., Prueger, J.H., Evett, S.R., Neale, C.M.U., and **Chavez, J.L.**, 2014, “The Factors Influencing Field-Scale Measurements of Evapotranspiration ,” In Proceedings of the ASABE Int’l Symposium on Evapotranspiration: Challenges in measurement and modeling from leaf to the landscape scale and beyond, control/ID paper 1826776, April 7-10, 2014, Raleigh, NC.
13. Mkhwanazi, M.M., and **J.L. Chávez**, 2013, “Mapping Evapotranspiration with the Remote Sensing ET algorithms METRIC and SEBAL under advective and non-advective conditions: Accuracy determination with weighing lysimeters.” In Proceedings of 33rd Annual American Geophysical Union (AGU) Hydrology Days 2013 Conference. Fort Collins, CO. March 25 - 27, 2013.

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15. Subedi, A., J.L. Chávez, and A.A. Andales, 2013, "Preliminary performance evaluation of the Penman-Monteith evapotranspiration equation in southeastern Colorado," In Proceedings of 33rd Annual American Geophysical Union (AGU) Hydrology Days 2013 Conference. Fort Collins, CO. March 25 - 27, 2013.
16. Chávez, J.L., and Evett, S.R., 2012, "Using soil water sensors to improve irrigation management," In Proceedings of the 24th Annual Central Plains Irrigation Conference, Colby, Kansas, Feb. 21-22, 2012.
17. Chávez, J.L., 2012, "Vegetation water use determination with energy balance models coupled with airborne multispectral imagery and weather data," In Proceedings of the 32nd Annual AGU Hydrology Days, Colorado State University, March 21-23, 2012, Fort Collins, CO, pp. 20-28.
18. Rambikur, E., and Chávez, J.L., 2012, "Scintillometer for evapotranspiration estimation over irrigated alfalfa and dry grassland," In Proceedings of the 32nd Annual AGU Hydrology Days, Colorado State University, March 21-23, 2012, Fort Collins, CO, pp. 109-118.
19. Mkhwanazi, M., and Chávez, J.L., 2012, "Using METRIC to estimate surface energy fluxes over an alfalfa field in eastern Colorado," In Proceedings of the 32nd Annual AGU Hydrology Days, Colorado State University, March 21-23, 2012, Fort Collins, CO, pp. 90-88.
20. Taghvaeian<sup>†</sup>, S., Chávez, J.L., and Hansen, N.C., 2012, "Ground-based remote sensing of corn evapotranspiration under limited irrigation practices," In Proceedings of the 32nd Annual AGU Hydrology Days, Colorado State University, March 21-23, 2012, Fort Collins, CO, pp. 119-131.
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22. Chávez, J.L., Varble J.L., and Andales A.A., 2011, "Performance evaluation of selected soil moisture sensors," In Proceedings of the 23rd Annual Central Plains Irrigation Conference, Burlington, CO, February 22-23, 2011. Available from CPIA, 760 N. Thompson, Colby, KS.
23. Varble, J., and Chávez, J.L., 2011, "Case Study: Improved agricultural irrigation scheduling using a soil water content sensor," AGU Hydrology Days 2011. Colorado State University, Fort Collins, CO.
24. Andales, A.A., and J.L. Chávez, 2011, "ET-based Irrigation Scheduling," In Proceedings of the 23rd Annual Central Plains Irrigation Conference, Burlington, Colorado, Feb. 22-23, 2011, Colby, KS.
25. Alfieri, J.G., W.P. Kustas, M.C. Anderson, P.D. Colaizzi , J.H. Prueger, L.E. Hipps, J.L. Chavez, S.R. Evett, K.S. Copeland, and T.A. Howell, 2011, "Use of a dual temperature-difference two-source model to estimate the turbulent energy fluxes under strongly advective conditions during BEAREX08," In Proceedings of the 91st American Society of Meteorology Annual Meeting, 25th Conference on Hydrology, Washington State Convention Center, January 24-27, 2011.
26. Chávez, J.L., 2010, "Mapeo de la Evapotranspiracion de cultivos: Presente y Retos," In Proceeding of the 1st Bolivian Irrigation and Drainage Congress (1er Congreso Boliviano de Riego y Drenaje), Universidad Mayor de San Andres (UMSA), La Paz, Bolivia.
27. Chávez J.L., Gowda P.H., and T.A. Howell, 2009, "Modeling surface aerodynamic temperature in a semi-arid advective environment," In Proceedings of the 2009 ASABE Annual International Meeting, Paper # 096190. St. Joseph, MN: ASABE.
28. Chavez, J.L., Howell, T.A., Gowda, P., Neale, C.M., Colaizzi, P.D., 2008, "Evaluating airborne remote sensing ET estimates using eddy covariance systems and a heat flux source area function," In Proceedings of the 2008 Irrigation Association Conference, Anaheim, California. Paper No IA09-1013, pp 1-29.
29. Chávez J.L., P.H. Gowda, T.A. Howell, C.M.U. Neale, and K.S. Copeland, 2008, "Estimating Seasonal ET from multispectral airborne imagery: An Evaluation of interpolation-Extrapolation Techniques," In Proceedings of the 2008 ASABE Annual International Meeting, Paper No. 083637, June 29 - July 2, 2008, Providence, RI.



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31. **Chavez J.L.**, P.H. Gowda, T.A. Howell, T.H. Marek, and L.L. New, 2007, "Evapotranspiration mapping using METRIC for a region with highly advective conditions," In Proc. of the 2007 Annual International ASABE Meeting, Centennial Celebration. Paper No. 072146. June 17-20, 2007. Minneapolis, MN.
32. **Chavez J.L.**, P.H. Gowda, T.A. Howell, R. Griffin, S. Rivera, and C.M.U. Neale, 2007, "A simple empirical stream flow prediction model for Ungauged watersheds," In proceedings of the 2007 Annual International ASABE Meeting, Centennial Celebration. Paper No. 072003. June 17-20, 2007. Minneapolis, MN.
33. Gowda P.H., **J.L. Chavez**, P.D. Colaizzi, T.A. Howell, R.C. Schwartz, and T.H. Marek, 2007, "Relationship between LAI and Landsat TM spectral vegetation indices in the Northern High Plains of Texas," In proceedings of the 2007 Annual Int'l ASABE Meeting, Centennial Celebration. Paper No. 072013, Minneapolis, MN.
34. Pierce F.J., **J.L. Chavez**, T.V. Elliot, G.R. Matthews, R. Evans, and Y. Kim, 2006, "A remote-real-time continuous move irrigation control and monitoring system," In Proceedings of the 2006 ASABE Annual Int'l Meeting, Paper No. 062162, Portland, OR.
35. **Chavez J.L.**, F.J. Pierce, G.R. Matthews, T.V. Elliot, R. Evans, and Y. Kim, 2006, "Performance of a continuous move irrigation control and monitoring system," In Proceedings of the 2006 ASABE Annual International Meeting, Paper No. 062163, Portland, OR.
36. Kim Y., R. Evans, F. Pierce, and **J. Chavez**, 2006, "Software design for wireless in-field sensor-based irrigation management," In Proceedings of the 2006 ASABE Annual Int'l Meeting, Paper No. 063074, Portland, OR.
37. **Chavez J.L.**, and F.J. Pierce, 2006, "Modeling Cart Movement to minimize precision irrigation errors for Linear Move systems," In Proceedings of the 8th Int'l Meeting on Precision Agriculture. Minneapolis, MN.
38. Pierce F.J., **J.L. Chavez**, and T.V. Elliot, 2006, "Remote, Real-time irrigation monitoring and control in permanent crops," In Proceedings of the 8th International Meeting on Precision Agriculture. Minneapolis, MN.
39. Neale, C.M.U., and **J.L. Chavez**, and R. Vinukollu, 2005, "Integration and weighting of remotely sensed energy balance fluxes." In Proceedings of the Int'l Society for Optical Engineering (SPIE), Europe International Remote Sensing Symposium. Remote Sensing for Agriculture, Ecosystems, and Hydrology VII Conference. Bruges, Belgium. September 19-22, 2005. Vol. 5976, pp. 59760M.
40. **Chávez, J.L.** and C.M.U. Neale, 2003, "Validating airborne multispectral remotely sensed heat fluxes with ground energy balance tower and heat flux source area (footprint) functions," In proceedings of the 2003 ASAE Annual Int'l Meeting, ASAE Paper No. 033128, St. Joseph, MI.
41. **Chávez J.L.**, and C.M.U. Neale, 2002, "Obtaining Spatial Air Temperature from Airborne Radiometric Crop Canopy," In Proceedings of the 2002 Annual International Meeting of the ASAE jointly with the XVth World Congress of the International Commission of Agricultural Engineering (CIGR). Chicago, Illinois.
42. Rivera, S., **J.L. Chávez**, and R. I. Guillen, 2002, "Mezcalar Watershed Sedimentation Study and GIS based Watershed Management Analysis," In Proceedings of the 2002 ASAE Watershed Management to meet Emerging Total Maximum Load (TMDL) Conference, Forth Worth, TX.

## Book Review

**Chávez, J.L.**, 2009, "Remote Sensing of Global Croplands for Food Security," (Eds.) Prasad S. Theknkabail, John G. Lyon, Hugh Turrall, Chandrashekhar M. Biradar, In: Taylor & Francis Series in Remote Sensing Applications, Qihao Weng (Ed.), Taylor & Francis Group, Boca Raton, Florida USA (2009), 556 pp. with 48 color p., Hardback, ISBN 978-1-4200-9009-3. Review Published on-line in the Journal of

**Chávez, J.L.**, J. Schneekloth, A. Andales, S. Cronin, B. Haselbush, R. Jones, G. Murrey, J. Peel, R. Romano, and M. Stonehaker, 2013, "Small Acreage Irrigation Guide: Water rights and irrigation management," (Eds.) Boyd Byelich, Jennifer Cook, and Chayla Rowley. Published by USDA NRCS and Colorado State University Extension, pp. 25.

