MICHAEL DETTINGER

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ACADEMIC HISTORY

1977 -- BA Physics, U.C. San Diego (Revelle College), *summa cum laude.*

1979 -- MS Civil Engineering, Massachusetts Institute of Technology, thesis: *"Numerical Modeling of Aquifer Systems under Uncertainty: A Second Moment Analysis"*

1991 -- MS Atmospheric Sciences, University of California, Los Angeles

1997 -- Ph.D., Atmospheric Sciences, University of California, Los Angeles, *advisor: Michael Ghil*, dissertation: *"Variations of Continental Climate and Hydrology on Diurnal-to-Interdecadal Scales"*

Degree committees (15): Christine Albano (PhD UNR); Charles Briscoe (MS SIO); Theresa Carpenter (PhD SIO); Helen Fillmore (MS UNR); Betsy Frick (MS UNR); Sam Haber (MS SIO); Maryam Lamjiri (PhD SIO); Jessica Lundquist (PhD SIO); Paul McBeth (MS UNR); Lauren Mancewicz (MS UNR); Cody Poulsen (PhD SIO); Michael Sierks (PhD SIO); Josh Sturtevant (MS UNR); Edwin Sumargo (PhD SIO); Charles Truettner (PhD UNR)

PROFESSIONAL HISTORY

1979-81: Engineer-scientist, Camp Dresser & McKee, Inc., Walnut Creek, California: *Water resources consulting & groundwater modeling resource evaluations, groundwater flow/transport modeling, and water quality management studies for DOE nuclear-waste programs, Guam EPA, water-quality districts, and chemical industry.*

1981-89: Hydrologist, U.S. Geological Survey, Carson City, Nevada: *Groundwater assessments, modeling & hydrogeologic framework of groundwater resources, flow and chemistry in Great Basin bedrock and alluvial aquifers; District Groundwater Specialist, including program review & representation of USGS to public, Legislature & State Engineer.*

1990-96: Research Hydrologist, California District, USGS, San Diego, CA: *Studies of sensitivity of water resources of California to interannual-decadal climate variations & change by historical analyses and simulations of snowmelt/watersheds. Analyses of freshwater-inflow variations to San Francisco Bay. Analysis of large-scale basis and predictability of global, hemispheric, and Western US hydroclimatic variations using historical and paleo-records of atmospheric circulations, trace gases, ocean temperatures, streamflow, and groundwater. Nonlinear dynamics of land-air interactions. UCLA Singular-Spectrum-Analysis Toolkit. Developer of NOAA CDC Global Streamflow dataset.*

1997-2001: Research Hydrologist, California District, USGS, & Research Associate, Climate Research Division, Scripps Institution of Oceanography, La Jolla, CA:
Continuation of studies of global, Western, and Sierra Nevada hydroclimatology of precipitation and streamflow. Weather & climate downscaling. Medium-range streamflow forecasting, Sierra Nevada, & long-range streamflow forecasting nationwide. Simulations of streamflow & aquifer responses to climate.

2002-2015: Research Hydrologist, Branch of Western Regional Research, USGS, & Research Associate, Climate Research Division, Scripps Institution of Oceanography, La Jolla, CA: *Studies of global, Western North American, and Sierra Nevada hydroclimatology of precipitation, snowpack, surface & groundwater. Developed constructed-analogs downscaling, component-resampling probability methods, & derived-distribution tools for evaluating global-change and short-term climate predictions and consequences. Evaluation of climate-change projections of western climates, Pacific-basin climate modes, flood statistics, streamflow & groundwater recharge. Innovating hydro-meteorological monitoring methods, Yosemite National Park. Co-designer, California 21st Century Extreme Storm Observations Network. Team leader, ARkStorm scenario development.*

2015-2019: Senior Hydrologist, Water Cycle Branch, USGS; Visiting Researcher, Desert Research Institute; & Research Associate, Climate Research Division, Scripps Institution of Oceanography, Carson City, NV:
Continuation of studies of climate change and water resources of the West, along with atmospheric-rivers processes and impacts, cold-air pooling in the Sierra Nevada, and other hydrologic and hydroclimatic problems in California and Nevada. Organizer & editor, 1st & 2nd International Atmospheric-Rivers Conferences. Scripps' Center for Western Weather and Water Extremes. UNR Water for the Seasons Water Sustainability and Climate Project on Truckee-Carson River System, and Native Waters Project across the Southwest.

