



## Michael Dettinger

Senior Scientist, U.S. Geological Survey

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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, advisor: John Wilson  
*"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, *"Variations of Continental Climate and Hydrology on Diurnal-to-Interdecadal Scales"*
- 1985—Master's committee, Betsy Frick, University of Nevada, Reno  
*"Quantitative Evaluation of Ground-water Flow in Steptoe Valley, Nevada"*  
1986—Master's committee, Paul McBeth, University of Nevada, Reno  
*"Hydrogeologic Significance of LANDSAT Lineaments in the Great Basin"*  
2004—Doctoral committee, Jessica Lundquist, Scripps Institution of Oceanography  
*"Diurnal Cycles of Streamflow in the Western United States"*  
2009--Master's committee, Sam Haber, Scripps Institution of Oceanography  
*"Isotopes of He, H and C as Groundwater Tracers in Aquifers along the Colorado River"*  
2009—Master's committee, Charles Briscoe, Scripps Institution of Oceanography  
*"Environmental, Economic and Energy Impacts of Desalination Plants in Southern California"*  
2010—Doctoral committee, Theresa Carpenter, Scripps Institution of Oceanography  
*"Southern California Flash Flood Frequencies and Climate Variability"*  
Current—Doctoral committee, Edwin Sumargo, Scripps Institution of Oceanography  
*"Cloud Variability and Surface Hydro-Climatology in the Western United States"*

### 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, and representation of USGS to public, Legislature and State Engineer.*
- 1990-96: Research Hydrologist, California District, USGS, San Diego, CA: **Hydroclimatology**  
*Studies of sensitivity of water resources of California to interannual-decadal climate variations and 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, ground water, and water quality. Nonlinear dynamics of land-air interactions. Co-developer of UCLA Singular-Spectrum-Analysis Toolkit, 1995. Developer of NOAA CDC Global Streamflow dataset, 1996.*
- 1997-2001: Research Hydrologist, California District, USGS, & Research Associate, Climate Research Division, Scripps Institution of Oceanography, La Jolla, CA: **Hydroclimatology**  
*Continuation of studies of global, Western, and Sierra Nevada hydroclimatology of precipitation and streamflow. Weather and climate downscaling. Medium-range streamflow forecasting, Sierra Nevada, and long-range streamflow forecasting nationwide. Simulations of streamflow & aquifer responses to climate, including use of insolation variations. Co-PI, NOAA-funded California-Nevada Applications Program (CNAP) for regional integrated science and assessment of climate applications.*

**2002-2015: Research Hydrologist, Branch of Western Regional Research, USGS, & Research Associate, Climate Research Division, Scripps Institution of Oceanography, La Jolla, CA: *Hydroclimatology & climate change***

*Studies of global, Western North American, and Sierra Nevadan hydroclimatology of precipitation, snowpack, streamflow & groundwater. Developed constructed-analogs downscaling, component-resampling, & derived-distribution approaches as tools for evaluating global-change and short-term climate predictions and consequences. Evaluation of climate-change projections for changes in western climates, large-scale Pacific-basin climate modes, flood statistics, streamflow & groundwater recharge. Development of innovative hydrometeorological monitoring methods, Yosemite National Park. Continuation of climate-applications assessments within CNAP & extension to State-funded California Climate Change Center. Co-designer, 21<sup>st</sup> Century Extreme Storm Observations Network for California. Team leader, ARkStorm scenario development, USGS Multi-Hazards Program. Co-PI, DOI's Southwest Climate Science Center and National Integrated Drought Information System's Southern California Pilot Study. Methods contributor, Climate Central/US Bureau of Reclamation Bias-corrected & Downscaled CMIP3/CMIP5 Climate Projections archive.*

**2015-present: Senior Hydrologist, Branch of Western Regional Research, USGS, & Resident Scientist, University of Nevada Reno: *Hydroclimatology & climate change***

*Continuation of studies of climate change and water resources of the West, and atmospheric-rivers processes and impacts, along with cold-air pooling in the Sierra Nevada, and other hydrologic and hydroclimatic problems in California and Nevada. Organizer & editor, International Atmospheric-Rivers Conference, 2015-16. Co-PI, Scripps' Center for Western Weather and Water Extremes. Co-PI, NOAA-funded California-Nevada Applications Program (CNAP) and DOI's Southwest Climate Science Center. Co-PI, UNR Water for the Seasons Water Sustainability and Climate Project on Truckee-Carson River System and Native Waters Project across the Southwest. Leading elements of USGS Science Applications for (climatic- hazards) Risk Reduction Program.*