### Technical Report

1. **José Chávez**, CSU (Fort Collins); Louise Comas, USDA-ARS WMR (Fort Collins); Huihui Zhang, USDA-ARS (Fort Collins); Jon Altenhofen, Northern Water (Berthoud); Joel Schneekloth, CSU (Akron); David Nielsen, USDA-ARS CPRMR (Akron); Ron Meyer, CSU (Burlington); Kevin Larson, CSU PRC (Walsh); Sean Gleason, USDA-ARS (Fort Collins); Kendall DeJonge, USDA-ARS (Fort Collins). 2018. Final Report, Colorado Corn Administrative Committee Research Grant Proposal. Title: "A Tool for Monitoring and Managing Water Stress in Corn." Submitted to Colorado Corn Growers Association, August 2018.
2. Hansen, N., Cotrufo F., Paustian K., Andales A., **Chávez J.L.**, Khosla R., Longchamps L., and Reich R., 2017. "Decision support tools, drought tolerance, and innovative soil and water management strategies to adapt semi-arid irrigated cropping systems to drought." Final project report, submitted to NRCS CIG program, December 2017.
3. **Chávez**, J.L., Waskom R., and S. Smith, 2017, "Colorado Irrigation Center Design and Concept Development," Final Report, submitted to Colorado Water Conservation Board, August 30<sup>th</sup>, 2017.
4. Cabot, P., A. Vashisht, and J.L. **Chávez**, 2017, "Using remote sensing assessments to document historical and current saved consumptive use (CU) on alfalfa and grass hayfields managed under full and partial-season irrigation regimes," Completion Report, submitted to Colorado Water Institute, July 2017.
5. **Chávez**, J.L., 2015, "Developing an Unmanned Aerial Remote Sensing of ET System," Final project report, Submitted to Colorado Water Conservation Board (CWCB), pp. 46.
6. **Chávez**, J.L., 2014, "Crop evapotranspiration determination using eddy covariance fluxes, high resolution remote sensing imagery, and a surface temperature approach," Agreement No: SCA 58-6209-9-058. Accession No: 418392. Final project report, Submitted to USDA ARS CPRL, pp. 50.
7. Hansen, N., **Chávez**, J.L., L. Garcia, and B. Lytle, 2014, "Lower South Platte Irrigation Research and Demonstration Project," Final project report, Submitted to Colorado Water Conservation Board, June 2014, pp. 103.
8. **Chávez**, J.L., 2014 "Reference Evapotranspiration Determination Using the Recursive Method and Surface Aerodynamic Temperature, Project progress report, Submitted to USDA NIFA, pp. 3.
9. **Chávez**, J.L., 2014, "Borlaug Fellowship Program Final Report," Submitted to Dr. Ajay Jha, Director of the Institute for Global Technical Transfer (IGATT), Colorado State University, as part of a USAID funded project in Pakistan, pp. 2.
10. **Chávez**, J.L., 2013, "Modeling and evaluating remote sensing-based crop ET with scintillometers and a heat flux source area function," Final project report, Submitted to U.S. Dept. of Agriculture, CSREES, State Agricultural Experiment Stations (AES), Jan. 1<sup>st</sup>, 2013, pp. 2.
11. Andales, A.A., **Chávez**, J.L. (collaborator), 2013, "Determining the Consumptive Water Use of Crops in Colorado for Efficient Irrigation," submitted to USDA NIFA, pp. 3.
12. **Chávez**, J.L., and S. Taghvaeian, 2012, "Grass water stress and ET monitoring using ground-based and airborne-based remote sensing: Project Report," Submitted to Northern Colorado Water Conservancy District, March 30, 2012, pp. 23.
13. **Chávez**, J.L., 2011, "Crop water stress index and evapotranspiration monitoring using remote sensing techniques," Submitted to Regenes Management Group, LLC, Jan. 2013, pp. 5.

14. **Chávez, J.L.**, 2011, “Wireless in-field soil water content monitoring project,” Report submitted to Central Colorado Water Conservancy District, March 9th, 2011, pp. 10.
15. **Chávez, J.L.**, 2011, “Irrigation water conservation tool,” Submitted to Central Colorado Water Conservancy District, May 17th, 2011, pp. 4.
16. **Chávez J.L.**, and Christopher M.U. Neale, 2003, “Airborne Remote Sensing of Evapotranspiration over Riparian Vegetation in the middle Rio Grande River,” Project Report submitted to the U. S. Bureau of Reclamation, Utah State University, Logan, UT, pp. 50.

### **Peer Reviewed Extension Fact Sheets**

**Chávez, J.L.**, Reich, D., Loftis, J.C., and Miles D.L., 2011, “Irrigation pumping plant efficiency.” Colorado State University Extension, Factsheet No. 4.712.

Andales, A., **Chávez, J.L.**, and Bauder, T.A., 2011, “Irrigation Scheduling: The Water Balance Approach,” Colorado State University Extension. Factsheet No. 4.707.

Reich, D., Godin, R., **Chávez, J.L.**, and Broner, I., 2009, “Subsurface Drip Irrigation (SDI),” Colorado State University Extension. Factsheet No. 4.716.

### **PAPERS PRESENTED/SYMPOSIA/INVITED LECTURES/PROFESSIONAL MEETINGS/WORKSHOPS**

#### **Invited Presentations – National and International**

1. June 25, 2018. “Center Pivot and Lateral Move Variable Rate Irrigation (VRI),” Presented at the 2018 Irrigation Association Agriculture Faculty Academy, at Colorado State University (CSU) Agricultural Research Development and Education Center (ARDEC), Fort Collins, CO
2. September 15, 2017. “Colorado Irrigation Technology Center (ITC): ITC project proposal,” Presented at the Northern Water Fall Field Day, Berthoud, CO
3. June 14, 2017. “Monitoring deficit irrigation with Unmanned Aerial System.” Presented at Escuela Tecnica Superior de Ingenieros Agronomos y de Montes, Universidad Castilla La Mancha, Albacete, Spain.
4. February 21-22, 2017. “Fixed-Wing Unmanned Aerial Systems for Improved Irrigation Management.” Presented at the 2017 High Plains Irrigation Association Conference in Burlington, CO.
5. January 12, 2017. “Use of an unmanned aerial system in aiding irrigation scheduling,” Presented at the 2017 4-States Irrigation Council Meeting, Fort Collins Hilton, Fort Collins, CO
6. November 8, 2016. “Irrigation water management aided by UAV remote sensing.” Presented at the 2<sup>nd</sup> World Irrigation Forum, Water Management in a Changing World: Role of irrigation for sustainable food production. Event SE-8 entitled “Key and Smart Technologies for Irrigation and Drainage.” Organized by the International Commission on Irrigation and Drainage (ICID), Nov. 6-8, 2016, Chiang Mai, Thailand.
7. June 2, 2015. Estimating crop water use or ET at different temporal and spatial scales. Presented at the "High-efficiency Water Use in Agriculture" Project (111 Plan) Workshop (Water and Food Security under Changing Environments), June 1-7, 2015. Center for Agricultural Water Research in China, China Agricultural University, Beijing, China.
8. February 17-18, 2015. Using canopy temperature as an indicator of plant stress. In Proceedings of the 26<sup>th</sup> Annual Central Plains Irrigation Conference (CPIC), Colby, KS.
9. January 8, 2015. Remote Sensing Principles: Multispectral Imagery Calibration. Presented at the “Centro de Investigación y Transferencia en Riego y Agroclimatología” (CITRA), Universidad de Talca, Talca, Chile.
10. November 3<sup>rd</sup>, 2014. A Remote Sensing of ET method based on Surface Aerodynamic Temperature. ASA, CSSA, and SSSA International Annual Meeting, Long Beach, California.
11. April 23<sup>rd</sup>, 2014. On Farm water management practices in the western USA. Seminar presented at Pir Mehr Ali

- Shah Arid Agriculture University, Islamabad, Pakistan. Sponsored by USDA/FAS and CSU.
12. April 22<sup>nd</sup>, 2014. On Farm water management practices in the western USA. Seminar presented at University of Agriculture Faisalabad, Faisalabad, Pakistan. Sponsored by USDA/FAS and CSU.
  13. April 21<sup>st</sup>, 2014. Irrigation management using a handheld infra-red thermometer (IRT). Seminar presented at the Pakistan National Agricultural Research Council (NARC), Islamabad, Pakistan. Sponsored by USDA/FAS, NARC, CSU and ICARDA.
  14. January 7<sup>th</sup>, 2014. Monitoring crop water use and stress using remotely sensed data. Seminar presented at E&J Gallo Winery, Modesto, CA
  15. May 7<sup>th</sup>, 2013. Optimizing Irrigation Scheduling at Different Spatial Scales. Kansas State University, Manhattan, KS
  16. May 10<sup>th</sup>, 2013. Crop water use monitoring at different spatial scales. Seminar presented to a group of 8 from Azerbaijan. At Colorado State University (CSU), Fort Collins, CO
  17. Aug 9<sup>th</sup>, 2013. Crop evapotranspiration determination at different scales. Presented to the visiting Borlaug Fellows from Pakistan, CSU, Fort Collins, CO
  18. Aug 9<sup>th</sup>, 2013. Crop water use determination at different scales. Presented to the Borlaug Fellows from Pakistan, Colorado State University, Fort Collins, CO.
  19. May 7<sup>th</sup>, 2013. Optimizing irrigation scheduling at different spatial scales. Kansas State Univ., Manhattan, KS.
  20. May 10<sup>th</sup>, 2013. Crop water use monitoring at different spatial scales. Prepared for the Azerbaijan Irrigation Cochran Fellows, Colorado State University, Fort Collins, CO.
  21. Jan 31 and Feb 1, 2012. Soil moisture sensors in irrigation management. Presented at the 24th Annual High Plain No-Till Conference. Sponsored by the Colorado Conservation Tillage Association. Burlington, CO.
  22. June 19, 2012. Water Use Management with Sensors and Remote Sensing. Seminar presented to the Agricultural Management Pakistani Delegation. At the Soil and Crop Sciences Department, Colorado State University.
  23. Nov. 22, 2012. Monitoreo del uso del agua del cultivo a diferentes escalas espaciales utilizando sensores remotos para mejorar el manejo del agua. Presented at the Research and Extension Center for Irrigation and Agriculmatology (CITRA, Centro de investigacion y transferencia de riego agriculmatologia), Universidad de Talca, Talca, Chile.
  24. October 20, 2011, **Chávez**, J.L., 2011. "Precision Irrigation with Wireless Monitoring and Control System Technology," Presented before the Precision Agricultural Fall class of 2011 (Dr. Khosla's), at the Soil and Crop Science Department, Colorado State University, Fort Collins, CO.
  25. April 15, 2011. **Chávez**, J.L. Spatial estimation of crop ET using remote sensing and micro-climatological data in Colorado, Instituto Tecnico Agronomico Provincial de Albacete, April 15, Albacete, Spain.
  26. February 16, 2011. **Chávez**, J.L. Crop Water Stress Index and Evapotranspiration Monitoring using Remote sensing, DISARM Meeting, Regensis Management Group. Presented at the USDA-ARS, Fort Collins, Colorado, Thursday February 16.
  27. September 28, 2010. **Chávez**, J.L., and Garcia, L.A. 2010. Use of remote sensing to obtain spatial ET estimates. Keynote presentation presented during the U.S. Commission on Irrigation and Drainage (USCID), Meeting Irrigation Demands in a Water-Challenged Environment Conference, Fort Collins, CO.
  28. May 5, 2010. **Chávez**, J.L. Modeling and evaluating remote sensing-based crop ET with scintillometers and a heat flux source area function. Presented to the Colorado Agricultural Experiment Station 2010 Coordination Meeting and the Colorado Water Institute. Colorado State University, Fort Collins, CO.
  29. April 23, 2010. **Chávez**, J.L. Mapping crop water use and stress in Colorado using remote sensing of ET algorithms. Presented at the "Food for Thought College of Science and Math Colloquium Series". Colorado State University, Pueblo, Colorado.
  30. April 16, 2010. **Chávez**, J.L. 2010. Measuring and estimating crop water use at different temporal and spatial

scales. Presentation given to the Colorado State University College of Engineering Advisory Board. At the Engineering Research Center. Fort Collins, Colorado (CO), USA.

