
MIKE HOBBS, B.Eng., M.S., Ph.D.

Cooperative Institute for Research in Environmental Sciences (CIRES), Boulder, CO 80303
at NOAA-Physical Sciences Laboratory (NOAA-PSL), Boulder, CO 80305
orcid.org/0000-0001-5540-8466 • www.researcherid.com/rid/N-4630-2014
307-228-0815 • mike.hobbins@noaa.gov

PROFESSIONAL SUMMARY

Recent Research Foci

- ~ reformulating and improving modeling and metering of drought;
- ~ developing datastreams and operationalizing tools for drought and famine early warning and monitoring communities;
- ~ examining effects of climate change and variability on the hydrosphere, specifically moisture dynamics at the land surface-atmosphere interface resulting in and from drought;
- ~ developing and operationalizing services of continental- and global-scale, real-time forecasts and reanalyses of hydrologic variables;
- ~ partitioning dynamics of secular hydrologic trends and variability, particularly in evaporative drivers;
- ~ overturning the temperature-proxy paradigm in evapotranspiration in science and operations;
- ~ developing and operationalizing the Evaporative Demand Drought Index (EDDI) – a tool for early warning and monitoring of drought;
- ~ quantifying and describing the spatial distribution of large-scale, natural water supply;
- ~ developing flash drought metrics and establishing principles and definitions to guide the science of flash-drought detection and prediction;
- ~ exploiting the relationships between evaporative fluxes, drought, and wildfire risk to develop decision-support tools for the wildfire community.

Leadership, Service, Outreach, Teaching

- Leadership:
 - ~ CIRES@NOAA Lead: overall supervisor for all CIRES employees (95) at NOAA-PSL, October, 2022-present;
 - ~ vice-chair: American Meteorological Society (AMS) Committee on Hydrology, 2020-2022;
 - ~ conference chair: 34th Conference on Hydrology at 2020 AMS Annual Meeting, the most successful year in the conference history;
 - ~ conference co-chair: 32nd and 33rd Conferences on Hydrology at 2018-2019 AMS Annual Meetings;
 - ~ conference co-chair: Famine Early Warning Systems Network (FEWS NET) 2023 Science Meeting;
 - ~ conference session chair: climate-information session and food-security presidential session at 2022 AMS; food-security session at 2023 and 2024 AMS; flash-drought sessions at 2021 and 2023 European Geosciences Union (EGU) General Assembly, 2022-2024 AMS, 2022 Frontiers in Hydrology Meeting (FIHM); hydrology and human health session at 2020 AMS; flood session at 2019 AMS; drought sessions at 2016-2018 and 2021-2022 AMS; evapotranspiration- and drought-related sessions at 2014-2016 American Geophysical Union (AGU) Fall Meetings; evapotranspiration sessions at 2012-2019 and 2021 AMS.
 - ~ member: NOAA-PSL Science Board, 2021-present;
 - ~ steering committee member and facilitator: National Integrated Drought Information System (NIDIS) Flash Drought Virtual Workshop at NOAA-PSL, 2020;
 - ~ member: NIDIS Technical Working Group, 2020-present;
 - ~ hiring manager: two CIRES positions in NOAA-PSL;
 - ~ EDDI team-lead: writing successful proposal for grant, science Principal Investigator, recruiting contributing members to the team of 13 people;
 - ~ member: *MDPI Hydrology* journal editorial board, 2020-2021.

- Service and outreach:
 - ~ committee member: AMS Committee on Hydrology, 2017-2022;
 - ~ editorial board member: MDPI *Hydrology*, 2020-2021;
 - ~ guest editor, special collection “Land Use and Water-Carbon: How agricultural land use and management influence water-carbon interactions in dryland ecosystems” in *Agriculture, Ecosystems & Environment*;
 - ~ faculty affiliate: Colorado State University, Fort Collins, CO, 2015-2020;
 - ~ convener: year-long, weekly seminar series for in-house, national, and international speakers at Research School of Biological Sciences, Australian National University;
 - ~ proposal-review panel member: NASA Modeling, Applications, and Predictions program, NOAA Climate Program Office NIDIS-Coping with Drought program;
 - ~ promotion and tenure committee member: School of Natural Resources, Univ. of Nebraska-Lincoln;
 - ~ faculty awards committee member: Desert Research Institute, University of Nevada-Reno;
 - ~ outreach with stakeholders and scientists from other disciplines;
 - ~ interviews with popular news, scientific press and podcasts;
 - ~ communicating with diverse audiences on various topics through peer-reviewed scientific literature, conference papers, and direct instruction;
 - ~ peer reviewer: *Advances in Science and Research*; *Agricultural and Forest Meteorology*; *Bulletin of the American Meteorological Society*; *Climate*; *Climatic Change*; *Earth Interactions*; *Environmental Research Letters*; *Geophysical Research Letters*; *Hydrologic and Earth System Sciences (HESS)*; *Hydrological Processes*; *Hydrological Sciences Journal*; *Hydrology*; *Hydrology Research*; *International Journal of Climatology*; *IPCC Fourth Assessment Report*; *IPCC Sixth Assessment Report*; *Irrigation and Drainage*; *Journal of Applied Meteorology and Climatology*; *Journal of Climate*; *Journal of Geophysical Research-Atmospheres*; *Journal of Great Lakes Research*; *Journal of Hydrologic Engineering*; *Journal of Hydrology*; *Journal of Hydrometeorology*; *Journal of Irrigation and Drainage Engineering*; *Journal of Water Management Modeling*; *Nature Communications*; *Nature Geosciences*; *PLOS ONE*; *Science*; *Science of the Total Environment*; *Theoretical and Applied Climatology*; *Water*; *Water Resources Management*; *Water Resources Research*.
- Teaching and mentoring:
 - ~ graduate teaching assistant: Colorado State University, *Engineering Mechanics-Statics*, a 200-level three-credit course in core engineering curriculum;
 - ~ instructor: COMET MetEd, *Evaporative Demand*, in Advanced Hydrologic Sciences Virtual Course;
 - ~ doctoral student’s committee member: Daniel McEvoy, University of Nevada-Reno;
 - ~ graduate students’ committee member: Shuang Xia, University of Nevada-Reno and Connor Seacrest, Colorado State University;
 - ~ mentor for: CIRES post-doctoral fellow (Matilda Newton, University of Colorado), Summer scholar (Timen Jansma, Wageningen University and Research), SOARS scholar (Delián Colón-Burgos, Penn State University), NERTO scholar (Siena Dante, City University of New York).