**SELECTED OTHER ACTIVITIES**

- **Senior Scientist**, USGS, since 2015. **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. **USGS Committee**, Report to Congress on a Program for Periodic Assessments of the Nation's Water Availability, Fall 2001 & Summer 2003 (origin of US Water Census Program). **Member**, USGS National Groundwater Climate-Response Network Design Committee, 1995-97. **Internal Review Team** for USGS Water Resources Division Strategic Plan, 1997.
- **Lead author**, Water-sector chapter of National Climate Assessment Synthesis Report, 2012-13. **Organizing committee & contributing author**, Southwest Regional Climate Assessment, 2011-2012. **Steering Committee**, CLIVAR PACE Postdoctoral Program, 2008-12. **Science Steering Group** for US Global Water Cycle Interagency Working Group, 2004-2008. **Coauthor**, US CCSP Committee for Science & Assessment Product 5.3 (Decision support & evaluations of seasonal-interannual forecasts & observations), 2006-08.
- **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 Department of Water Resources 21<sup>st</sup> Century Observations, Modeling & Decision Support Systems for Enhanced Flood Response & Emergency Preparedness Program, 2008-pres. **Central Valley Flood Management Planning Program Climate-Change Working Group**, 2009-11. **Climate Change Advisor**, CALFED Bay-Delta Program, 2006-09. **Editor**, CALFED/Delta Science Program State of Bay-Delta Science reports, 2007-08, 2014-16. **Member**, CALFED Water-Management Science Board, 2004-05.
- **NOAA Office of Oceanic and Atmospheric Research Outstanding Scientific Paper Awards**, 2007 & 2009. **Program committee and contributing author**, NOAA Research Council Water Cycle Science Challenge Workshop, 2011. **NASA Standing Review Board**, Surface-Water Oceanic Topography (SWOT) Mission, 2014-pres.
- **Venice Sustainability Advisory Panel**, Venice, Italy, UCSD Sustainability Solutions Institute,

- 2008-09, 2010-13. **Lake Tahoe Science Consortium Committee of Scientists**, 2014-2016.
- **Fellow**, American Geophysical Union (Hydrology Fellow for “*insightful, societally relevant research in understanding how climate and weather affect the variability of hydrologic systems;*” 2014). **Member**, American Meteorological Society (*Water Resources Committee, 2014-pres; chair, 2017-pres*). **Member**, Ecological Society of America (*invited ESA Centennial paper, Western Water & Climate Change, 2015*). **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, Third World Climate Conference, 2009.
  - **Executive committee**, USA National Phenological Network Implementation Team, 2005-07.
  - **Program chair & fundraiser**, Annual Pacific Climate (PACCLIM) Workshops, 1998-2004. **Organizing committees**, biennial MTNCLIM Workshops, 2004-16.
  - **Vice President’s National Performance Review Award**, 1996, for leadership in Mojave Desert Ecosystems planning efforts. **Leader** of the Physical Sciences Subgroup of Mojave Desert Science-Data Management Interagency Working Group, 1995-96.
  - **Associate Editor**, Water Resources Research, 1998-2000; J. Hydrometeorology, 2011-12; San Francisco Estuary & Watershed Science, 2012-pres.

## SELECTED PUBLICATIONS & REPORTS

[Total numbers of publications: >130 journal articles & book chapters, >30 government reports & >80 other technical publications. Impact: GoogleScholar lists >16,000 citations to my work in the scientific literature, with 42 of my publications cited >100 (many indicated below by \*\*). My work has been cited >1000 times/yr every yr since 2010. *h=57 at GoogleScholar.*]