2020-pres: Visiting Researcher/Research Associate, Scripps Institution of Oceanography; and Michael Dettinger

Climate Science, LLC (until 2024), Carson City: *Forecast-informed reservoir operations, climate change, and drought studies at Scripps. Scoping of a new climate-change institute at Lake Tahoe. Grid-savvy drought impacts/indicators study with Public Policy Institute of California. High-resolution projections of hydrologic impacts of climate change in Lake Tahoe Basin with Desert Research Institute. Assorted mentoring.*

OTHER ACTIVITIES

- **National Academy of Engineers,** for "*hydroclimate research that significantly enhanced understanding & management of water resources in the western US*," 2022; Committee to Review 5th National Climate Assessment, 2022-23; Peer Election Committee, 2023-25 (chair, 2025; Committee on Membership, 2025); Committee for Rescoping Natural Resources Engineering Section (2025). #290 in Reuters' Global List of Top 1000 Most Influential Climate Scientists, 2021. **Special Recognition Award,** California Extreme Precipitation Symposium, 2020. **Fellow,** American Association for Advancement of Science for "*seminal contributions to understanding of the hydroclimatology of the Western US*," 2018. **Fellow,** American Geophysical Union Hydrology Fellow for "*insightful, societally relevant research in understanding how climate and weather affect variability of hydrologic systems,*" 2014; AGU **Tyndall History of Global Environmental Change Lecturer** (*"Climate change and western water resources—A history of the Science"),* 2021; AGU **Horton Medal Selection Committee**, 2020-23*;* AGU **College of Fellows New Frontiers Committee**, 2023-. **Water Resources Committee,** American Meteorological Soc, 2015- (chair*,* 2017-19). **Invited lead author** of Ecological Soc of America Centennial paper, *Western Water & Climate Change*, 2015.
- Sierra Business Council's **Sierra Nevada Vulnerability Assessment Technical Advisory Group**, 2020-pres. **Lake Tahoe Science to Action Subcommittee**, 2018-19. **Lake Tahoe Science Consortium Committee of Scientists**, 2014-16. EU-funded **Venice Sustainability Advisory Panels**, Venice, Italy, 2008-09, 2010-13.
- **Coordinating Lead Author**, 4th California Climate Assessment Sierra Nevada Region, 2017-18. **California Department of Water Resources (DWR) Climate Science Service Awards**, 2007 & 2014. **California DWR Climate Change Technical Advisory Group**, 2008-09, 2012-14. **Project management team**, California DWR/NOAA 21st Century Observations, Modeling & Decision Support Systems for Enhanced Flood Response & Emergency Preparedness Program, 2008-12. **Editor**, CALFED/Delta Science Program State of Bay-Delta Science reports, 2007-08, 2014-16. **Member,** CALFED Water-Management Science Board, 2004-05.
- **Contributing author,** Urban Climate Change Research Network (UCCRN) Assessment Reports on Climate Change in Cities (ARC3), 2008-09, 2014-15. **Contributing author,** Seasonal-to-Interannual Climate Forecast Needs--Users' Perspectives, 3rd World Climate Conference, 2009. EU-funded **Venice (Italy) Sustainability Advisory Panels**, 2008-09, 2010-12. Co-proposer & executive committee, **USA National Phenology Network Implementation**, 2005-07.
- **Senior Scientist** (retired), USGS, 2015-19. **Department of Interior Superior Service Award**, 2005, for exceptional contributions to hydroclimatology. **Research Advisor**, USGS Surface-Water Hydrology Discipline, 2009-14. **USGS Global Change Strategic Science Planning Team**, 2010-12. **Committee** for Report to Congress on a Program for Periodic Assessments of the Nation's Water Availability, Fall 2001 & Summer 2003. **Member**, US National Groundwater Climate-Response Network Design Committee, 1995-97. **Vice President's National Performance Review Award**, for physical-science leadership in DOD/DOI Mojave Desert Ecosystems planning efforts*,* 1996.
- **Lead author**, Water Resources chapter, National Climate Assessment Report, 2012-13. **Co-organizer & coauthor**, Southwest Climate Assessment, 2011-2012. **Steering & selection committees**, NOAA PACE Postdoctoral Program, 2008-12. **Science Steering Group**, US Global Water Cycle Interagency Working Group, 2004-08. **Coauthor,** US Committee for Science & Assessment Product 5.3 **(**Decision support & evaluations of seasonal-interannual forecasts & observations), 2006-08. **NASA Standing Review Board**, Surface-Water/Oceanic Topography (SWOT) Mission, 2014-22. **Program committee & coauthor**, NOAA Research Council Water-Cycle Science Challenge, 2011.
- **Program chair & fundraiser**, Annual Pacific Climate (PACLIM) Workshops, 1998-2004. **Co-founder & organizing committees**, biennial MTNCLIM Workshops, 2004-24.