EDUCATION

Doctor of Philosophy	2004
Hydrologic Science and Engineering	<i>Colorado State University</i>
Dissertation: <i>Regional evapotranspiration and pan evaporation: Complementary interactions and long-term trends across the conterminous United States.</i>	
Master of Science	2000
Hydrologic Science and Engineering	<i>Colorado State University</i>
Thesis: <i>Evaluating and enhancing two implementations of the complementary relationship in regional evapotranspiration.</i>	
Bachelor of Engineering (Honours)	1989
Civil Engineering	<i>University of Leeds, UK</i>

PRIZES, AWARDS, AND RECOGNITION

- ~ CIRES Outstanding Performance Award in Science for: “Leadership and innovation in drought research, including development and operationalization of the Evaporative Demand Drought Index, its application to famine early warning, and strides in understanding flash drought,” 2022.
- ~ Elected Vice-chair of AMS Committee on Hydrology, 2020.
- ~ American Society of Agricultural and Biological Engineers (ASABE) Superior Paper Award for paper: “The variability of ASCE Standardized Reference Evapotranspiration: a rigorous, CONUS-wide decomposition and attribution,” 2017.
- ~ Elected Member of AMS Committee on Hydrology, 2017.
- ~ Gary Comer Abrupt Climate Change Fellowship, 2005-2008.
- ~ National Science Foundation (NSF) Computer Science, Engineering, and Mathematics Scholarship, 2002.
- ~ H. W. Shen Water Resources Graduate Award, Colorado State University, 2001.
- ~ American Geophysical Union (AGU) Hydrology Days Best M.S. Student Paper Award for presentation: “The complementary relationship in regional evapotranspiration: The CRAE Model and the Advection-aridity approach,” 1999.

AFFILIATIONS AND PROFESSIONAL MEMBERSHIPS

- ~ Vice-chair: AMS Committee on Hydrology, 2020-2022.
- ~ Editorial board member: MDPI *Hydrology*, 2020-2022.
- ~ Committee Member: AMS Committee on Hydrology, 2017-2022.
- ~ Faculty Affiliate: Colorado State University, Fort Collins, CO, 2015-2018.
- ~ Member: American Meteorological Society.
- ~ Member: American Geophysical Union.
- ~ Member: European Geosciences Union.
- ~ Member: International Association of Hydrological Sciences.

GRANTS

- ~ NIDIS grant (\$73,075): “Further applying the National Water Model for drought monitoring: Model performance assessment and drought-tool development,” 2022.
- ~ NOAA Office of Oceanic and Atmospheric Research (OAR) Joint Technology Transfer Initiative (JTII) grant (\$317K): “Operationalizing the computation and dissemination of the Evaporative Demand Drought Index (EDDI) and value-added products for CONUS-wide drought monitoring and early warning at the NOAA-Climate Prediction Center,” 2022-2024.
- ~ NOAA Climate Program Office (CPO) NIDIS grant (\$448K): “Improving drought monitoring and early warning in the Midwest Drought Early Warning System (DEWS) using the Evaporative Demand Drought Index (EDDI) and a new hydrologically holistic drought measure,” 2020-2022.
- ~ NOAA CPO Sector Application Research Program (SARP) grant (\$199K): “Identifying and quantifying triggers, time scales, and tools to support management of different drought types in the Northeastern United States,” 2019-2020.
- ~ DOI North Central-Climate Adaptation Science Center (NC-CASC) grant (\$100K) “Evaporation, drought, and the water cycle across timescales: Climate foundational sciences for the NC-CASC,” 2017-2019.
- ~ NOAA CPO SARP grant (\$38K): “Developing a wildfire component for the NIDIS California Drought Early Warning System,” 2016-2018.
- ~ NOAA OAR JTII grant (\$891K): “Operationalizing an Evaporative Demand Drought Index (EDDI) service for drought monitoring and early warning,” 2016-2019.
- ~ NIDIS grant (\$36K): “Development of a Nevada Drought Early Warning System and NIDIS application tools,” 2016-2018.
- ~ United States Agency for International Development (USAID) Participating Agency Program Agreement (\$550K): “Development of gridded atmospheric forcing datasets,” 2016-2021.

RELEVANT WORK EXPERIENCE

Senior Research Scientist with CIRES

Feb 2015 – Present

Visiting Scientist with University Corporation for Atmospheric Research (UCAR) at NOAA-PSL

Oct 2012 – Jan 2015

Boulder, CO

Developing national evaporative demand (E_0) services for NOAA and NIDIS stakeholders and the National Water Center and a global E_0 service for FEWS NET.

- ~ Developing the first E_0 services (physically based, daily, accurate, long-term reference evapotranspiration) for (i) NOAA (CONUS-wide) and (ii) FEWS NET (global), including automation of production, verification against observations, bias-correction, and data assimilation;
- ~ Developing a new drought E_0 -based index for monitoring and early warning—the Evaporative Demand Drought index (EDDI)—and transitioning it to operations and general acceptance by drought-monitoring and scientific communities;
- ~ Acting as scientific advisor and coordinator to a cross-National Weather Service (NWS) team developing the nation’s first real-time forecasts of reference evapotranspiration (FRET), developing E_0 algorithms and climatologies to add value to forecasts, presenting new FRET product at national scientific and professional meetings;
- ~ Outreach to stakeholders, including within NOAA, other US government agencies, academics (including ecologists and economists), intergovernmental groups such as the Western Governors Association, state climatologists (UT, CO, and CA), students in training courses (COMET);
- ~ Collaborating with various federal and state agencies (e.g., with USGS towards an ET input to the National Water Census, and the production of official state E_0 climatologies), with university researchers (e.g., with UCLA on developing remotely sensed E_0), and with other research institutions (e.g., with the Desert Research Institute on large-scale evapotranspiration [ET] estimation);
- ~ Educating NOAA colleagues on principles pertaining to ET and E_0 .
- ~ Hiring (three) personnel, from early to mid career: including writing position description, reviewing application material, conducting interviews, liaising with human resources, and on-boarding successful hires;
- ~ Presenting background scientific and ongoing project material to colleagues at the NWS OHD, NOAA’s Climate Prediction Center, the CBRFC, Service Hydrologists at other RFCs, and other WFOs, at various inter-agency, regional and national meetings;
- ~ Responsible for developing own funding streams through strategic grant-seeking, from NOAA Office of Hydrologic Development (OHD), NIDIS, and FEWS NET.