- \*\* 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.
- \*\* Dettinger, M.D., 1989, Reconnaissance estimates of natural recharge to desert basins in Nevada, U.S.A., by using chloride-balance calculations: Journal of Hydrology, 106, 55-78.
- Dettinger, M.D., 1989, Distribution of carbonate-rock aquifers in southern Nevada and the potential for their development--Summary of findings, 1985-88: Special Summary Publication of the Nevada Carbonate Aquifers Program, 20 p.
- \*\* Dettinger, M.D., & Cayan, D.R., 1995, Large-scale atmospheric forcing of recent trends toward early snowmelt in California: Journal of Climate, 8, 606-623.
- \*\* Dettinger, M.D., Ghil, M., Strong, C.M., Weibel, W., & Yiou, P., 1995, Software expedites singular-spectrum analysis of noisy time series: Eos, Trans. American Geophysical Union 76, pp. 12, 14, 21.
- Dettinger, M.D., & Schaefer, D.H., 1996, Hydrogeology of structurally extended terrain in the eastern Great Basin of Nevada, Utah, and adjacent states from geologic and geophysical models: U.S. Geological Survey Hydrologic-Investigations Atlas HA-694-D, 1 sheet.
- Jeton, A.E., Dettinger, M.D., & Smith, J.L., 1996, Potential effects of climate change on streamflow, eastern and western slopes of the Sierra Nevada, California and Nevada: U.S. Geological Survey Water Resources Investigations Report 95-4260, 44 p.
- Morgan, D.S., & Dettinger, M.D., 1996, Ground-water conditions in Las Vegas Valley, Clark County, NV: 2, Hydrogeology and simulation of ground-water flow: US Geological Survey Water-Supply Paper 2320-B, 124 p.
- \*\* White, W.B., Lean, J., Cayan, D.R., & Dettinger, M.D., 1997, Response of global upper ocean temperature to changing solar irradiance: Journal of Geophysical Research, 102, 3255-3266.
- \*\* Cayan, D.R., Dettinger, M.D., Diaz, H.F., & Graham, N., 1998, Decadal variability of precipitation over western North America: Journal of Climate, 11, 3148-3166.
- \*\* 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.
- \*\* McCabe, G.J., & Dettinger, M.D., 1999, Decadal variability in the relations between ENSO and precipitation in the western United States: International Journal of Climatology, 19, 1399-1410.

- \*\* Dettinger, M.D., & Diaz, H.F., 2000, Global characteristics of streamflow seasonality and variability: *Journal of Hydrometeorology*, 1, 289-310.
- \*\* 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, American Meteorological Society*, 82, 399-415.
- \*\* Dettinger, M.D., Battisti, D.S., Garreaud, R.D., McCabe, G.J., & Bitz, C.M., 2001, Interhemispheric effects of interannual and decadal ENSO-like climate variations on the Americas, in V. Markgraf (ed.), *Interhemispheric climate linkages: Present and Past Climates in the Americas and their Societal Effects*: Academic Press, 1-16.
- \*\* Ghil, M., Allen, M.R., Dettinger, M.D., Ide, K., Kondrashov, D., Mann, M.E., Robertson, A.W., Saunders, A., Y.Tian, Varadi, F., & Yiou, P., 2002, Advanced spectral methods for climatic time series: *Reviews of Geophysics*, 40, 1003, 1-41.
- \*\* McCabe, G.J., & Dettinger, M.D., 2002, Primary modes and predictability of year-to-year snowpack variations in the western United States from teleconnections with Pacific Ocean climate: *Journal of Hydrometeorology*, 3, 13-25.
- \*\* Westerling, A., Brown, T., Gershunov, A., Cayan, D., & Dettinger, M., 2003, Climate and wildfire in the western United States: *Bulletin, American Meteorological Soc.*, 84, 595-604.
- Dettinger, M.D., 2004, Fifty-two years of pineapple-express storms across the West Coast of North America: California Energy Commission PIER Report CEC-500-2005-004, 15 p.
- \*\* Dettinger, M.D., Cayan, D.R., Meyer, M.K., & Jeton, A.E., 2004, Simulated hydrologic responses to climate variations and change in the Merced, Carson, and American River basins, Sierra Nevada, California, 1900-2099: *Climatic Change*, 62, 283-317.
- \*\* Stewart, I., Cayan, D.R., & Dettinger, M.D., 2004, Changes in snowmelt runoff timing in western North America under a 'Business as Usual' climate change scenario: *Climatic Change*, 62, 217-232.
- \*\* Dettinger, M.D., 2005, From climate-change spaghetti to climate-change distributions for 21<sup>st</sup> Century California: *San Francisco Estuary and Watershed Science*, 3(1), article 4.
- 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: *Journal of the American Water Resources Association*, 41, 517-536.
- \*\* Stewart, I., Cayan, D., & Dettinger, M., 2005, Changes towards earlier streamflow timing across western North America: *Journal of Climate*, 18, 1136-1155.
- \*\* Bales, R., Molotch, N., Painter, T., Dettinger, M., Rice, R., & Dozier, J., 2006, Mountain hydrology of the western US: *Water Resources Research*, 42, W08432, 13 p.
- \*\* Knowles, N., Dettinger, M., & Cayan, D., 2006, Trends in snowfall versus rainfall for the Western United States: *Journal of Climate*, 19(18), 4545-4559.
- \*\* 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. [NOAA OAR Outstanding Paper Award, 2007]
- Florsheim, J.L., & Dettinger, M., 2007, Climate and floods still govern California levee breaks: *Geophysical Research Letters*, 34(L22403), 5 p.
- Malamud-Roam, F., Dettinger, M.D., Ingram, B.L., Hughes, M., & Florsheim, J., 2007, Holocene climates and connections between the San Francisco Bay estuary and its watershed—A review: *San Francisco Estuary & Watershed Science*, 5(1), article 3.
- \*\* 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.
- \*\* Cayan, D.R., Maurer, E.P., Dettinger, M.D., Tyree, M., & Hayhoe, K., 2008, Climate change scenarios for the California region: *Climatic Change*, 87(Suppl 1), S21-S42.
- \*\* Funk, C., Dettinger, M., Brown, M., Verdin, J., Michaelsen, J., Barlow, M., & Hoell, A., 2008,