31. March 22, 2010. Crop Water Stress Index and ET determination. 1st (First) World Water Day. Colorado State University. Fort Collins, CO.
32. February 18, 2010, "Remote sensing-based crop water stress (CWS) determination of limited MON87460 transgenic drought tolerant corn hybrids." MONSANTO corn drought academic review meeting. MONSANTO, Gothenburg, NE.
33. September 1, 2009. "ET-based scheduling basics." At the USDA-NRCS/CSU-Extension Irrigation Scheduling (Irrigation Water Management) Workshop, at the USDA Service Center, Delta, CO.
34. April 3, 2008. "Emerging irrigation water management technologies." At the Civil and Environmental Engineering Department, Colorado State University, Fort Collins, CO.
35. June 7, 2007. "MODTRAN4 Procedures to Calibrate Thermal Imagery." At the USDA-ARS, Conservation and Production Research Laboratory, Bushland, TX.
36. May 5, 2006. "Potencial de los Recursos Hídricos de la Cuenca Alta del Rio Grande." (Water Resource Potential of the Upper Rio Grande Watershed). At Prefectura of Santa Cruz, Santa Cruz, Bolivia.
37. April 26, 2006. "Efficient water management technologies: From the field to the irrigation district level". At the USDA-ARS, Conservation and Production Research Lab., Bushland, TX.
38. March 6, 2006. "Remote Real-Time Continuous Move Irrigation Monitoring and Control System." At the USDA-ARS-NPARRL, Northern Plains Agricultural Research Lab, Sidney, MT.
39. February 15, 2006. "Remote Real-Time Continuous Move Irrigation Monitoring and Control System." At the USDA-ARS-CPCRC, Pacific Northwest Columbia Plateau Conservation Research Center, Pendleton, OR.
40. January 25, 2006. "Remote Real-Time Continuous Move Irrigation Monitoring and Control System." At the Center for Precision Agricultural Systems (CPAS), Washington State University, Prosser-WA.
41. February 2, 2005. "Validating surface energy balance fluxes derived from airborne remote sensing." At the Center for Precision Agricultural Systems (CPAS), Washington State University, Prosser-WA.
42. January 14 -15, 2003. "Airborne and Surface Remote Sensing Measurements." At the SMACEX 02 / SMEX 02. Workshop organized by the USDA-ARS Hydrology and Remote Sensing Laboratory (Beltsville, MD). Sheraton Hotel in Columbia, MD.
43. June 25 – 30, 2001. "Remote sensing and GIS applications to watershed management." Quito-Ecuador. Before the Ecuadorian National Irrigation Association. Invited by the International Irrigation Center (IIC), BIE Dept. Utah State University; as part of the Technical Assistance Project to the Irrigation Sub-sector – Irrigation Systems Transfer to Farmers. USU Contract PAT-BIRF 3730EC.
44. July 1 – 30, 2001. "Remote sensing and GIS applications to Irrigation systems management." Training provided to the INDRHI (Dominican Republic National Hydraulic Institute) personnel. Santo Domingo-Dominican Republic. This training was part of the Irrigated Areas Mapping Project – Irrigation Systems Management Studies financed by the Inter-American Development Bank (IDB) under the USU contract BID 905/OC-DR.

#### **Invited Speaker/Presentations - Colorado Extension**

1. Nov 26<sup>th</sup>, 2013. Tools for improving water efficiency and optimizing irrigation timing. Colorado Crop Clinic: Soil & Crop Health. CSU Extension, Sterling, CO
2. May 30<sup>th</sup>, 2013. Implementation of deficit irrigation regimes: Demonstration and Outreach. Presented before the CO Corn Growers Association, Greeley, CO
3. Jan 31 and Feb 1, 2012. Soil moisture sensors in irrigation management. Presented at the 24th Annual High Plain No-Till Conference. Sponsored by the Colorado Conservation Tillage Association. Burlington, CO.
4. September 29, 2011. **Chávez, J.L.** Irrigation Water Management: Soil Moisture Measurements: Soil Water Tension and Content Sensors. Target group: U.S. Natural Resource Conservation Service, Delta, Colorado.

## Workshops

1. October 13, 2016, “Deficit Irrigation in Colorado and Need for ET Monitoring,” presented at the 9<sup>th</sup> USCID Int’l Conference, ET Workshop sponsored by the ASCE EWRI, ASABE, and USCID. Hilton Hotel, Fort Collins, CO.
2. August 9, 2016, “USDA NRCS Irrigation Water Management Workshop,” presentation and demonstration (field) on soil moisture sensors (methods to estimate/measure soil moisture, field exercises), Organized by USDA NRCS, at CoBank Center for Agricultural Education, CSU-ARDEC, Fort Collins, CO.
3. April 21, 2016. “Alternative Agricultural Water Transfer Methods: Deficit Irrigation Monitoring”. Organized by Colorado State University Extension, Organizer and speaker, Fort Morgan, CO.
4. March 21, 2012. “2012 Evapotranspiration (ET)” Workshop: New Technologies and Methods for Estimating ET. Organized by Colorado State University Extension, USDA ARS, and Colorado Division of Water Resources, Role: Organizer and speaker, Fort Collins, CO.
5. Nov. 21, 2012. “Uso de percepción remota en la estimación de la ET” (Use of remote sensing in the estimation of ET). Centro de investigación y transferencia en riego y agroclimatología (CITRA), 2012. Workshop directed to researchers from the Research and Extension Center for Irrigation and Agroclimatology (CITRA), University of Talca, Role: Speaker/presenter. Talca, Chile.
6. September 29, 2011, “2011 Irrigation Water Management Training” Workshop. Presented the theme “Soil moisture measurements.” Workshop Organized by Colorado State University Extension, Role: helped organize it and speaker, Delta, CO.
7. March 12, 2010. “2010 Evapotranspiration (ET)” Workshop.” Presented the theme “Remote sensing to improve ET estimates.” Sponsored by Colorado State University, USDA ARS, and Colorado Division of Water Resources. Role: Speaker, Fort Collins, CO.
8. September 1, 2009. “2009 Irrigation scheduling based on the soil water balance approach.” Organized by Colorado State University Extension, Role: helped organize it and speaker, Delta, CO.

## Presentations and newsletters articles

Note: Authors/speakers underlined are students or research associates advised by Dr. **Chávez**.

1. José L. Chávez, Huihui Zhang, Daran Rudnick, Joel Schneekloth. 20XX. “UAS-based Variable Rate Irrigation: Is it possible? Irrigation Innovation Consortium Newsletter...
2. Chávez, J.L. 2018. “Irrigation Water Management Technologies,” Brazilian delegation – USGS host (Gabriel Senay, William Hughes, Tamara Ivahnenko), Colorado State Univ., 22 Oct 2018.
3. Chávez, J.L., Zhang, H., Capurro, M.C., Masih, A., Altenhofen, J. 2018. “Evaluation of multispectral unmanned aerial systems for irrigation management,” 2018 SPIE Conference 10664: Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping III, Orlando, FL, 17 April, 2018
4. Brown, A.J., Andales, A.A., Gates, T.K., Chávez, J.L, and B.D. Craig. 2018. “Distribution of Soil Water Salinity and Impacts on Maize Yield in Gypsiferous Irrigated Fields with Subsurface Drainage,” Presented at the Hydrology Days 2018 conference, CSU, March 20, 2018, Fort Collins, CO.
5. Brian D. Craig, Jose L. Chávez, Timothy K. Gates, A.J. Brown, and Allan A. Andales. 2018 Remote Sensing of Soil Salinity for Use in Irrigation Water Management. Presented at the Hydrology Days 2018 conference, CSU, March 20, 2018, Fort Collins, CO.
6. Sumit Gautam, Perry Cabot, and José L. Chávez. 2018. Evaluation of multispectral remote sensing derived vegetation indices to estimate reflectance-based crop coefficients and seasonal evapotranspiration rates for grass pastures in western Colorado. Presented at the Hydrology Days 2018 conference, CSU, March 20, 2018, Fort Collins, CO.
7. Brown, A.J., Andales, A.A., Gates, T.K., and Chávez, J.L. 2018. Soil Salinity measurement and effects on corn in southwest Colorado. Poster presented at the 2018 Great Plains Soil Fertility Conference, Organized by the Int’l Plant Nutrition Institute, March 6-7, 2018, Double Tree by Hilton Hotel, Denver, CO