SELECTED BOOKS, PUBLICATIONS & REPORTS *(w/annotations)*

*[***Total numbers of publications:** *1 reference book, >165 journal articles & chapters, >30 government reports & >100 other technical publications.* **Impact***: GoogleScholar lists >41,000 citations to my work in the scientific literature, with 85 cited >100 times (many indicated below by **). Among my 1st-authored papers, 18 have been cited >100 times, totaling >6,500 citations. My research has led directly to three new entries (**d**'s below) in the AMS Glossary of Meteorology since 2018.]*

Ralph, M., **Dettinger**, M., Waliser, D., and Rutz, J. (eds.), 2020, Atmospheric Rivers: Springer International Publishing, 252 p., doi: 10.1007/978-3-030-28906-5. *(1st reference book on ARs)*

** **Dettinger**, M.D., & Wilson, J.L., 1981, First-order analysis of uncertainty in numerical models of groundwater flow, 1, Mathematical development: Water Resources Research, 17, 149-161. *(Development of matrix-calculus formulation for modeling of groundwater-flow uncertainties)*

** **Dettinger**, M.D., 1989, Reconnaissance estimates of natural recharge to desert basins in Nevada, U.S.A., by using chloride-balance calculations: J. Hydrology, 106, 55-78. *(First new recharge-estimation method for Nevada in 25+ yrs; still used sometimes)*

** **Dettinger**, M.D., & Cayan, D.R., 1995, Large-scale atmospheric forcing of recent trends toward early snowmelt in California: J. Climate, 8, 606-623. *(Early documentation & explanation of regional streamflow-seasonality trends)*

** **Dettinger**, M., Cayan, D., Diaz, H., & Meko, D., 1998, North-south precipitation patterns in western North America on interannual-to-decadal time scales: J. Climate, 11, 3095-3111. *(Pre-PDO characterization of interdecadal precipitation variability along West Coast w/connections between ENSO & longer term "changes")*

** Cayan, D.R., Kammerdiener, S., **Dettinger**, M.D., Caprio, J.M., & Peterson, D.H., 2001, Changes in the onset of spring in the western United States: Bulletin, Amer Meteorol Soc, 82, 399-415. *(Observed trends toward earlier spring vegetation greenup across the western US associated with late-20th-Century warming)*

** **Dettinger**, M.D., et al., 2001, Interhemispheric effects of interannual & decadal ENSO-like climate variations on the Americas, in V. Markgraf (ed.), Interhemispheric climate linkages--Present & past climates in the Americas & societal effects: Acad. Press, 1-16. *(Coordinated streamflow & precipitation covariations from Alaska to Tierra del Fuego)*

** Ghil, M., Allen, M.R., **Dettinger**, M.D., et al., 2002, Advanced spectral methods for climatic time series: Rev. Geophysics, 40, 1003, 1-41. *(Classic reference still used across many scientific fields)*

** **Dettinger**, M.D., 2004, Fifty-two years of pineapple-express storms across the West Coast of North America: California Energy Commission PIER Energy-Related Environmental Research Report CEC-500-2005-004, 15 p. *(Objective history & impacts of major class of AR storms)*

** **Dettinger**, M.D., Cayan, D.R., Meyer, M.K., & Jeton, A.E., 2004, Simulated hydrologic responses to climate variations & change in the Merced, Carson, & American River basins, Sierra Nevada, California, 1900-2099: Clim Chg, 62, 283-317. *(Early coupling of day-to-day climate-change projections to several hydrologic models)*