Visiting Scientist with UCAR

Feb 2012 – Oct 2012

and Visiting Scientist with Wyle Information Systems Group at NWS-Colorado Basin River Forecast Center (CBRFC)

Oct 2009 – Feb 2012

Salt Lake City, UT

Improved the treatment of evapotranspiration (ET) in NWS operations, by (i) improving water-supply forecast skill of CBRFC’s river forecast model by incorporating a physically based, dynamic driver of evaporative demand (E_0), and (ii) instituting a forecast of reference crop evapotranspiration (FRET) throughout the NWS Western Region (WR).

- ~ Increased CBRFC’s streamflow forecast skill by optimizing the evaporation drivers in the Sacramento Soil Moisture Accounting streamflow simulation model;
- ~ Acted as scientific advisor and coordinator to an NWS WR team developing the nation’s first real-time forecasts of reference evapotranspiration (FRET), developing E_0 algorithms and climatologies to add value to forecasts, presenting new FRET product at national scientific and professional meetings;
- ~ Developed and hosting real-time and forecast datastreams of E_0 for use by drought-monitoring community, and developing a stand-alone E_0 -based drought metric for use in the input suite for the United States Drought Monitor;
- ~ Liaising with WR headquarters, other RFCs and Weather Forecast Offices (WFOs) to align various disparate efforts on research into ET , and towards distribution and verification of FRET;

- ~ Collaborating with various federal and state agencies (e.g., with USGS towards an ET input to the National Water Census, and the production of official state ET_0 climatologies), with university researchers (e.g., with UCLA on developing remotely sensed E_0), and with other research institutions (e.g., with the Desert Research Institute on large-scale ET estimation);
- ~ Educating colleagues in NWS and NOAA on principles pertaining to ET and E_0 .
- ~ Presenting background scientific and ongoing project material to colleagues at the NWS OHD, NOAA's Climate Prediction Center, the CBRFC, Service Hydrologists at other RFCs, and other WFOs, at various inter-agency, regional and national meetings;
- ~ Leading and collaborating on funding proposals from internal and external (NOAA, NASA, USGS) sources.

Post-Doctoral Fellow

Aug 2005 - Jan 2009

with **Australian National University, Research School of Biological Sciences (RSBS)** *Canberra, Australia*

Examined evaporative dynamics at spatial scales from point to continental, and temporal scales from instantaneous to multi-decadal. Explored E_0 as a driver of drought.

- ~ Designed and conducted a field experiment on fine-scale physics of evaporation pans. Collected, quality-controlled, stored, and analyzed micro-meteorological and thermodynamic data.
- ~ Analyzed trends in evaporative demand and drought exposure and under past and predicted climate change. Examined the effects of non-traditional different evaporative drivers in drought modeling.
- ~ Collated NetCDF output from multiple GCM scenarios and generated intermediate NetCDF output from offline modeling toward the first analysis of evaporative demand under modeled climate change.
- ~ Wrote or co-authored six peer-reviewed journal articles, reported research results in nine presentations at national and international conferences.
- ~ Organized and conducted week-long familiarization programs to attract top undergraduates from Australia and New Zealand to graduate research at RSBS.

Water Resources Engineer and Data Analyst

Jun 2003 - Jul 2005

with **Riverside Technology, inc.** and **Paluster Environmental Services**

Fort Collins, CO

While in graduate school, consulted to National Weather Service (NWS) for flood-forecasting and the Rio Grande Water Conservancy District on an assessment of ET from groundwater in the San Luis Valley, CO.

- ~ Evaluated, analyzed, and managed raw micro-meteorological data. Gathered new literature online.
- ~ Calibrated NWS's river forecasting suite of models (SNOW-17 and Sacramento Soil Moisture Accounting models) for basins in the New England and Southeast River Forecasting Centers.
- ~ Prepared and reviewed academic papers and project reports on procedures and results.

Post-Doctoral Research Fellow and Graduate Research Assistant
with **Colorado State University (CSU), Civil Engineering Department**

May 1996 - May 2005

Fort Collins, CO

Conducted research into a new paradigm in estimating actual ET while first a Graduate Research Assistant, then a Post-Doctoral Research Fellow. Funded by the US Forest Service Rocky Mountain Research Station.

- ~ Evaluated two models of the complementary relationship in regional ET across CONUS and refined one model for use on a regional and seasonal basis.
- ~ Implemented ARC/INFO and ArcView GIS packages to create a suite of user-friendly FORTRAN-nested Arc Macro Language (AML) programs to run ET model over CONUS.
- ~ Using station-based and remotely sensed datasets, created the first long-term, monthly, continental-scale, high resolution, accurate time-series of ET and intermediate variables.
- ~ Conducted secular trend analyses on 42-year monthly time-series of ET and its components.
- ~ Reported research results in peer-reviewed journal articles and at national and regional conferences.