8. Rudnick, Chávez, Aguilar, Irmak, Bordovsky, and Burr. 2017. Advances in irrigation technology. The Ogallala Aquifer. Published in Colorado Water, Colorado Water Institute, Nov/Dec 2017, pp 29-32.
9. Jones, Andales, Chávez, McGovern, and Smith. 2017. Weather Data Integration into Irrigation Scheduling Tools. The Ogallala Aquifer. Published in Colorado Water, Colorado Water Institute, Nov/Dec 2017, pp 24-28.
10. Interviewed by Nathan Hurst from the Smithsonian (on water stress monitoring research), on 8 sept, 2017. Comments on a recent technology from Penn State University were published at: <http://www.smithsonianmag.com/innovation/snap-sensor-could-tell-farmers-exactly-how-much-water-their-crops-180965036/>
11. José L. Chávez, “How feasible is to monitor deficit irrigation with an unmanned aerial system?,” Presented at the ASCE EWRI Congress in Sacramento, CA, 23 May 2017.
12. Sumit Gautam, Perry Cabot, and José L. Chávez, “Ground-based multispectral remote sensing to estimate actual crop coefficients for alfalfa and grass pastures in the western slope Colorado,” Presented at the Hydrology Days 2017 conference, CSU, March 21, 2017, Fort Collins, CO.
13. Mahmoud Osman, Jose Chavez, Karan Venayagamoorthy, “Aerodynamic methods for estimating turbulent fluxes over irrigated crops,” Presented at the Hydrology Days 2017 conference, CSU, March 20, 2017, Fort Collins, CO.
14. **José L. Chávez** and Christopher Neale, “Remote Sensing in Irrigation: From Landsat to UAS,” Tech Corner, Irrigation Today Magazine, Irrigation Association, pp. 30-31, October 2016. Irrigationtoday.org
15. Amandeep Vashisht, **José L. Chávez** and Perry Cabot, “Remote Sensing Assessments of Full and Partial Irrigation Regimes to Estimate Conserved Consumptive Use of Agricultural Water in Western Slope of Colorado,” 2016 USCID Fall meeting, Fort Collins, CO, October 11-14, 2016
16. **José L. Chávez**, Joseph Yu Zhang, Huihui Zhang, and Wayne Woltdt, “Issues Encountered Operating an UAS for Crop ET Estimations,” 2016 USCID Fall meeting, Fort Collins, CO, October 11-14, 2016
17. Abhinaya Subedi, **José L. Chávez** and Allan A. Andales, 2016, “Alfalfa Evapotranspiration Estimation: One Step Model,” 2016 USCID Fall meeting, Fort Collins, CO, October 11-14, 2016
18. **José L. Chávez**, Christopher Neale, Terry Howell, Marcos Carrasco-Benavides, Allan Andales, and Mahmoud Soliman, 2016, “Remote Sensing of ET Based on Aerodynamic Temperature,” 2016 USCID Fall meeting, Fort Collins, CO, October 11-14, 2016
19. Andales A., **José L. Chávez**, and Neil Hansen. “Irrigation Scheduling Strategies for Limited Irrigation Conditions.” Presented at the American Society of Agronomy (ASA), 2016 Annual Meeting, Phoenix, AZ, Nov 6-9, 2016
20. Huihui Zhang, Ming Han, **José L. Chávez**, Liwang Ma (2016), “Estimation of soil water deficit using canopy temperature with a water balance model,” Presented at the American Society of Agronomy (ASA), 2016 Annual Meeting, Phoenix, AZ, Nov 6-9, 2016
21. Vashisht, A., P. Cabot, and **J. Chávez** (2016), “Assessing conserved consumptive use of agricultural water for a potential Colorado Western Slope Water Bank,” In Proceedings of the 2016 UCOWR/NIWR Annual Water Resources Conference, June 21-23, 2016, Hilton Pensacola Beach Hotel, Pensacola Beach, FL
22. **Chávez, J.L.** (2016), “Monitoring crop water use under full and deficit irrigation using a spatially distributed temperature model.” Presented webinar to the Pakistan project audience at Univ. of Utah, from Colorado State University, Fort Collins, CO, March 25, 2016.
23. Comas LH, KR Willi, H Zhang, **JL Chávez**, M Han, J Altenhofen, SM Gleason, KC DeJonge, and JS Young. (2016). “Determining Stomatal Conductance and Transpiration From Remotely-Sensed Plant Parameters.” International Symposium on Sensing Plant Water Status – Methods and Applications in Horticultural Science. Int’l Society for Horticultural Sci. Oct. 5-7, 2016, Postdam, Germany.
24. Cabot, P., J. Brummer, C. Pearson, L. Jones, G. Litus, A. Berrada, **J. Chávez**, S. Gautam, A. Vashisht, J. Lafantasia, and J. Kruthaupt. (2016). Western Slope Research Update. AES Research Center Conference. Presented at the Colorado Agricultural Experiment Station (AES) Research Center Conference, Colorado State University, Fort Collins, CO, January 6, 2016.

25. **Chávez, J.L.**(2016), “Monitoring alfalfa, grass, corn and potato water use under full and deficit irrigation using a spatially distributed temperature model.” Presented at the Colorado Agricultural Experiment Station (AES) Research Center Conference, Colorado State University, Fort Collins, CO, January 6, 2016.
26. Comas, L.H., J. Altenhofen, J.S. Young, K.R. Willi, S.M. Gleason, J.L. **Chávez**, H. Zhang, and K.C. DeJonge, (2016), “Using canopy temperature, stomatal conductance and transpiration from remotely-sensed plant parameters to determine plant water use.” Poster presented at the Western Photosynthesis Meeting in Tabernash, CO, Jan 4-6, 2016.
27. **Chávez, J.L.**(2015), “Monitoring crop water use and stress to inform irrigation,” article published in the Colorado Water Newsletter, Nov/Dec 2015, Volume 32, Issue 4, pp 10-11.
28. Andales, A.A., and **Chávez, J.L.** (2015), “Adapting irrigation cropping systems to drought,” article published in the Colorado Water Newsletter, Nov/Dec 2015, Volume 32, Issue 4, pp 14-16co.
29. **Chávez, J.L.**(2015), “Remotely sensed canopy temperature: A tool to detect crop water stress.” Presentation at the USCID Water Management meeting on Emerging Issues in Water Management Governance, Albuquerque, New Mexico, Nov. 17-20, 2015.
30. Hathaway, J.C. and **Chávez, J.L.**(2015), “Estimating soil water content and crop water requirements with unmanned aircraft systems (UAS) remote sensing.” Poster presentation at the USCID Water Management meeting on Emerging Issues in Water Management Governance, Albuquerque, New Mexico, Nov. 17-20, 2015.
31. **Chávez, J.L.**(2015), “Developing an Unmanned Aerial Remote Sensing of ET System,” presented before the Colorado Water Institute (CWI) advisory board, 06 Nov., at Denver Water, Denver, CO,
32. **Chávez, J.L.** and J.C. Hathaway. (2015). Unmanned Aerial Systems (UAS) for Sensing Actual Evapotranspiration. Presented at the CSU Soil & Crop Sci Seminar, October 22, Fort Collins, CO,
33. Mcebisi M. Mkhwanazi and José L. **Chávez.** (2015). Developing a remote sensing ET algorithm that accounts for advection with limited data. At the 2015 ASCE EWRI World Congress, May 19, Austin, TX,
34. **Chávez, J.L.** and E. Kullberg, 2015, Handheld Infra-Red Thermometry Calibration: Monitoring Crop Water Stress. At the 2015 ASCE EWRI World Congress, May 19, Austin, TX
35. M. Semin Barlak, **José L. Chávez,** Prasanna H. Gowda, and Steven R. Evett. (2015). Mapping evapotranspiration at high resolutions using the Surface aerodynamic temperature model and airborne multispectral remote sensing data. Presented at the Hydrology Days 2015 conference, March 23, 2015, Fort Collins, CO.
36. Emily G. Kullberg, **José L. Chávez,** and Kendall DeJonge. (2015). Evaluation of Water Stress Coefficient Methods to Estimate Actual Corn Evapotranspiration in Colorado. Presented at the Hydrology Days 2015 conference, March 23, 2015, Fort Collins, CO.
37. Abhinaya Subedi, **José L. Chávez,** Allan A. Andales. (2015). Monolithic weighing lysimeter-based alfalfa evapotranspiration rates evaluation using micrometeorological instruments. Presented at the Hydrology Days 2015 conference, March 23, 2015, Fort Collins, CO.
38. Marcos Carrasco-Benavides, Samuel Ortega-Farías, Luis Morales-Salinas and **José L. Chávez.** (2015). Estimation of sensible heat flux of a drip-irrigated vineyard using the aerodynamic temperature model in Talca-Chile. Presented at the Hydrology Days 2015 conference, March 23, 2015, Fort Collins, CO.
39. **Chávez, J.L.** (2015). Determining crop water use and stress using a range of instrumentation and methods. Presented before the “Partner Center for Advance Studies in Water,” University of Utah, Salt Lake City, UT, March 2-3, 2015.
40. **Chávez, J.L.** (2015). Remote Sensing Principles: Multispectral Imagery Calibration. Presented at the "Centro de Investigación y Transferencia en Riego y Agroclimatología" (CITRA), Universidad de Talca, Talca, Chile, January 8, 2015.
41. **Chávez, J.L.** (2014). Irrigation Scheduling Research in Eastern Colorado: Report. 2014 Annual Meeting, WERA-1022, Meteorological and Climate Data to Support ET-based Irrigation Scheduling, Water



- Conservation and Water Resources Management. September 17-18, 2014, Castle Hotel, Orlando, FL.
42. **Chávez, J.L.** (2014). Determining crop water use and stress using remotely sensed and ground-based micro-met data. Presentation to visiting Spaniard Scholars (Dr. Luciano Mateos and Dr. Helena Gomez, Institute for Sustainable Agriculture (Spanish Council for Scientific Research) in Cordoba, Spain), Colorado State University, Fort Collins, CO, May 9, 2014.
  43. Mefford, B., and **J.L. Chávez.** (2014). Assessing corn water stress using spectral reflectance. AGU Hydrology Days, Colorado State University, Fort Collins, CO, March 24-26, 2014.
  44. Evett, Steven R., Kustas, William P., Alfieri, Joseph G., Prueger, John H., and **Chavez, José L.** (2013). Lessons learned from the Bushland Evapotranspiration and Agricultural Remote Sensing Experiment 2008 (BEAREX08). Geological Society of America Meeting. 2013 GSA Annual Meeting in Denver: 125th Anniversary of GSA (27-30 October 2013).
  45. Saleh Taghvaeian and José L. **Chávez.** (2013). Corn Water Stress Thermography: Potentials and Limitations. Presented at the Seventh International Conference on Irrigation and Drainage, USCID. Phoenix, AZ, April 16-19, 2013.
  46. **Chávez, José L.** (2013). Determining corn water use with thermal and weather data. Colorado Water Newsletter, Theme: Agricultural Water. Water Center of Colorado State University, July/August 2013, Vol 30, Issue 4, Fort Collins, CO.
  47. **José L. Chávez.** (2013). Determining Corn Water Use with a Remote Sensing Based Within Canopy Air Temperature Method, USCID Water Management Conference, October 22-25, Denver, CO
  48. Mcebisi M. Mkhwanazi, and **José L. Chávez.** (2013). Modified SEBAL Remote Sensing ET Algorithm to Account for Advection, USCID Water Management Conference, October 22-25, Denver, CO
  49. Abhinaya Subedi, **José L. Chávez** and Allan A. Andales. (2013). Effects of Surface Non-Uniformity on Penman-Monteith Equation, USCID Water Management Conference, October 22-25, Denver, CO
  50. Brenna Mefford, Kendall DeJonge, and **José L. Chávez.** (2013). Ground Based Remote Sensing of Shortwave Spectral Vegetation Indices, USCID Water Management Conference, October 22-25, Denver, CO
  51. **Chávez, J.L.** (2013). Corn evapotranspiration estimates derived from a remote sensing based within canopy air temperature model. Symposium: Accuracy, uncertainty, and limitations of evapotranspiration quantification in agriculture. ASA, CSSA, & SSSA Int'l Annual Meeting, Nov. 3-6, 2013, Tampa, FL.
  52. Allan A. Andales, **Jose Luis Chavez**, Lane Simmons and Michael Bartolo. (2013). Evapotranspiration Measurements Using Weighing Lysimeters: The Rocky Ford Experience. Symposium: Accuracy, uncertainty, and limitations of evapotranspiration quantification in agriculture. ASA, CSSA, & SSSA Int'l Annual Meeting, Nov. 3-6, 2013, Tampa, Florida.
  53. Saseendran S. Anapalli, Lajpat R. Ahuja, Liwang Ma, Thomas J. Trout, David C. Nielsen, Allan A. Andales, **José L Chávez**, and Jay Ham. (2013). Exploring Options for Enhancing Water Stress Responses of Corn (*Zea mays* L.) in RZWQM2. Symposium: Accuracy, uncertainty, and limitations of evapotranspiration quantification in agriculture. ASA, CSSA, & SSSA Int'l Annual Meeting, Nov. 3-6, 2013, Tampa, Florida.
  54. **Chávez, J.L.**, and S. Taghvaeian. 2012. Grass water stress and ET monitoring using ground-based and airborne-based remote sensing: Project Report. Submitted to Northern Colorado Water Conservancy District. March 30, 2012.
  55. **José Chávez**, Saleh Taghvaeian, Thomas Trout, William Sanford. 2012. Monitoring Corn Water Stress and Actual ET with Remote Sensing. 2012 World Environmental & Water Resources Congress, ASCE-EWRI, Albuquerque, NM, May 23, 2012.
  56. Mkhwanazi, M., and **Chávez, J.L.** (2012). Using surface aerodynamic temperature in remote sensing-based ET models (Aerodynamic Surface Temperature Modeling Under Various Surface Conditions). Presented at the 2012 Annual International ASA-CSSA-SSSA Conference Meeting. Symposium--Evapotranspiration: Monitoring, Modeling and Mapping At Point, Field, and Regional Scales. Cincinnati, Ohio, 23 Oct.
  57. David Gleason, Troy Bauder, Allan Andales, and **Jose L. Chavez.** (2012). Performance of atmometers in