- Warming of the Indian Ocean threatens eastern and southern Africa food security, but could be mitigated by agricultural development: *PNAS*, 105, 11081-11086.
- Healey, M., Dettinger, M., & Norgaard, R. (eds.), 2008, State of the science for the Bay-Delta: CALFED Science Program, 185 p.
- \*\* Hidalgo H.G., Das T., Dettinger M.D., Cayan D.R., Pierce D.W., Barnett T.P., et al., 2009, Detection and attribution of stream flow timing changes to climate change in the western United States: *J. Climate*, 22, 3838-3855.
- \*\* Cloern, J.E., Knowles, N., Brown, L.R., Cayan, D., Dettinger, M.D., et al., 2011, Projected evolution of California's San Francisco Bay-Delta river system in a century of climate change: *PLoS One*, 26 p.
- Das, T., Dettinger, M., Cayan, D., & Hidalgo, H., 2011, Potential increase in floods in California's Sierra Nevada under future climate projections: *Climatic Change*, 109, 71-94.
- \*\* Dettinger, M.D., 2011, Climate change, atmospheric rivers and floods in California—A multimodel analysis of storm frequency and magnitude changes: *J. American Water Resources Association*, 47, 514-523.
- \*\* 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.
- Major, D.C., Omojola, A., Dettinger, M., Hanson, R., & Sanchez-Rodriguez, R., 2011, Climate change, water and wastewater in cities, in Rosenzweig, C., Solecki, W., Hammer, S., and Mehrotra, S. (eds.), *Climate Change and Cities—First Assessment Report of the Urban Climate Change Research Network*: Cambridge University Press, 113-143.
- \*\* Ralph, F.M., & Dettinger, M.D., 2011, Storms, floods and the science of atmospheric rivers: *Eos, Transactions of AGU*, 92(32), 265-266.
- 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.
- Ralph, F.M., & Dettinger, M.D., 2012, Historical and national perspectives on extreme west-coast precipitation associated with atmospheric rivers during December 2010: *Bulletin, American Meteorological Society* 93, 783-790.
- Dettinger, M.D., 2013, Projections and downscaling of 21<sup>st</sup> Century temperatures, precipitation, radiative fluxes and winds over the southwestern US, with a focus on Lake Tahoe: *Climatic Change*, 116, 17-33.
- Dettinger, M., & Ingram, L., 2013, The coming megafloods: *Scientific American*, 308(1), 64-71 (*translated and published in eleven countries internationally*).
- Overpeck, J., Garfin, G., Jardine, A., Busch, D., Cayan, D., Dettinger, M., et al., 2013, Assessment of climate change in the southwest United States—Summary for decisionmakers: in *Assessment of Climate Change in the Southwest United States*, eds. G. Garfin, A. Jardine, R. Merideth, M. Black, and S. LeRoy, 1–20. Washington, DC: Island Press.
- White, A.B., Anderson, M.L., Dettinger, M.D., Ralph, F.M., et al., 2013, A 21<sup>st</sup> Century California observing network for monitoring extreme weather events: *J. Atmos & Oceanic Tech*, 30, 1585-1603.
- Dettinger, M.D., 2013, Atmospheric rivers as drought busters on the US west coast: *J. Hydrometeorology*, 14, 1721-1732.
- Ralph, F.M., Dettinger, M.D., White, A., Reynolds, D., Cayan, D., and others, 2014, A vision of future observations for western US extreme precipitation and flooding: *J. Contemporary Water Resources Research & Education*, 153, 16-32.
- Dettinger, M.D., Udall, B., and Georgakakos, A.P., 2015, Western water and climate change: Ecological Applications (*invited ESA Centennial Paper*), 25(8), 25 p.
- Dettinger, M.D., 2016, Historical and future relations between large storms and droughts in California: *San Francisco Estuary and Watershed Science*, 14(2), 21 p.
- Healey, M., Dettinger, M., & Norgaard, R. (eds.), 2016, State of Bay-Delta Science 2016: Delta

Science Program, 418 p.