PUBLICATIONS

Peer-reviewed: Papers, chapters, extended abstracts

Hughes MA, Jackson DJ, Unruh D, Wang H, **Hobbins MT**, Ogden FL, Cifelli R, Cosgrove B, DeWitt D, Dugger A, Ford TW, Fuchs B, Glaudemans M, Gochis D, Quiring SM, RafieeiNasab A, Webb RS, Xia Y, and Xu L (2024), Evaluation of retrospective National Water Model soil moisture and streamflow for drought-monitoring applications. Published online at *Journal of Geophysical Research-Atmospheres*, doi: 10.1029/2023JD038522. <https://doi.org/10.1029/2023JD038522>.

Otkin JA, Woloszyn M, Wang H, Svoboda MD, Skumanich M, Pulwarty R, Lisonbee J, Hoell A, **Hobbins MT**, Haigh T, and Cravens AE (2024), Anticipating flash drought: Formulating a system for early warning and even earlier action. *Bulletin of the American Meteorological Society*, 105(2):103-105.

Stuart L, **Hobbins MT**, Niebuhr E, Ruane AC, Pulwarty R, Hoell A, Thiaw WM, Muñoz-Arriola F, Jahn M, and Farrar M (2024), Enhancing global food security: Opportunities for the American Meteorological Society. Published online at *Bulletin of the American Meteorological Society*, doi:10.1175/BAMS-D-22-0106.1. <https://doi.org/10.1175/BAMS-D-22-0106.1>

Christian JI, **Hobbins MT**, Hoell A, Otkin JA, Ford TW, Cravens AE, Powlen KA, Wang H and Mishra V (2024), Flash drought: A state of the science review. Published online at *WIREs Water*, doi: 10.1002/wat2.1714. <https://doi.org/10.1002/wat2.1714>

Hobbins MT, Jansma T, Sarmiento DP, McNally A, Magadzire T, Jayanthi H, Turner W, Hoell A, Husak G, Senay GB, Boiko O, Budde M, Mogane P, and Dewes CF (2023), A global, long-term, daily reanalysis of reference evapotranspiration for drought and food-security monitoring. *Scientific Data*, 10:746, doi: 10.1038/s41597-023-02648-4. <https://doi.org/10.1038/s41597-023-02648-4>

Otkin JA, Woloszyn M, Wang H, Svoboda MD, Skumanich M, Pulwarty R, Lisonbee J, Hoell A, **Hobbins MT**, Haigh T, and Cravens AE (2022), Getting ahead of flash drought: From early warning to early action. *Bulletin of the American Meteorological Society*, E2188–E2202, doi: 10.1175/BAMS-D-21-0288.1. <https://doi.org/10.1175/BAMS-D-21-0288.1>

Baghban S, Bozorg-Haddad O, Berndtsson R, **Hobbins MT**, and Al-Ansari N (2022), Mitigation and adaptation measures. Chapter 9 in: *Climate Change in Sustainable Water Resources Management*, edited by Bozorg-Haddad O, Springer Water, Singapore. ISBN:978-981-19-1898-8, doi:10.1007/978-981-19-1898-8_9. https://doi.org/10.1007/978-981-19-1898-8_9

Abadi A, Gwon Y, Gribble M, Berman J, Bilotta R, **Hobbins MT**, and Bell J (2022), Drought and all-cause mortality risk in Nebraska from 1980 to 2014: Time-series analyses by age, sex, race, urbanicity and temporality of drought. *Science of the Total Environment*, 840:156660, doi:10.1016/j.scitotenv.2022.156660. <https://doi.org/10.1016/j.scitotenv.2022.156660>

McEvoy DJ, Roj S, Dunkerly C, McGraw D, Huntington JL, **Hobbins MT**, and Ott T (2022), Validation and bias correction of forecast reference evapotranspiration for agricultural applications in Nevada, USA. *Journal of Water Resources Planning and Management*, 148(11):04022057, doi:10.1061/(ASCE)WR.1943-5452.0001595. <https://ascelibrary.org/doi/full/10.1061/%28ASCE%29WR.1943-5452.0001595>

Hoffmann D, Gallant A, and **Hobbins MT** (2021), Flash drought in CMIP5 models. *Journal of Hydrometeorology*, 22:1439–1454, doi:10.1175/JHM-D-20-0262.1. <https://doi.org/10.1175/JHM-D-20-0262.1>

Parker T, Gallant A, **Hobbins MT**, and Hoffmann D (2021), Flash drought in Australia and its relationship to evaporative demand. *Environmental Research Letters*, 16(6):064033, doi:10.1088/1748-9326/abfe2c. <https://doi.org/10.1088/1748-9326/abfe2c>

Kew SF, Philip SY, Hauser M, **Hobbins MT**, Wanders N, van Oldenborgh GJ, van der Wiel K, Veldkamp TIE, Kimutai J, Funk CC, and Otto FEL (2021), Impact of precipitation and increasing

temperatures on drought in eastern Africa. *Earth System Dynamics*, 12:17–35, doi:10.5194/esd-12-17-2021. <https://doi.org/10.5194/esd-12-17-2021>

Hobbins MT, and Barsugli JJ (2020), Threatening the vigor of the Colorado River: Loss of sunlight-reflecting snow spurs evaporation and ebbs river flow. *Science*, 367(6483):1192-1193, doi:10.1126/science.abb3624. <https://doi.org/10.1126/science.abb3624>

Pendergrass AG, Meehl GA, Pulwarty RS, **Hobbins MT**, Hoell A, AghaKouchak A, Bonfils CJW, Gallant AJE, Hoerling M, Hoffmann D, Kaatz L, Lehner F, Llewellyn D, Mote P, Neale RB, Overpeck JT, Sheffield A, Stahl K, Svoboda MD, Wheeler MC, Wood AW, and Woodhouse CA (2020), Flash droughts present a new challenge for subseasonal-to-seasonal prediction. *Nature Climate Change*, 10:191-199, doi:10.1038/s41558-020-0709-0. <https://doi.org/10.1038/s41558-020-0709-0>

Zhang B, Xia Y, Long B, **Hobbins MT**, Zhao X, Hain CR, Li Y, and Anderson MC (2020), Evaluation and comparison of multiple evapotranspiration data models over the contiguous United States: Implications for the next phase of NLDAS (NLDAS-Testbed) development. *Agricultural and Forest Meteorology*, 280(107810), doi:10.1016/j.agrformet.2019.107810. <https://doi.org/10.1016/j.agrformet.2019.107810>