estimating reference evapotranspiration in a semi-arid environment. Presented at the 2012 ASA, CSSA, SSSA Int'l Annual Meetings, Oct. 21-24, 2012, Cincinnati, Ohio.

58. **Chávez, J.L.**, Reich, D., Loftis, J.C., and Miles D.L. 2011. Irrigation pumping plant efficiency. Colorado State University Extension, Factsheet No. 4.712.
59. Andales, A., **Chávez, J.L.**, and Bauder, T.A. 2011. Irrigation Scheduling: The Water Balance Approach. Colorado State University Extension. Factsheet No. 4.707. Published on-line, July 2011.
60. **Chávez, J.L.** 2011. Monitoring crop water stress to quantify water savings for agricultural water transfer purposes. USCID NewsLetter, Spring 2011, Issue No 108. ISSN: 1083-1320.
61. **Chávez, J.L.**, 2011. Irrigation water conservation tool. Submitted to Central Colorado Water Conservancy District. May 17th, 2011.
62. **Chávez, J.L.** 2011. Wireless in-field soil water content monitoring project. Report submitted to Central Colorado Water Conservancy District. March 9th, 2011.
63. Gowda, P.H., T.A. Howell, P.D. Colaizzi, N. Rajan, **J.L. Chavez**, S.R. Evett. 2010. Lysimetric evaluation of eddy covariance fluxes over irrigated sunflowers in the Texas High Plains. ASA-CSSA-SSSA 2010 Int'l Annual Meeting. Oct. 31-Nov. 4, Long Beach, CA.
64. **Chávez, J.L.**, W.P. Kustas, P.H. Gowda, T.A. Howell, J.H. Prueger, L.E. Hipps, S.A. O'Shaughnessy, P. Colaizzi, S.R. Evett, C.M.U. Neale, M.C. Anderson, and K.S. Copeland. 2009. Aerodynamic temperature derived from flux-profile measurements and two-source model predictions over a cotton row crop in an advective environment. ASA-CSSA-SSSA 2009 Int'l Annual Meeting. Nov. 1-5, Pittsburgh, PA.
65. Hipps, L.E., W.P. Kustas, J.H. Prueger, J.L. **Chavez**. 2009. How well we can diagnose the effects of coupling of the regional atmosphere on ET of an irrigated surface under extreme advection of heat. ASA-CSSA-SSSA 2009 Int'l Annual Meeting. Nov. 1-5, Pittsburgh, PA.
66. Anderson, M.C., W.P. Kustas, C.M.U. Neale, J.H. Prueger, D.G. Williamson, S. Evett, J.L. **Chavez**, and P. Gowda. 2009. Mapping evapotranspiration and moisture stress in an advective environment using multi-scale thermal remote sensing data. ASA-CSSA-SSSA 2009 Int'l Annual Meeting. Nov. 1-5, Pittsburgh, PA.
67. Prueger, J.H., W.P. Kustas, L.E. Hipps, J.L. **Chavez**, S. Evett, A. French, and J.L. Hatfield. 2009. BEAREX\_08 Eddy covariance intercomparison. ASA-CSSA-SSSA 2009 Int'l Annual Meeting. Nov. 1-5, Pittsburgh, PA.
68. Alfieri, J.G., J.H. Prueger, W.P. Kustas, L.E. Hipps, J.L. **Chavez**, and A. French. 2009. Comparison of turbulent statistics and spectral characteristics under strong advective conditions. ASA-CSSA-SSSA 2009 Int'l Annual Meeting. Nov. 1-5, Pittsburgh, PA.
69. Kustas, W.P., J.H. Prueger, L. Hipps, J.L. **Chávez**, and A. French. 2009. Evaluating flux-variance relationships under strongly advective conditions during BEAREX08. ASA-CSSA-SSSA 2009 Int'l Annual Meeting. Nov. 1-5, Pittsburgh, PA.
70. **Chávez, J.L.**, P.H. Gowda, T.A. Howell, C.M.U. Neale, P.D. Colaizzi, and K.S. Copeland. 2008. ET mapping with METRIC algorithm using airborne high resolution multispectral remote sensing imagery. ASA-CSSA-SSSA 2008 Int'l Annual Meeting. Oct. 5-9, Houston, TX.
71. Howell, T.A., S.R. Evett, J.A. Tolk, P.D. Colaizzi, P.H. Gowda, J.L. **Chavez**, and K.S. Copeland. 2008. Energy balance of irrigated and dryland cotton in the Southern High Plains. ASA-CSSA-SSSA 2008 Int'l Annual Meeting. Oct. 5-9, Houston, TX.
72. Colaizzi P.D., W.P. Kustas, S.A. O'Shaughnessy, R.C. Schwartz, S.R. Evett, T.A. Howell, J.L. **Chavez**, P.H. Gowda, and J.A. Tolk. 2008. Radiometric surface temperature components for row crops. ASA-CSSA-SSSA 2008 Int'l Annual Meeting. Oct. 5-9, Houston, TX.
73. **Chavez, J.L.**, P.H. Gowda, T.A. Howell, and K.S. Copeland. 2007. An Aerodynamic Temperature-based Regional ET model Evaluation for Texas High Plains. ASA-CSSA-SSSA 2007 Int'l Annual Meeting. ASA Centennial, Nov. 4-8, New Orleans, LA.
74. Gowda, P.H., B.R. Scanlon, T.A. Howell, C.M.U. Neale, A.N. French, P.D. Colaizzi, S.R. Evett, and J.L.

- Chavez.** 2007. Bushland Evapotranspiration and Agricultural Remote Sensing Experiment – 2007 (BEAREX07). ASA-CSSA-SSSA 2007 Int’l Annual Meeting. ASA Centennial, Nov. 4-8, New Orleans, LA.
75. Colaizzi P.D., S.R. Evett, T.A. Howell, R.C. Schwartz, J.A. Tolk, P.H. Gowda, and J. **Chavez.** 2007. Evaluation of radiation partitioning models at Bushland, TX. ASA-CSSA-SSSA 2007 Int’l Annual Meeting. ASA Centennial, Nov. 4-8, New Orleans, LA.
76. **Chavez,** J.L., P.H. Gowda, P.D. Colaizzi, S.R. Evett, T.A. Howell, and K.S. Copeland. 2007. METRIC estimated ET evaluation on the semi-arid Southern High Plains. AGU Jointly Assembly. Acapulco, Mexico. May 22-26.
77. P.H. Gowda, J.L. **Chavez,** P.D. Colaizzi, S.R. Evett, T.A. Howell, and K.S. Copeland. 2007. Two-Source energy balance model evaluation for mapping evapotranspiration on the semi-arid Southern High Plains. 2007 AGU Jointly Assembly. Acapulco, Mexico. May 22-26.
78. Perry E.M., P. Andrade, J. **Chavez,** and F. Pierce. 2006. Spatial and temporal resolution requirements for real-time temperature measurements in perennial crops. ASA-CSSA-SSSA 98th Int’l Annual Meeting. Nov. 12-16, Indianapolis, IN.
79. **Chavez** J.L., F.J. Pierce, G. Matthews, and T.V. Elliot. 2005. Evaluation of an Integrated Wireless Irrigation Control System for Variable Rate Water Application. ASA-CSSA-SSSA 2005 97th Int’l Annual Meeting. Nov. 6-10, Salt Lake City, UT.
80. F.J. Pierce, **Chavez** J.L., T.V. Elliot, G. Matthews, R. Evans, and J. Kim. 2005. An integrated wireless approach for remote, real-time irrigation monitoring and control. ASA-CSSA-SSSA 2005 97th Int’l Annual Meeting. Nov. 6-10, Salt Lake City, UT.