** **Dettinger**, M.D., 2005, From climate-change spaghetti to climate-change distributions for 21st Century California: San Francisco Estuary & Watershed Science, 3(1), article 4. *(Introduced ensemble climate-change probabilities to California science & environmental community)*

Hanson, R.T., & **Dettinger**, M.D., 2005, Ground-water/surface-water responses to ensembles of global climate simulations, Santa Clara-Calleguas basin, Ventura County, California, 1950-93: J. American Water Resources Assoc, 41, 517-536. *(Earliest linked global-climate-model-to-groundwater-flow-model simulations)*

** Stewart, I., Cayan, D., & **Dettinger**, M., 2005, Changes towards earlier streamflow timing across western North America: J. Climate, 18, 1136-1155. *(Western North America-wide observation of streamflow-timing trends associated with late-20th-Century warming)*

** Knowles, N., **Dettinger**, M., & Cayan, D., 2006, Trends in snowfall versus rainfall for the Western United States: J. Climate, 19, 4545-4559. *(Detected westwide snowfall-to-rainfall changes associated with late-20th-Century warming)*

** Ralph, F.M., Neiman, P.J., Wick, G., Gutman, S., **Dettinger**, M., Cayan, D., & White, A.B., 2006, Flooding on California's Russian River—Role of atmospheric rivers: Geophysical Research Letters, 33 (L13801), 5 p. *(First demonstrated dominating role of ARs in causing Northern California flooding)*

** Barnett, T.P., Pierce, D.W., Hidalgo, H., Bonfils, C., Santer, B., Das, T., Bala, G., Wood, A., Nozawa, T., Mirin, A., Cayan, D., & **Dettinger**, M., 2008, Human-induced changes in the hydrology of the western United States: Science, 316, 1080-1083. *(First rigorous statistical attribution of observed snowmelt/streamflow trends to global warming)*

** Funk, C., **Dettinger**, M., et al., 2008, Warming of the Indian Ocean threatens eastern & southern Africa food security, but could be mitigated by agricultural development: PNAS, 105, 11081-11086. (*Brief foray into global food security)*

** Das, T., **Dettinger**, M., Cayan, D., & Hidalgo, H., 2011, Potential increase in floods in California's Sierra Nevada under future climate projections: Clim Chg, 109, 71-94. *(One of the first simulation-based evaluations of flood changes under climate change in the West.)*

** **Dettinger**, M.D., 2011, Climate change, atmospheric rivers and floods in California—A multimodel analysis of storm frequency & magnitude changes: J. American Water Resources Association, 47, 514-523. *(First-ever projections of AR enhancement by climate change)*

** **Dettinger**, M.D., Ralph, F.M., Das, T., Neiman, P.J., & Cayan, D., 2011, Atmospheric rivers, floods, and the water resources of California: Water, 3, 455-478. *(Most notable for graphics re: California's variable precipitation regime)*

** Ralph, F.M., & **Dettinger**, M.D., 2011, Storms, floods and the science of atmospheric rivers: Eos 92(32), 265-266.

(Proposing AR science as a 21st C grand challenge to the meteorology community)

Dettinger, M.D., et al., 2012, Design and quantification of an extreme winter storm scenario for emergency preparedness and planning exercises in California: Natural Haz., 60, 1085-1111. *(Scientific design & construction of ARkStorm severe-storm scenario for California emergency preparedness & planning)*

Dettinger, M., & Ingram, L., 2013, The coming megafloods: Scientific American, 308(1), 64-71. (also *translated & published in eleven other countries*)

White, A, Anderson, M, **Dettinger**, M, Ralph, FM, et al., 2013, A 21st Century California observing network for monitoring extreme weather events: J. Atmos Ocean Tech, 30, 1585-1603. *(Design & implementation of a multimillion dollar California severe-storm monitoring network)*

** **Dettinger**, M, 2013, Atmospheric rivers as drought busters on the US West Coast: J. Hydrometeorology, 14, 1721-1732. *(First glimpse of AR-to-drought connections)*

** **Dettinger**, M.D., Udall, B., & Georgakakos, A.P., 2015, Western water & climate change: Ecological Applications, 25(8), 25 p. (*Invited ESA Centennial Paper*)