Hobbins MT, Dewes CF, Huntington JL, McEvoy DJ, Rangwala I, Shukla S, and Yocum HM (2019), Evaporative demand: Dynamics and opportunities in drought early warning, monitoring, and vulnerability assessment. *Proceedings of the 6th Interagency Conference on Research in the Watersheds*, Shepherdstown, WV, 23-26 July, doi:10.2737/SRS-GTR-243. <https://tinyurl.com/zwaaf7sy>

Rangwala I, and **Hobbins MT** (2019), Flash droughts in the Mountain West: Emerging risks under a warmer climate. *Mountain Views*, 13(1): 34-37. <https://tinyurl.com/s54w8488>

Hobbins MT, Senay GB, Gowda PH, and Artan GA (2019), Evapotranspiration and evaporative demand. Chapter 3 in: *Statistical Analysis of Hydrological Variables: Methods and Applications*, edited by Teegavarapu R, Salas JD, and Stedinger JR, American Society of Civil Engineers-Environmental Water Resources Institute, Reston, VA, ISBN:9780784415177, doi:10.1061/9780784415177.ch03. <https://doi.org/10.1061/9780784415177.ch03>

Hobbins MT, Rangwala I, Barsugli JJ, and Dewes CF (2019), Extremes in evaporative demand and their implications for drought and drought monitoring in the 21st Century. Chapter 25 in: *Extreme Hydrology and Climate Variability: Monitoring, Modeling, Adaptation and Mitigation*, edited by Melesse AM, Abteu W, and Senay GB, Elsevier, New York, NY, ISBN:9780128159989. <https://tinyurl.com/z7v6tn4>

McEvoy DJ, **Hobbins MT**, Brown TJ, VanderMolen KA, Wall TU, Huntington JL, and Svoboda MD (2019), Establishing relationships between drought and wildfire danger indices: A test case for the California-Nevada Drought Early Warning System. *Climate*, 7(52), doi:10.3390/cli7040052. <https://www.mdpi.com/2225-1154/7/4/52>

McNeeley SM, Dewes CF, Stiles CJ, Beeton TA, Rangwala I, **Hobbins MT**, and Knutson CL (2018), Anatomy of an interrupted irrigation season: Micro-drought at the Wind River Indian Reservation. *Climate Risk Management*, 19: 61-82, doi:10.1016/j.crm.2017.09.004. <https://doi.org/10.1016/j.crm.2017.09.004>

Hobbins MT, McEvoy DJ, and Hain CR (2017), Evapotranspiration, evaporative demand, and drought. Chapter 11 in: *Drought and Water Crises: Integrating Science, Management, and Policy*, edited by Wilhite DA and Pulwarty RS, CRC Press, Boca Raton, FL, doi:10.1201/9781315265551 ISBN-13:978-1-138-03564-5. <https://tinyurl.com/f4xfrvus>

Shukla S, McEvoy DJ, **Hobbins MT**, Husak GJ, Huntington JL, Funk CC, and Verdin JP (2017), Examining the value of global seasonal reference evapotranspiration forecasts to support FEWS NET's food security outlooks. *Journal of Applied Meteorology and Climatology*, 56: 2941-2949, doi:10.1175/JAMC-D-17-0104.1. <https://doi.org/10.1175/JAMC-D-17-0104.1>

Dewes CF, Rangwala I, Barsugli JJ, **Hobbins MT**, and Kumar S (2017), Drought risk assessment under climate change is sensitive to methodological choices for the estimation of evaporative demand. *PLoS ONE*, 12(3): e0174045, doi:10.1371/journal.pone.0174045.

<https://doi.org/10.1371/journal.pone.0174045>

Hobbins MT, and Huntington JL (2016), Evapotranspiration and evaporative demand. Chapter 42 in: *Handbook of Applied Hydrology*, edited by Singh VP, McGraw-Hill Education, New York, NY, ISBN-13:978-0071835091. <https://tinyurl.com/6uk34s>

Hobbins MT, Wood AW, McEvoy DJ, Huntington JL, Morton CG, Anderson MC, and Hain CR (2016), The Evaporative Demand Drought Index: Part I - Linking drought evolution to variations in evaporative demand. *Journal of Hydrometeorology*, 17: 1745-1761, doi:10.1175/JHM-D-15-0121.1.

<https://doi.org/10.1175/JHM-D-15-0121.1>

McEvoy DJ, Huntington JL, **Hobbins MT**, Wood AW, Morton CG, Anderson MC, and Hain CR (2016), The Evaporative Demand Drought Index: Part II - CONUS-wide assessment against common drought indicators. *Journal of Hydrometeorology*, 17: 1763-1779, doi:10.1175/JHM-D-15-0122.1.

<http://doi.org/10.1175/JHM-D-15-0122.1>

Hobbins MT (2016), The variability of ASCE Standardized Reference Evapotranspiration: A rigorous, CONUS-wide decomposition and attribution. *Trans. ASABE*, 59(2): 561-576, doi:10.13031/trans.59.10975, **WINNER: 2017 ASABE Superior Paper Award**.

<http://doi.org/10.13031/trans.59.10975>

McEvoy DJ, Huntington JL, Mejia JF, and **Hobbins MT** (2016), Improved seasonal drought forecasts using reference evapotranspiration anomalies. *Geophysical Research Letters*, 43: 377-385, doi:10.1002/2015GL067009. <https://doi.org/10.1002/2015GL067009>

Moorhead J, Gowda PH, **Hobbins MT**, Senay GB, Paul G, Marek T, and Porter D (2015), Accuracy assessment of NOAA gridded daily reference evapotranspiration for the Texas High Plains. *Journal of the American Water Resources Association*, 51(5): 1262-1271, doi:10.1111/1752-1688.12303.