## CONTRACTS & GRANTS

### **Externally-Funded Projects as PI**

- (2018-2019) “UAS-based Variable Irrigation,” PI: J.L. **Chavez,** Collaborators: Huihui Zhang (USDA), Daran Rudnick (UNL), Joel Schneekloth (CSU) Sponsor: FFAR through CWI, Period: 07/01/18 – 06/30/19, Grant Amount: \$21,860.33
- (2018-2019) “Assessing Temporal and Spatial Crop Water Consumptive Use with Unmanned Aerial Systems,” PI: J.L. **Chavez,** Collaborators: Huihui Zhang, Daran Rudnick, Joel Schneekloth, Ashish Masih, Allan Andales; Sponsor: CWCB through CWI, Period: 07/01/18 – 06/30/19, Grant Amount: \$49,999.00
- (2016-2017) “Colorado Irrigation Center Design and Concept Development.” PI: J.L. **Chavez,** Co-PI: R. Waskom, and Stephen Smith, Sponsor: CWCB through CWI, Period: 07/01/16 – 06/30/17, Grant Amount: \$49,876.00
- (2015-2019) “Monitoring alfalfa and grass water use under deficit irrigation using a spatially distributed temperature model.” PI: J.L. **Chavez,** Co-PI: K. Venayagamoorthy and Perry Cabot, Sponsor: USDA NRCS (CO AES), Period: 07/01/15 – 06/30/19, Grant Amount: \$129,904.00
- (2015-2017) “Evaluation of a methodology to monitor biofuel crop water status using remote sensing,” PI: J.L. **Chavez,** Sponsor: USDA ARS, Period: Aug 1 2015 – Dec 31 2016, Grant Amount: \$67,000.00.
- (2015-2016) “Collaboration in the development of a tool for monitoring corn water stress,” PI: J.L. **Chavez,** Sponsor: USDA ARS, Period: 07/01/15 – 06/30/16, Grant Amount: \$6,641.00 (Pass ID: 120651).
- (2014-2015) “Corn Yield Spatial Analysis for Deficit Irrigated Fields,” Sponsor: USDA-US Dept. of Agriculture ARS WMRU, Period: June 1 – Nov 30, 2014, Grant Amount: \$18,458.00.
- (2014-2015) “Developing an Unmanned Aerial Remote Sensing of ET System,” PI: Sponsor: Colorado Water Conservation Board (CWCB), July 1<sup>st</sup> 2014 – June 30<sup>th</sup> 2015. Amount \$50,000.00.
- (2013-2013) “Accuracy assessment of the CWSI-based ET estimates considering different spatial resolutions from multiple remote sensing platforms (Phase I),” Sponsor: Regenes Management Group, LLC, (overall project budget, Phase I and II: \$150,645.00), Amount \$37,661.00.
- (2013-2015) “Implementation of Deficit Irrigation Regimes: Demonstration and Outreach,” Sponsor: Colorado

- Water Conservation Board (CWCB), Period: 9/28/2013 - 12/31/2015 Amount: \$124,743.00.
- (2013-2015) “Implementation of Deficit Irrigation Regimes: Demonstration and Outreach,” Sponsor: Central Colorado Water Conservancy District, Period: 9/28/2013 - 9/30/2015, Amount: \$10,000.00.
- (2013-2015) “Estimating Evapotranspiration and Plant Water Stress with Remote Sensing,” Sponsor: USDA-US Dept. of Agriculture, ARS, WMRU, Period: Sept 1, 2013 – Sept 30, 2015, Grant Amount: \$5,000.00.
- (2013-2015) “Implementation of Deficit Irrigation Regimes: Demonstration and Outreach,” Sponsor: West Greeley Conservation District, Period: 9/28/2013 - 9/30/2015, Grant Amount: \$15,000.00
- (2013-2015) “Implementation of Deficit Irrigation Regimes: Demonstration and Outreach,” Sponsor: Northern Colorado Water Conservancy District, Period: 9/28/2013 - 9/30/2015, Amount: \$10,000.00.
- (2012-2015) “Reference evapotranspiration determination using the recursive method and surface aerodynamic temperature.” USDA-CSREES and Colorado Agricultural Experiment Station. PI: Jose **Chavez**, coPI: Allan Andales, Jul 2012 – June 2015. Amount \$90,000.00.
- (2011-2012) “Grass water stress and ET monitoring using ground & airborne-based remote sensing,” Northern Colorado Water Conservation District, Jul 2011 – Jun 2012. Amount \$8,680.00.
- (2010-2011) “Irrigated Agriculture Water Conservation Tool.” Central Colorado Water Conservancy District, Apr 2010 – May 2011, Amount \$29,242.00.
- (2010-2013) “Crop Water Stress Index and Evapotranspiration Monitoring Using Remote Sensing Techniques.” Regenes Management Group, LLC, Amount \$199,063.00.
- (2009-2010) “Remote sensing-based crop water stress determination of limited irrigation MON87460 transgenic drought tolerant corn hybrids,” Monsanto, Amount \$43,677.00.
- (2009-2011) “Wireless in-field soil water content monitoring,” Central Colorado Water Conservancy District (CCWCD) July 2009 – May, 2011, Amount \$39,703.00.
- (2009-2014) “Crop evapotranspiration determination using eddy covariance fluxes, high resolution remote sensing imagery & a surface temperature approach,” USDA, ARS, CPRL, Amount \$40,000.00.
- (2009-2012) “Modeling and evaluating remote sensing-based crop ET with scintillometers and a heat flux source area function.” USDA-CSREES and Colorado Agricultural Experiment Station. PI: J.L. **Chavez**, Jul 2009 – June 2012. Amount \$105,000.00.

### **Externally-Funded Projects as CoPI**

- (2018-2019) “Irrigation Innovation Consortium” (*Strategic collaborative partnerships developing new synergies to create water productivity innovation in agriculture and the irrigated landscape*). Waskom, R. (PI), Chávez J.L., and Andales A.A. (co-PI). Submitted to FFAR – Foundation for Food and Agriculture Research. Grant Amount: \$4,999,968 .00
- (2015-2016) “Using remote sensing assessments to document historical and current saved consumptive use (CU) on alfalfa and grass hayfields managed under reduced and full irrigation regimes: A new CU documentation system,” PI: Perry Cabot, co-PI: J.L. **Chavez**, Sponsor: Colorado Water Conservation Board - CWCB (through CWI), Grant Amount: \$50,000.00
- (2015-2017) “Monitoring Consumptive Use and Agronomic Sustainability for Fallowed Alfalfa and Grass Hayfields Under the Auspices of a Western Slope Water Bank.” PI: Perry Cabot, Co-PIs: Jose **Chavez**, Joe Brummer; Sponsor: Colorado River District, Trout Unlimited, The Nature Conservancy, West Water Conservancy District, Southwest Water Conservancy District, and Colorado Water Conservation Board (Water Bank Partners); Grant Amount: \$300,000.00.
- (2014-2017) “Decision support tools, drought tolerance, and innovative soil and water management strategies to adapt semi-arid irrigated cropping systems to drought.” PI: Cotrufo, CoPIs: Paustian, Khosla, **Chávez**, and Andales. Sponsor: USDA-NRCS CIG, Period: 1 Feb. 2014 to 31 Jan. 2017. Grant Amount: \$851,800.00. (Total Project cost: \$1,703,600.00; 50% cost sharing).
- (2014-2019) “Arid Climate Water Management Strategies.” PI: Ramchand Oad, CoPI: J.L. Chavez. Sponsor: Platte River Water Development Authority, Period: 8/1/2014 - 12/31/2019. Grant Amount: \$137,097
- (2011-2013) “Lower South Platte irrigation research & demonstration project,” PI: Neil Hansen, Co-PI: Jose **Chavez**, Sponsor: Parker Water & Sanitation District, May 2011 – Dec 2013. Grant Amount:

\$280,160.00

(2009-2012) “Using the ASCE Standardized Reference ET equation and appropriate crop coefficients for irrigation management.” USDA/NRCS. PI: Allan Andales, Co-PI: Jose **Chavez**, Sponsor: USDA NRCS CIG, Sept 2009 – Sept 2012. Grant Amount: \$74,143.00.

### **Externally-Funded Projects as Investigator or role other than PI or CO-PI**

(2016 – 2020) “Sustaining Agriculture through Adaptive Management to Preserve the Ogallala Aquifer under a Changing Climate,” PI: Meagan Schipanski, Collaborator: **J.L. Chavez**, Period: 01-FEB-16 to 31-JAN-20, Sponsor: USDA-NIFA-National Institute of Food and Agriculture. Grant Amount: \$7.99M (\$118.5K for CEE).

(2014-2019) “Global Center for Advanced Studies on Water (GCAS-W): A Partnership with Mehran University of Engineering and Technology to Achieve Water Sustainability.” PI: Ajay Jha (formerly), Tim Gates (current), Collaborator: **Jose Chavez**, Sponsor: University of Utah (USAID), Grant Amount: \$ 1,599,136.00 (PASS ID: 120017)

### **Internally-Funded Awards**

(2017-2017) “Borland Equipment Grant,” PI: Jose **Chavez**, Sponsor: CSU Civil and Env. Eng. Dept. (Borland funds). Fort Collins, CO. November 2017. To acquire a Fluke IR calibrator (blackbody) Amount \$9,635.00.

(2013-2015) “Borland Chair of Hydrology,” PI: Jose **Chavez**, Sponsor: CSU Civil and Env. Eng. Dept. (Borland funds). Fort Collins, CO. Period: 2013 – 2015. Amount \$50,000.00.

(2013-2014) “Internal RFP for Research Equipment and Instrumentation in Support of Water and Water-Related Environmental Research Efforts: Borland Grant,” PI: Jose **Chavez**, coPI: Saleh Taghvaeian, Jeff Niemann, Sponsor: Civil and Environmental Engineering Department, Colorado State University, Borland Program, Oct. 2013 – June 2014. Amount \$16,295.00.

(2012-2012) “Variable Rate Irrigation (center pivot) system for CSU ARDEC field 3100,” PI: Dr. Raj Khosla and co-PIs: Drs. José L. **Chávez** and Allan Andales; funding from Colorado AES, CSU Departments of Soil and Crop Sciences, Civil and Environmental Engineering, Bioagricultural Sciences and Pest Management; external contributions from Colorado Corn Growers Association and 21st Century Water Technologies; \$145,000 of total project funds. (Facility improvement project; Provided design computations necessary to select the center pivot and sizing of irrigation pump and water storage pond).

(2011-2011) “Precision irrigation center pivot system.” PI: Jose **Chavez**, Sponsor: CSU Civil and Environmental Engineering Department, Borland Grant, Oct 2011, Grant Amount: \$18,430.00

### **Course Titles (Courses Taught 2010-2018)**

CIVE 512 – Irrigation Systems Design

CIVE 519 - Irrigation Water Management

CIVE 549 - Drainage and Wetlands Engineering

CIVE 525 - Water engineering for international development\*

This course was team taught. I was responsible for the last 25% of the content (4 weeks). It was an interdisciplinary course (i.e., water distribution 50%, sanitation 25%, and irrigation 25%)

CIVE581A3 - Irrigation Water Management (Experimental course)

CIVE 695J – (IWC): Independent Study - Bioresources Agricultural Engineering (Irrigation water conservation)

CIVE 695J – (RS): Independent Study – Bioresources Agricultural Engineering (Remote Sensing of crop evapotranspiration)

CIVE 695J – (ET): Independent Study – Irrigation Engineering (Crop water demand and irrigation scheduling)

CIVE 799J – Dissertation Bioresource and Agricultural Engineering

## Course Syllabi, Assignments, and Other Materials

CIVE 519 (Irrigation Water Management) is a graduate level course; both offered to resident and off-campus (distance program through CSU Online Plus) students. This course prepares the student to apply basic soil, plant, water, and atmospheric engineering principles for the purpose of determining the crop water need (use), or evapotranspiration (ET), both in time and amounts, to sustain agricultural production while protecting the environment. The course covers a range of methods and instrumentation available to determine ET (crop water requirements), irrigation scheduling, and effective water use, including remote sensing of ET. This course requires a term project which is a design project in which student select field data from soil water content (“moisture”) and/or soil water potential sensors, from remote sensing platforms, and/or micro-meteorological energy balance and weather stations to apply a crop water use monitoring method and evaluation water application strategies. This course was fully developed by Dr. **Chávez**.

