

Michael D. Dettinger

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ACADEMIC HISTORY

1977 -- BA Physics, U.C. San Diego (Revelle College)

Summa cum laude, Phi Beta Kappa.

1979 -- MS Civil Engineering, Massachusetts Institute of Technology

"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"

2006-pres—Doctoral committee, Theresa Carpenter, Scripps Institution of Oceanography

"Southern California Flash Flood Frequencies and Climate Variability"

2008-2009--Master's committee, Sam Haber, Scripps Institution of Oceanography

"Isotopes of Helium, Hydrogen and Carbon as Groundwater Tracers in Aquifers along the Colorado River"

2009—Master's committee, Charles Briscoe, Scripps Institution of Oceanography

"An Evaluation of Environmental, Economic and Energy Impacts of Desalination Plants in Southern California"

PROFESSIONAL HISTORY

1979-81: Engineer-scientist, Camp Dresser & McKee, Inc., Walnut Creek, California: Water-resources consulting & ground-water modeling

Resource evaluations, ground-water 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: Ground-water

Assessments of groundwater resources, flow and chemistry in bedrock and alluvial aquifers; ground-water modeling; regional synthesis of hydrogeologic framework and flow systems, eastern and southern Great Basin; and District Ground-water Specialist, including program development and review, and representation of USGS to public forums, Legislature and State Engineer.

1989-90: USGS Graduate Studies Program, UCLA Atmospheric Sciences.

Advisor: Michael Ghil. Emphasis: Climate Dynamics.

1991-96: 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 analysis of historical hydroclimate and simulations of snowmelt/watershed responses. Analyses of freshwater-inflow variations to San Francisco Bay and Delta. 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. Modeling and nonlinear dynamics of land-air interactions through planetary-boundary layers. Co-developer of UCLA Singular-Spectrum-Analysis Toolkit, 1995.

1996-97: Research Hydrologist, USGS, at NOAA/Climate Diagnostics Center, Boulder, CO

Study of Western Hemisphere ENSO and PDO effects on streamflow. Initial medium-range forecasts of Sierra Nevada snowmelt and streamflow. Developer of CDC Global Streamflow dataset.

1997-2001: Research Hydrologist, California District, USGS, & Research Associate, Climate Research Division, Scripps Institution of Oceanography, La Jolla, CA: Hydroclimatology

Continuation of global, Western, and Sierra Nevada hydroclimatology of precipitation and streamflow using historical and paleo-records of atmospheric circulations, ocean temperatures, streamflow, ground water, and water quality. Global- to watershed-scale climate downscaling. Medium-range streamflow forecasting, Sierra Nevada, and long-range streamflow forecasting nationwide. Simulations of ground-water/surface-water sensitivities to climate variations, including the use of remote-sensed insolation variations for NASA Earth Science Innovations Program. DOE-funded Accelerated Climate Prediction Initiative simulations of Sierra Nevada watershed sensitivities to climate changes. NOAA-funded California Applications Program (CAP) for regional integrated science and assessment of climate applications by water and other resource management sectors.

2002-present: 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 Nevada hydroclimatology of precipitation, snowpack, and streamflow using historical and paleo-records of atmospheric circulations, ocean temperatures, streamflow, ground water, and water quality. Development of innovative constructed-analogs downscaling, component-resampling, and derived-distribution approaches as tools for evaluating global-change and shorter term climate predictions and their hydrologic consequences. Evaluation of climate-change projections for changes in western climates, large-scale Pacific-basin climate modes, streamflow and ground-water recharge. Development and implementation of new and innovative hydrometeorological monitoring methods, Yosemite National Park. Continuations of climate-service assessment activities within CAP, and extension to State-funded California Climate Change Center. Co-developer of NOAA/DWR 21st Century flood-monitoring vision for Enhanced Flood Response and Emergency Preparedness Program. Team leader for extreme winter storm scenario development, USGS multi-hazards evaluation program.