<https://doi.org/10.1111/1752-1688.12303>

King DA, Bachelet DM, Symstad AJ, Ferschweiler K, and **Hobbins MT** (2015), Estimation of potential evapotranspiration from extraterrestrial radiation, air temperature and humidity to assess future climate change effects on the vegetation of the Northern Great Plains, USA. *Ecological Modelling*, 297: 86-97, doi:10.1016/j.ecolmodel.2014.10.037. <https://doi.org/10.1016/j.ecolmodel.2014.10.037>

Xia Y, **Hobbins MT**, Mu Q, and Ek MB (2015), Evaluation of NLDAS-2 evapotranspiration against tower flux site observations. *Hydrological Processes*, 29: 1757-1771, doi:10.1002/hyp.10299.

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Hobbins MT (2015), Evaporative demand (and evapotranspiration): Modeling and projections. *Workshop on High-Resolution Climate Modeling in the Northern Great Plains*, Boulder, CO, 24-25 September.

Hobbins MT (2015), Gridded weather and reference ET data for US and global ET mapping. *International Workshop on Evapotranspiration Mapping for Water Security*, Washington, D.C., 15-17 September.

Hobbins MT (2014), NOAA's reference ET forecast and reanalysis products. *WERA-1022 Meteorological and Climate Data to Support ET-Based Irrigation Scheduling, Water Conservation, and Water Resources Management*, Orlando, FL, 17-18 September.

Hobbins MT (2014), Evapotranspiration and evaporative demand: How important are physically based estimates? *North Central Climate Science Center: Mini Workshop on Evapotranspiration*, Fort Collins, CO, 5 May.

Hobbins MT (2013), Evaporative demand: Drought impacts and assessment. *Western States Water Council-California Department of Water Resources Workshop on Measuring, Quantifying, and Reporting Drought Impacts*, San Diego, CA, 5-7 August.

First-author presentations

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Hobbins MT and Harrison L (2024), Drought in Africa: diagnosing demand side drivers. *104th American Meteorological Society Annual Meeting*, Baltimore, MD, January 29-February 1. (Oral)

Hobbins MT (2024), A new global reference evapotranspiration dataset for FEWS NET: Opportunities in monitoring food security and famine early warning. *104th American Meteorological Society Annual Meeting*, Baltimore, MD, January 29-February 1. (Oral)

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Hobbins MT, Jackson DL, Hughes M, and Woloszyn M (2022), A rigorous attribution of the demand side of drought: a case study in the Midwest US. Abstract EGU22-13137, *European Geosciences Union General Assembly*, Vienna, Austria, 23-27 May. (Oral)

Hobbins MT, Jackson DL, Hughes M, and Woloszyn M (2022), A rigorous attribution of the demand side of agricultural drought: a case study in the Midwest US. *102nd American Meteorological Society Annual Meeting*, Houston, TX, 24-27 January. (Oral) <https://tinyurl.com/44r5ppb8>

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Hobbins MT, McEvoy DJ, Rangwala I, Xia S, and Yocum HM (2021), Drought indices and indicators for the Northeast: NOAA's Evaporative Demand Drought Index (EDDI). *Northeast DEWS Drought Indicators and Tools Webinar series*, virtual, 14 September. (Webinar)

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Hobbins MT, McNally AL, Sarmiento DP, Jansma T, Husak GJ, Turner W, and Verdin JP (2020), Using a new evaporative demand reanalysis to understand the demand perspective of drought and food insecurity in Africa. *100th American Meteorological Society Annual Meeting*, Boston, MA, 12-16 January. (Oral)

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Hobbins MT, Blakeley SL, Dewes CF, Harrison LS, Husak GJ, Jayanthi H, McNally AL, Sarmiento DP, Shukla S, and Verdin JP (2018), Opportunities for demand perspectives on drought: Updates on a global, daily evaporative demand reanalysis. *FEWS NET Science Partners meeting*, Washington, D.C., 12 December. (Oral)

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Hobbins MT, Hoell A, and Newman M (2018), On the causes and predictability of flash drought. *NOAA-Physical Sciences Division Improving Forecasts of Extremes on Subseasonal to Seasonal Time Scales workshop*, Boulder, CO, 9 November. (Oral)

Hobbins MT, Barsugli JJ, Dewes CF, Huntington JL, Lukas JJ, McEvoy DJ, Rangwala I, Ray AJ, and Yocum HM (2018), The Evaporative Demand Drought Index (EDDI): Updates and performance in the 2017 Northern Great Plains drought. *16th Annual Climate Prediction Applications Science Workshop*, Fargo, ND, 22-24 May. (Oral)

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Hobbins MT, Hughes MA, Mahoney KM, and Zamora RJ (2018), Too much water and too little: Meet EDDI, the Evaporative Demand Drought Index. *National Water Center Technology Showcase*, Tuscaloosa, AL, 27 March. (Poster)

Hobbins MT, Barsugli JJ, Dewes CF, Huntington JL, Lukas JJ, McEvoy DJ, Morton CG, Rangwala I, Ray AJ, Smith C, Wood AW, and Yocum HM (2018), The Evaporative Demand Drought Index (EDDI): Early warning and monitoring of drought from the demand side. *NOAA-Physical Sciences Division webinar*, virtual, 14 March. (Webinar)

Hobbins MT, Dewes CF, McEvoy DJ, Shukla S, Harrison LS, Blakeley SL, McNally AL, and Verdin JP (2018), A new global reference evapotranspiration reanalysis forced by MERRA2: Opportunities for famine early warning, drought attribution, and improving drought monitoring. *98th American Meteorological Society Annual Meeting*, Austin, TX, 7-11 January. (Poster)

Hobbins MT (2017), A global reference evapotranspiration service for the FEWS NET Science Community: Derivation, FEWS applications, next steps. *FEWS NET Science Update Meeting: Agro-Climatology for Food Security Assessment*, Washington, D.C., 6-8 September. (Oral)

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Hobbins MT, Ray AJ, Yocum HM, McEvoy DJ, Huntington JL, Rangwala I, Dewes CF, and Lukas JJ (2017), R2O of the Evaporative Demand Drought Index: The physical basis for a new early warning and

monitoring index for drought and engagement with stakeholders. *15th Annual Climate Prediction Applications Science Workshop*, Anchorage, AK, 2-4 May. (Oral)