CIVE 512 (Irrigation Systems Design) is also a graduate level course offered to resident and distance students. This course provides an understanding of basic engineering principles and procedures which are necessary for the successful selection, design and operation of pressurized and surface (free flow) irrigation systems. This course was adapted/updated from an existing course. New software for design and evaluation were introduced in the course program as well as problem exercises using MS Excel spreadsheets.

CIVE 549 (Drainage and Wetlands Engineering) is also a graduate level course offered to resident and distance students. This course is a drainage and wetlands design program for agricultural and natural resources applications. Addresses water table modification for nonpoint sources pollution control. This course was adapted/updated from an existing course. A drainage software for design and evaluation was introduced in the course program as well as problem exercises using MS Excel spreadsheets.

## Participation in Professional Development Activities Related to Teaching

July 14-15, 2014, Advanced National Effective Teaching Institute (NETI-2), “*Cooperative learning and inductive teaching and learning* (inquiry-based and problem-based learning)” workshop, American Society for Engineering Education, at the Le Westin Montreal, Canada. Learning how students could improve learning by working in groups to solve practical engineering problems utilizing PBL techniques.

May 22, 2013, Attending seminar on "Is Culture important in STEM?" provided by CSU TILT, Fort Collins, CO. Understanding how cultural background affects the way students learn. Learning to present academic material in a fashion that would be understood and retained by most students.

May 22, 2013, Attending seminar on "Critical Thinking in Content Writing: Write-to-Learn strategies for the large classroom" provided by CSU TILT, Fort Collins, CO.

May 23, 2013 Attending seminar on "Rubrics: What's communication got to do with it?" provided by CSU TILT, Fort Collins, CO.

May 23, 2013, Attending seminar on "Fostering and Assessing the Learning Environment" provided by CSU TILT, Fort Collins, CO.

July 24, 25, and 26, 2013 “How to Engineer Engineering Education.” Attending the workshop to acquire skills on active learning, collaborative learning, and problem based learning techniques. Hrs: 20, 3-day workshop, Bucknell University, Lewisburg, PA.

April 19, 2012, RamCT Blackboard Advanced Tests, Question Sets, Metadata, and Statistics. Contact Hours: 2, Training provided by CSU Libraries, Fort Collins, CO.

April 12, 2012, RamCT Blackboard Communication Basics and Discussions. CSU Library. Fort Collins, CO.

April 23, 2012, RamCT Blackboard Grade Center Basics. Attending the new RamCT Blackboard workshop on Grading. Contact Hours: 2. CSU Library. Fort Collins, CO.

May 16, 2012, Using problem-based, integrative learning to support student engagement and critical thinking. Summer Conference. Attending the conference at CSU, The Institute for Learning and Teaching (TILT).

Contact Hours: 6, Fort Collins, CO.

December 2, 2010. Best Practices / Online. The Institute for Learning and Teaching (TILT), Colorado State University, Fort Collins, CO.

February 19-20, 2009, Effective College Teaching Workshop, American Society for Engineering Education, University of Colorado, Boulder, CO.

### **Professional Development Activities**

25 October 2018, “Keeping Up with GIS Technologies: open source/free geospatial technologies as QGIS, Spatial SQL with PostGIS, Python, and Big Data Analytics with Manifold.” Organized by CSU Geospatial Centroid,” at CSU Morgan Library, 9 am -4:30 pm, CSU, FC, CO

11 July 2018, “Hidden Gems in the Western Hemisphere,” Fulbright, instructor Peter Raucci, Outreach and Recruitment Specialist, Institute of Int’l Education, Webinar, 12 – 13 pm MDT.

9 April 2018, “Supervisor Development Program: Rules of the road,” CSU Human Resources, CSU OEO, instructor: Mark Flynn, 1-5 pm, CSU, Fort Collins, CO

5 March 2018, “Place-based Agricultural Monitoring Using Satellite Data and Cloud Computing,” Webinar delivered by Dr. Dan McEvoy, WRCC (Western Regional Climate Center) Regional Climatologist, sponsored by the Desert Research Institute and University of Idaho, delivered through Zoomlink.

31 January 2018, “Implementing Variable Rate Irrigation,” 12pm – 1pm (MST). Irrigation Association, Irrigation Foundation.

8 December 2017, “Proposal & Award Policies & Procedures Guide (PAPPG) Update Webinar with NSF,” By Gene Feldman, via YouTube. 2-3:15 PM EST

7 December 2017, “ASCE Webinar: Applications of Remote Sensing to Water Resources Engineering,” 12pm – 1pm. Presentation of the American Academy of Water Resources Engineers.

4 August 2017, “WEKA – Data Mining Software in Java,” emerging data management software suitable for modeling and forecasting, Speaker: Dr. Sajjad Ahmad, University of Nevada Las Vegas, US-Pakistan Center for Advanced Studies in Water (USPCASW), Jamshoro, Pakistan

3-4 August 2017, “Human Subjects Research Workshop Overview,” including statistical analysis and software, Speaker: Dr. Jim VanDerslice from University of Utah, US-Pakistan Center for Advanced Studies in Water (USPCASW), Mehran University of Engineering and Technology (MUET), Jamshoro, Pakistan

11 May 2017, “Successful Ag Water Leasing in Colorado: Real-world Examples of How Alternative Transfer Mechanisms (ATMs) Work for Irrigators,” Speakers: Chris Kraft and Jack Goble, Host: Colorado Cattlemen's Association, Thu, May 11, 12:00 pm | 1 hr 15 min. Webinar through Cisco Webex.

25 April 2017, “A Booming Interest in Groundwater Conservation in Kansas - Why Now?,” Speaker: Dr. Bill Golden, OWCAP webinar, USDA NIFA CAP Ogallala project, through Extension Zoom, Colorado State University

8 April 2017, “ICID Webinar on Water Accounting and Audit,” Speaker: Dr. Win Bastiaanssen (UNESCO), through YouTube, International Commission on Irrigation and Drainage (ICID).  
[http://www.icid.org/icid\\_webinar.html](http://www.icid.org/icid_webinar.html)

10 January 2017, “Up in the Sky! What you Need to Know About Flying Unmanned Aircraft Systems at CSU,” Professional Development Institute, Colorado State University, Fort Collins, CO

9 January 2017, “Introducing CSU’s New Supervisory Development Program, TA DA!,” Professional

Development Institute, Colorado State University, Fort Collins, CO

9 January 2017, "Beginner Active Assailant: Emergency Classroom Preparedness," Professional Development Institute, Colorado State University, Fort Collins, CO

9 January 2017, "Publish or Perish: Effective Writing Practices to Help You Flourish!," Professional Development Institute, Colorado State University, Fort Collins, CO

28 October, 2016, "Opentober, open access, open data, open education, October 2016" Open Access Symposium, Morgan Library Event Hall, Colorado State University, Fort Collins, CO

28 September, 2016, "Unmanned Aerial Systems (UAS)," seminar presented by Trihydro, sponsored by Rocky Mountain States Section of the Air & Waste Management Association, Fort Collins, CO.

10 August, 2016, Workshop, "Irrigation Water Management: Infiltration Physics & Plant Available Water Concepts," Natural Resources Conservation Service, CoBank Center for Agricultural Education, CSU-ARDEC, Fort Collins, CO

9 August, 2016, Webminar, "Geospatial Analytics in the cloud with ENVI and Amazon web services," Harris Geospatial Solutions and Amazon webservices, via Goto Webminar.

17 July, 2016, Workshop, "Hyperspectral Imaging and Data Analysis," Continuing professional development course, 8 hrs, presented by USDA ARS at the ASABE Int'l Meeting, Orlando, FL.

17-18 May, 2016, Workshop, "Wyoming Unmanned Aerial Vehicle Symposium," Marian H. Rochelle Gateway Center, University of Wyoming, Laramie, Wyoming.

11 May, 2016, Webinar, "Get the Most from Your UAV and Aerial Data," Harris Geospatial Solutions and Exelis VIS, via Goto Webminar.

29 March, 2016, Webinar: "Partnership Pays: Building a Relationship with ARS to Enhance Your USDA SBIR Proposal", Arkansas Small Business and Technology Development Center, via Goto Webminar.

18 March, 2016, Webinar: Using Soil Moisture Sensors. Irrigation Association (IA), via Goto Webminar.

10 March, 2016, Webinar: UAV image import and processing in ERDAS IMAGINE Photogrammetry. Hexagon Geospatial, via WebEx Event Manager.

09 March, 2016, Webinar: UAS and Remote Sensing - The Present and the Promise. Sponsored by American Society of Agronomy (ASA). Delivered by Nathan Stein, Ag Solutions Manager, SenseFly.

18 March 2016, Webinar: Using Soil Moisture Sensors, by Brent Mecham, Diganta D. Adhikari, and Jon J. Peters, Irrigation Association.

29 February, 2016, Informational Roundtable on Ownership of Academic Materials at CSU, CSU Chapter of the American Association of University Professors (AAUP), CSU, Fort Collins, CO.

23-24 February, 2016, Central Plains Irrigation Conference and Exposition, February 23-24, 2016, City Limits Convention Center, Kearney, Nebraska.

25 March 2015, Webinar: ET & Plant Factors, dealing with drought & deficit irrigation, by Brent Mecham, Industry development director, Irrigation Association.

30 September 2015, Search Chair Training, OEO, CSU.Comm

## **ADVISING:**

### **UNDERGRADUATE STUDENTS ADVISED:**

- 4 Current Undergraduate Advisees - 2018
- 4 Current Undergraduate Advisees - 2017
- 4 Current Undergraduate Advisees - 2016
- 7 Current Undergraduate Advisees - 2015
- 6 Current Undergraduate Advisees - 2014



4 Previous Undergraduate Advisees - 2013  
5 Previous Undergraduate Advisees - 2012  
6 Previous Undergraduate Advisees - 2011  
4 Previous Undergraduate Advisees - 2010

**GRADUATE STUDENTS CURRENTLY ADVISED (Research Committee Chair):**

Brian Craig (MS), started Summer 2017  
Edson Costa Filho (MS), started Spring 2018  
Garrett Banks (MS), started Fall 2015  
Brianna Knudtson (MS), started Fall 2018  
Joseph Miller (MS), started Fall 2018

Current Graduate Committee Memberships (excluding those chaired):

  0   # Plan C  
  0   # Plan B  
  1   # MS/MA  
  8   # PhD

Current: **Garvey** Smith (PhD, Andales), **Ivan** Arias Hernandez (PhD, Chandra), **Jason** Eugene Hodkin (PhD, Chandra), Ansley Joseph **Brown** (PhD, Andales), Maria Cristina **Capurro** (PhD, Andales), Haiming **Tan** (MS computer science, Chandra), Clive Peter **Sugama** PhD syst. Eng. (Chandra), Wesley Gunnar **White** PhD in syst. Eng. (Chandra), Jonathan Paul **Olson** (PhD Systems Engineering program w Chandra), Bilal **Alpaslan** (MS Plan B, graduated F2017), (major advisor Tim G., Chavez in committee), Caner **Kutlu** (MS, Gates), Ahmad Shukran **Sahaar** (PhD, Niemann),

Past: Saddam QahtanWaheed (PhD, Jorge R.), Peter Goble (MS, Atmospheric Science, Russ Schumacher, Nolan Doesken, defended on 02/08/15) defended Sp 2016, Dave Barnard (PhD, Horticulture, Bill Bauerle), Armin Sabet (MS Plan B, CEE, Ryan Bailey) submitted final report and approved March 2015, Kelsey Dudziak (Dr. Neil Grigg) defended and graduated Sp 2015. PhD student Camilo Riveros Burgos (Universidad de Talca, Chile).