Albano, C.M., **Dettinger**, M.D., McCarthy, M.I., Welborn, T.L., & Cox, D.A., 2016, Application of an extreme winter storm scenario to identify vulnerabilities, mitigation options, and science needs in the Sierra Nevada mountains, USA: Natural Haz., 80, 879-900. *(ARkStorm@Tahoe)*

Dettinger, M.D., 2016, Historical and future relations between large storms and droughts in California: San Francisco Estuary & Watershed Science, 14(2), 21 p. *(Detailed characterization of historical & future complementarity between major storms & droughts in California)*

Healey, M., **Dettinger**, M., & Norgaard, R. (eds.), 2016, State of Bay-Delta Science 2016: Delta Science Program, 418 p. *(Also co-edited the previous State-of-Science report in 2008)*

Ralph, F.M., et. al., 2016, CalWater field studies designed to quantify the roles of atmospheric rivers & aerosols modulating US West Coast precipitation in a changing climate: Bull. Amer Meteorol Soc., 97, 20 p. *(Airborne campaigns re: ARs, aerosols, & climate change; precursor to now-operational AR Reconn Program w/USAF/NOAA)*

(d) Harpold, A., **Dettinger, M.** & Rajagopal, S., 2017, Defining snow drought & why it matters: Eos, 98, 15-17. *(First formal definitions of "snow droughts" for cryosphere community)*

** Konrad, C.P., & **Dettinger**, M.D., 2017, Flood runoff in relation to water vapor transport by atmospheric rivers over the Western US, 1949-2015: Geophysical Research Letters, 44, 7 p. *(Mapping consistent AR-flooding relations at >5000 stream gages across the western US)*

Dettinger, M.D., Ralph, F.M., & Rutz, J., 2018, Empirical return periods of the most intense vapor transports during AR landfalls on the US West Coast: J. Hydromet., 19, 1363-1377. *(Quantifying frequency, history, & geography of the strongest-ever observed West Coast atmospheric rivers)*

Dettinger, M., et al., 2018, Fourth California Climate Assessment--Sierra Nevada Region Report: California's Fourth Climate Change Assessment report SUM-CCCA4-2018-004, 94 p. *(1st region report for Sierra Nevada in California Climate Assessments series)*

** **(d)** Ralph, F.M., **Dettinger**, M.D., Cairns, M.M., Galarneau, T.J., and Eylander, J., 2018, Defining "atmospheric river"--How the Glossary of Meteorology helped resolve a debate: Bull. Amer. Meteor. Soc., 99, 837-839. *(Formalizing the definition of ARs)*

Vicuna, S., Redwood, M., **Dettinger**, M., & Noyola, A., 2018, Urban Water Systems, in Rosenzweig, C., et al. (eds.), Climate Change and Cities—2nd Assessment Report of the Urban Climate Change Research Network: Cambridge University Press, New York, 519-552. *(Also co-authored water-resources chapter in 1st Assessment Report, 2011.)*

** Ralph, F.M., Rutz, J., Cordeira, J., **Dettinger**, M., et al., 2019, A scale to characterize the strength and impacts of atmospheric rivers: Bull. Amer. Meteor. Soc., 100, 269-289. *(Introduced widely used AR Scale)*

(**d**) Lake Mendocino FIRO Steering Committee, 2020, Lake Mendocino Forecast Informed Reservoir Operations Final Viability Assessment, 141 p. *(>6 yrs of multiagency work & negotiation to demonstrate & implement FIRO)*

McAfee, S., Restaino, C., Omerod, K.J., **Dettinger**, M., et al., 2021, Climate change impacts in Nevada: UNv Extension FS21-06, 9 p. *(First Nevada state-scale vulnerability assessment)*

Albano, C.M., et al., 2022, A multi-dataset assessment of climatic drivers and uncertainties of recent trends in evaporative demand across the continental US: J. Hydromet., 23, 15 p. *(Documentation of increasing US atmospheric thirstiness)*

Dettinger, M., Wilson, A., & McGurk, G., 2023, Keeping water in climate-changed headwaters longer: San Francisco Estuary & Watershed Science, 21, 9 p. *(Call for headwater action to mitigate projected climate-change impacts on California's water resources)*