Hobbins MT, McEvoy DJ, Huntington JL, Ray AJ, Yocum HM, Rangwala I, Dewes CF, and Lukas JJ (2017), The Evaporative Demand Drought Index (EDDI): A new drought monitoring and early warning tool. *97th American Meteorological Society Annual Meeting*, Seattle, WA, 22-26 January. (Oral)

Hobbins MT, Shukla S, McNally AL, McEvoy DJ, Huntington JL, Husak GJ, Funk CC, Senay GB, Verdin JP, Jansma T, and Dewes CF (2016), What role does evaporative demand play in driving drought in Africa? Abstract GC43F-02, *2016 Fall Meeting, AGU*, San Francisco, CA, 12-16 December. (Oral)

Hobbins MT, McEvoy DJ, Huntington JL, Wood AW, Morton CG, Verdin JP, and Ray AJ (2016), The Evaporative Demand Drought Index: A new early warning and monitoring index for drought. *National Weather Service National Climate Services Meeting*, Silver Spring, MD, 9-12 May. (Poster)

Hobbins MT (2016), A global reference evaporative demand reanalysis for FEWS NET: A drought monitoring and early warning tool. *FEWS NET Science Update Meeting: Agro-Climatology for Food Security Assessment*, Santa Barbara, CA, 5-7 April. (Oral)

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Hobbins MT, McEvoy DJ, Huntington JL, Wood AW, Morton CG, and Verdin JP (2016), EDDI examines the current California drought: Early warning and monitoring of agricultural and hydrologic drought with the new Evaporative Demand Drought Index. *96th American Meteorological Society Annual Meeting*, New Orleans, LA, 10-14 January. (Oral)

Hobbins MT, McEvoy DJ, Huntington JL, Wood AW, Morton CG, and Verdin JP (2015), The current California drought through EDDI's eyes: Early warning and monitoring of agricultural and hydrologic drought with the new Evaporative Demand Drought Index. Abstract H34D-03, *2015 Fall Meeting, AGU*, San Francisco, CA, 14-18 December. (Oral)

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Hobbins MT, McEvoy DJ, Huntington JL, Verdin JP, and Wood AW (2015), Monitoring the California Drought with a novel drought index: The Evaporative Demand Drought Index (EDDI). *AGU Chapman Conference: California Drought: Causes, Impacts, and Policy*, Irvine, CA, 20-22 April. (Poster)

Hobbins MT, McEvoy DJ, Huntington JL, Wood AW, and Verdin JP (2015), The physical basis of the Evaporative Demand Drought Index. *95th American Meteorological Society Annual Meeting*, Phoenix, AZ, 4-8 January. (Poster)

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Hobbins MT (2014), A global reference ET service for FEWS NET: Goals, tasks, and uses. *FEWS NET Science Update Meeting: Putting Drought in Historical Context*, Boulder, CO, 19-20 November. (Oral)

Hobbins MT, Senay GB, and Verdin JP (2014), NOAA introduces its multi-generational reference evapotranspiration product. *ASABE International Symposium on Evapotranspiration: Challenges in Measurement and Modeling from Leaf to the Landscape Scale and Beyond*, Raleigh, NC, 7-10 April. (Oral)

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Hobbins MT (2014), What drives the spatial and temporal variability of evaporative demand across CONUS? *ASABE International Symposium on Evapotranspiration: Challenges in Measurement and Modeling from Leaf to the Landscape Scale and Beyond*, Raleigh, NC, 7-10 April. (Poster)

Hobbins MT, Geli HME, Lewis CS, Senay GB, and Verdin JP (2013), NOAA introduces its first-generation reference evapotranspiration product. Abstract H53E-1453, *2013 Fall Meeting, AGU*, San Francisco, CA, 9-13 December. (Poster)

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Hobbins MT, Wood AW, and Werner K (2011), Improving drought monitoring and predictions using physically based evaporative demand estimates. Abstract H43H-1322, *2011 Fall Meeting, AGU*, San Francisco, CA, 5-9 December. (Poster)

Hobbins MT, Wood AW, Werner K, and Hogue TS (2011), Evapotranspiration estimation at the NOAA-NWS-Colorado Basin River Forecast Center: Operational challenges and research opportunities. *Western States Remote Sensing of ET Workshop*, Boise, ID, 12-13 October. (Poster)

Hobbins MT, Wood AW, and Werner K (2011), Examining the role of evaporative demand in drought monitoring. *NASA Workshop on Global Drought Monitoring*, Silver Spring, MD, 11-12 April. (Oral)

Hobbins MT, Streubel D, Wood AW, and Werner K (2011), Examining the spatio-temporal variability of potential evaporation across the conterminous US. *NASA/USDA Workshop on Evapotranspiration: An Essential Observation for Climate Understanding and Efficient Water Management*, Silver Spring, MD, 5-7 April. (Poster)

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Hobbins MT, Dai A, Roderick ML, and Farquhar GD (2008), Parameterizing evaporative demand in the Palmer Drought Severity Index: Implications for Australia. Abstract H24A-08, *2008 Western Pacific Geophysical Meeting, AGU*, Cairns, Qld., Australia, 29 July-1 August. (Oral)

Hobbins MT, Farquhar GD, and Roderick ML (2007), The evaporation paradox, and the roles of dimming and stilling. *3rd Conference of the Gary Comer Abrupt Climate Change Fellowship*, Palisades, NY, 2-5 May. (Oral)

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Hobbins MT, Roderick ML, and Farquhar GD (2006), Is the temperature-based parameterization of potential evapotranspiration in the Palmer Drought Severity Index forcing overestimates of mid-continental drying and drought? Abstract H24B-04, *2006 Fall Meeting, AGU*, San Francisco, CA, 11-15 December. (Oral)

Hobbins MT, Roderick ML, and Farquhar GD (2006), What are we talking about when we talk about drying? *17th Annual Australia New Zealand Climate Forum*, Canberra, ACT, Australia, 5-7 September. (Oral)