Graduate Committee Memberships (for past 5 years, not including those above)

  0   # Plan C  
  1   # Plan B  
  3   # MS/MA  
  3   # PhD

Graduate Degrees Completed Under Your Supervision (past 5 years):

Sumit Gautam, 2018 Summer, MS  
Mahmoud Soliman, 2017 Summer, ME  
Jeffrey Hathaway (MS), Spring 2016  
Semin Barlak (MS), Fall 2016  
Abhinaya Subedi (PhD), Fall 2016  
Amandeep Vashisht (MS), Fall 2016  
Ryne Schroder (MS), Spring 2016  
Emily Kullberg (MS), Summer 2015  
Mcebisi Mkhwanazi, 2014, PhD  
Jordan Varble, 2011, MS  
Stuart Joy, 2011, MS  
Evan Rambikur, 2012, MS  
Brenna Mefford, 2014, MS  
Emily Kullberg, 2015, MS  
Ramsey Pickard, 2015, MS Plan B

## **POSTDOCTORAL STUDENTS/RESEARCH ASSOCIATES hosted:**

Past 5 years:

Dr. Saleh Taghvaeian, 2011-2013, Postdoctoral Fellow

Dr. Ming Han, Dec 2015 – May 2017, Postdoctoral Fellow

Dr. Ramón López-Urrea, Spain, Jan-April 2016, Visiting Scholar

MS. Ilyes Chalgaf, 2012, Visiting Scholar

MS. Camilo Riveros-Burgos, Chile, May-Aug 2017, Visiting Scholar

MS. Ashish Masih, India, Fall 2017 – present, Research Associate

Dr. Ayym Elhaddad, Fall 2017 – present, Research Associate

### **Descriptions of Mentoring Activities (visiting scholars)**

Fall 2018: Waqas Inam, thru USPCASW. MS Thesis research mentoring (Mapping soil salinity).

Spring 2018: Nabeel Khan, thru USPCASW. MS Thesis research mentoring (METRIC algorithm application).

Summer 2013 and April 2014: Zain Nawaz, visiting engineer from the Water Management Research Centre, University of Agriculture Faisalabad (UAF), Faisalabad, Pakistan. Mentoring was provided in regards to computations of reference crop (alfalfa and grass) evapotranspiration using agricultural weather station (network) data, the REF-ET software and applications in MS Excel spreadsheets. Also, on on-demand irrigation decisions by implementing an irrigation scheduling program based on a soil water balance approach. Mentoring was provided throughout the summer of 2013 when he visited CSU, throughout the Fall of 2013 via distance mode, and in Pakistan in April of 2014.

Summer 2012: Ilyes Chalgaf, a PhD candidate from the Centro de investigación y tecnología agroalimentaria de Aragón (CITA-DGA), Unidad de Suelos y Riegos, Zaragoza, Spain, was mentored during the summer of 2012 on mapping crop water use using satellite imagery and several energy balance based remote sensing algorithms.

### ***Evidence of Outreach/Service***

#### **SUMMARY OF EXTENSION WORK**

As part of the CSU Extension Water Team, I have participated in outreach activities both nationally and internationally. Briefly, my role as an extension specialist in irrigation and drainage engineering is to assist farmers directly (through emails and phone calls), and to assist extension agents with technical advice and material regarding pressing issues in different counties in Colorado (e.g., drought and irrigation management, soil moisture sensor selection/installation, etc.). Besides direct communications with extension agents during the year there is an annual CSU Extension Forum (typically in November) where Extension Specialists participate to discuss county technical assistance needs.

Other activities have included writing fact sheets, presenting in extension related workshops and seminars, presenting research results at local, state, and national conferences, publishing research results in journal articles, seeking funding for research and extension activities from local farmer associations, water conservation districts, the state of CO, and federal agencies (e.g., USDA).

In particular, I have been part of several workshops and seminars contributing in the topics of soil moisture sensors, infra-red thermometry, and remote sensing in the improvement of irrigation water management. Also, every year I am invited to be a speaker at the Central Plains Irrigation Conference, organized by the Central Plains Irrigation Association (CPIA). Every year the location of the presentation rotates among Burlington (CO), Kolby (KS), and Kearny (NE).

In terms of coordinating with Extension specialists at the national level, I am a member (Chair in 2015) of the Western Extension and Research Activities (WERA-1022) group. In particular, I participate in WERA in the topic of irrigation scheduling, crop coefficients, and weather station data.

A working relationship has been developed with the following institutions to better address their knowledge needs: USDA-ARS, State Water Resources Division, Central Colorado Water Conservancy District, Northern Colorado Water Conservancy District, West Greeley Conservancy District, and CSU faculty from different Departments.

## **COMMITTEES**

### **University Committee**

Faculty Council At-large member representing the College of Engineering, 2013-2016,  
Executive committee of the faculty council, 2015-2016,

### **College Committee**

Search Committee Chair, Spring-Summer 2018 (March-June), for UAS Center Coordinator.  
UAS Center Steering Committee member  
CSU Irrigation Innovation Consortium (IIC) Advisory Committee member

### **Department Committees**

Awards Committee, 2014-2016,  
Graduate Admission Committee (GAC), 2010-2014,  
Borland Committee, Chair of Hydrology, 2013- 2016,  
Internal Departmental (CEE) Advisory Committee, 2013-present, on-going appointment as long as I serve as the coordinator of the Irrigation and Drainage Engineering Division/Program,  
Graduate Instructional Committee (GIC), 2009-2012,

### **Other Committees**

ASABE MS-60, Unmanned Aerial Systems, 2017-  
Food Security & Sustainability, co-organizer of session (and panelist) entitled “How Technology Can Contribute Significantly to Improving Agricultural Water Management.” Nov 29, 2016, CSU, Fort Collins, CO  
USCID Fall 2016 meeting organizing committee  
ET workshop organizing committee (Fall 2016), ASCE EWRI  
CoAgMet network advisory board, 2016-present,  
CSU Extension Water Team, 2009-present,  
CSU-Extension Search Committee, 2010, to fill four 4H STEM positions  
USDA ARS Remote Sensing Physical Scientist Search committee panel member, 2014  
Evapotranspiration Committee (Task Force) of the American Society of Civil Engineers (ASCE) Environmental and Water Resources Institute (EWRI), 2009-2015  
USCID Fall 2013 Conference planning committee  
WERA-1022, Western Extension and Research Activities group, Irrigation Scheduling and Weather Station data committee. Chair 2015-2016  
USDA ARS LIRF, FC CO, focus group discussion, 21 Aug 2015, Greeley, CO

## **PROFESSIONAL AFFILIATIONS AND ACTIVITIES**

### **Memberships in professional societies**

American Society of Civil Engineers (ASCE), American Society of Agricultural Engineers (ASABE), Irrigation Association (IA), and United States Commission on Irrigation and Drainage (USCID).

### **Office in professional societies**

Chair, 2015-2016, and Vice-Chair, Secretary, 2014-2015, Western Extension and Research Activities (WERA-1022). Meteorological and Climate Data to Support ET-based Irrigation Scheduling, Water Conservation and Water Resources Management.

### **Review/editorial boards**

Editor-In-Chief, Irrigation Science Journal, 2018-present,  
Associate Editor, Irrigation Science Journal, 2013 – 2018,  
Associate Editor, Agronomy Journal, 2017-2018,

### **Grant Refereeing**

Research proposal review for the Foundation for Food and Agriculture Research (FFAR), October 16, 2018  
Research proposal review for the Israeli Ministry of Education, German-Israeli Cooperation, September 3, 2018  
Research Proposal for an international organization, NWO division Earth and Life Sciences, Netherlands, 2014  
Research Proposal for FONDECYT-CHILE (Chilean National Science and Technology Commission), December 16, 2016. Proposal title “USE OF LIVING COVER CROPS AS SUSTAINABLE STRATEGIES TO IMPROVE WATER USE EFFICIENCY, YIELD AND FRUIT QUALITY OF VINEYARDS IN SOUTHERN CHILE.”

### **Manuscript Refereeing (reviewer)**

Journal of Applied Remote Sensing (JARS), 2018  
Hydrological Processes  
Journal of Hydrology  
Remote Sensing  
Agricultural Water Management, 2018  
Journal of Irrigation and Drainage Engineering, 2018  
Soil Science Society of America, 2018  
Transactions of ASABE  
Applied Eng. in Agriculture  
Remote Sensing of the Environment  
Water Resources Research  
Irrigation Science, 2018  
Acta Horticulturae  
Agronomy Journal, 2018

### **OTHER ACTIVITIES/ACCOMPLISHMENTS – SERVICE/OUTREACH**

Chair (moderator) of the Soil Moisture - Salinity - Water & Health I session in Hydrology Days, AGU, Colorado State University, March 20, 2018, Fort Collins, CO.

Chair (moderator) of the Eco-Hydrology – Interdisciplinary WATER research session in Hydrology Days, AGU, Colorado State University, March 23, 2015, Fort Collins, CO.

Outside reviewer for report entitled “Validation, Calibration, and Improvement of Remote Sensing ET Algorithms in Mountainous Regions,” for The New Mexico Water Resources Research Institute, 2014

Provided technical advice regarding crop evapotranspiration models to Dr. José Salas for his “Introduction to Hydrology” Chapter. Handbook of Engineering Hydrology, Vol.15 Modern Water Resources Engineering, Eds. Lawrence k. Wang and Chih Ted Yang. Humana Press, Springer Science 2014.

CEE Department Irrigation and Drainage (IRR) Engineering Program Coordinator, 2013-present

CSU Engineers Without Borders (EWB), Advisor, 2009

5th National Decennial Irrigation Conference, Proceedings Associate Editor, Associate Editor, 2010