Hobbins MT, Farquhar GD, and Roderick ML (2006), Towards a more robust characterisation of Australian drought. *Bureau of Meteorology Workshop on Climate Change Detection and Attribution*, Melbourne, Vic., Australia, 5 June. (Oral)

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Hobbins MT, Ramírez JA, and Brown TC (2004), Developing a long-term, high-resolution, continental-scale, spatially distributed time-series of topographically corrected solar radiation. *24th Annual AGU Hydrology Days*, Fort Collins, CO, 10-12 March. (Oral)

Hobbins MT, Ramírez JA, and Brown TC (2004), Developing a homogeneous data series of pan evaporation across the conterminous United States for analysis of long-term trends. *24th Annual AGU Hydrology Days*, Fort Collins, CO, 10-12 March. (Oral)

Hobbins MT, Ramírez JA, and Brown TC (2003), Is pan evaporation decreasing across the conterminous United States? If it is, so what? *23rd Annual AGU Hydrology Days*, Fort Collins, CO, 31 March-2 April. (Oral)

Hobbins MT, Ramírez JA, and Brown TC (2001), Trends in regional evapotranspiration across the United States under the complementary relationship hypothesis. *21st Annual AGU Hydrology Days*, Fort Collins, CO, 2-5 April. (Oral)

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Hobbins MT, Ramírez JA, and Brown TC (1999), Regional evapotranspiration and the complementary relationship: A comparison and evaluation of the CRAE model and the Advection-aridity approach. Abstract H51A-14, *1999 Spring Meeting, AGU*, Boston, MA, 1-4 June. (Poster)

Co-author presentations

Pan Y, Wang H, Hughes ML, **Hobbins MT**, Ray AJ, Rosencrans M, Pugh B, Uzoma A, and Shrestha S (2024), Operationalizing the Evaporative Demand Drought Index (EDDI) and value-added products for CONUS drought monitoring and early warning at the NOAA Climate Prediction Center. *48th Climate Diagnostics and Prediction Workshop*, Tallahassee, FL, 26-29 March. (Poster)

Hughes ML, Acharya N, Currier WR, **Hobbins MT**, Jackson D, Sthapit E, and Cifelli R (2024), Improving NOAA's water tools through physical process, data-driven, and hybrid modeling techniques. *104th American Meteorological Society Annual Meeting*, Baltimore, MD, 28 January-1 February. (Oral)

McEvoy DJ, **Hobbins MT**, Andrade A, and Albano C (2023), Understanding the increasingly important role of evaporative demand as a driver of extreme drought and wildfire danger in the 21st century. *2023 AGU Fall Meeting*, San Francisco, CA, 11-15 December (Oral).

Husak GJ, Shukla S, Funk CC, Turner W, Saldivar R, Hauzaree D, **Hobbins MT**, and Svoboda MD (2023), Exploring the evolving relationship between precipitation and potential evapotranspiration over sub-Saharan Africa. *2023 AGU Fall Meeting*, San Francisco, CA, 11-15 December. (Poster)

Jayanthi H, Muhammad FZ, Arwal N, **Hobbins MT**, Young C, Husak G, Funk C, Peterson P, Magadzire T, and Verdin J (2023), CHIRPS 2.0 beta and loss exceedance curves. *FEWS NET Science Meeting*, Boulder, CO, 13-15 June. (Oral)

Stuart L, and **Hobbins MT** (2023), Hunger at the AMS: Perspectives on food security for a changing earth system. *103rd American Meteorological Society Annual Meeting*, Denver, CO, 8-12 January. (Oral)

Robjhon M, Xu L, Thiaw W, Fan Y, and **Hobbins MT** (2023), Global drought monitoring and forecasting to advance food security early warning. *103rd American Meteorological Society Annual Meeting*, Denver, CO, 8-12 January. (Oral)

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Colón-Burgos D, Rangwala I, **Hobbins MT**, and Senay GB (2022), Decadal-scale changes in drought-related climate parameters: Assessing the consistency of Global Climate Models in projecting changes in the Northern Great Plains. *102nd American Meteorological Society Annual Meeting*, virtual, 24-27 January. (Poster)

Xia S, McEvoy DJ, **Hobbins MT**, Huntington JL, Rangwala I, and Yocum HM (2021), Identifying indicators and timescales of agricultural drought in the northeast United States using crop area-weighted

drought indices. Abstract GC25E-0700, *2021 Fall Meeting, AGU*, New Orleans, LA, 13-17 December. (Poster)

Rangwala I, Smith LL, Senay GB, Barsugli JJ, Kagone S, and **Hobbins MT** (2021), Landscape Evolution Response Index (LERI): High-resolution monitoring of anomalies in ET response across the contiguous US. *Northeast DEWS Drought Indicators and Tools Webinar series*, virtual, 14 September. (Webinar)

Xia S, McEvoy DJ, **Hobbins MT**, Rangwala I, and Yocum HM (2021), Drought index relationships to crop health. *Northeast DEWS Drought Indicators and Tools Webinar series*, virtual, 7 September. (Webinar)

Colón-Burgos D, Rangwala I, **Hobbins MT**, and Senay GB (2021), Decadal-scale changes in drought-related climate parameters: Assessing the consistency of global climate models in projecting changes in the Northern Great Plains. *2021 Boulder Summer Student Research Virtual Poster Symposium*, virtual, 29 July. (Poster)

Colón-Burgos D, Rangwala I, **Hobbins MT**, and Senay GB (2021), Decadal-scale changes in drought-related climate parameters: Assessing the consistency of global climate models in projecting changes in the Northern Great Plains. *SOARS Research Colloquium*, virtual, 26 July. (Oral)

McEvoy DJ, **Hobbins MT**, Rangwala I, Yocum HM, and DeGaetano A (2020), Quantifying drought metrics, time scales, and tools to support management of different drought types in the Northeastern United States. *NOAA Northeast Regional Climate Center webinar*, virtual, 29 October. (Webinar)

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