OTHER PROFESSIONAL ACTIVITIES

- **Department of Interior Superior Service Award**, 2005, for exceptional contributions to hydroclimatology in the USGS. **Assistant Research Advisor**, USGS Surface-Water Hydrology Discipline, 2009-11. **Member** of USGS national committee for Report to Congress on a Program for Periodic Assessments of the Nation's Water Availability, Fall 2001 and Summer 2003. **Review panelist**, USGS Geologic Division's annual "Multi-disciplinary workshops on the arid southwest" funding program, 2000-2001. **Member**, national-level Internal Review Team for the USGS Water Resources Division Strategic Plan, Reston, VA, October 1997.
- **Climate Change Advisor**, CALFED Bay-Delta Program, 2006-. **Editorial Board**, CALFED State of Science Report, 2007-2008. **Member**, CALFED Water-Management Science Board, 2004-2005. **Organizer and co-chair**, "Climate Variability and CALFED" sessions, First to Fifth Biennial CALFED Science Conferences, Sacramento, CA, 2000-2008.
- **Member**, NOAA's CCSP Product Development Committee for Science & Assessment Product 5.3 (Decision support and evaluations on seasonal to interannual forecasts and observations), 2006-2008. **Member**, Science Steering Group for US Global Water Cycle Program, 2004-. **USGS representative** on US Climate-Change Science Program Observations Working Group, 2002-2006. **Member**, Oversight Committee, US CLIVAR/NOAA Climate Predictions Applications Postdoctoral Program, 2008-. **Proposal review panel**, NASA Water Management

- Program, 2005, and NOAA Sectoral Applications Research Program-Water, 2006.
- **California Department of Water Resources Climate Science Service Award**, 2007. **Member**, California Water Plan Update 2009 Climate Change Technical Advisory Group, 2008-2009. **Project management team**, California Department of Water Resources 21st Century Observations, Modeling and Decision Support Systems, 2008- . **Contributor**, California Environmental Protection Agency “Indicators of Climate Change in California” report, 2008. **Member**, Science Panel, California Department of Conservation Statewide Watershed Program, 2008- . **Lecturer**, Two-day NWS-hosted Climate Course for California DWR, June 2009.
 - **NOAA Office of Oceanic and Atmospheric Research Outstanding Scientific Paper Award**, 2007, for article on atmospheric rivers and floods on Russian River (article #50 below). **Review panel**, NOAA Office of Hydrology Distributed Models Intercomparison Project II Precipitation Product assessment, 2009. **Instigator**, USGS/NOAA collaborative research on high-frequency stable-isotope variations in landfalling Pacific storms, 2006-2008,
 - **Member**, Venice Sustainability Advisory Panel, Venice, Italy, UC San Diego Environment and Sustainability Initiative, 2008-09. **Steering committee**, UCSD-Cambridge University Climate Change and Water Resources of California, Himalaya & Africa Workshops, 2008-2009.
 - **Contributing author**, International Panel on Climate Change in Cities (IPC3), 2008-2009.
 - **Executive committee**, National Phenological Network Implementation Team, 2005-2007.
 - **Review panel**, National Intelligence Estimate, Geopolitical Implications of Climate Change, 2007.
 - **Program chair & fundraiser**, Pacific Climate (PACLIM) Workshops, 1998-2004.
 - **Founding member**, CIRMOUNT Western Mountain Climate Sciences Consortium, 2002-present. **Organizing committees**, Mountain Climate Sciences Symposium, 2004, and MTNCLIM Workshops, 2005, 2006, 2008.
 - **Vice President’s National Performance Review Award**, 1996, for leadership in Mojave Desert Ecosystems planning efforts. **USGS Water Resources representative** to DOI/DOD interagency Mojave Desert Ecosystem Initiative, and **Leader** of the Physical Sciences Subgroup of Mojave Desert Science-Data Management Interagency Working Group, 1995-96.
 - **Invited speaker**, “Global Implications of Climate Change for Water Supplies”, National Academy of Sciences’ Sackler Colloquium on the Role of Science in Solving the World’s Emerging Water Problems, Irvine, 2004. **Co-chair** for NASA Working Group on Climate Responses to Direct Solar Forcings, 2000.
 - **Hydroclimate representative**, USGS National Ground-water Climate-Response Network Design Committee, 1995-97. **Convener** of sessions on Natural Variations of Groundwater at Fall AGU Meeting, 2000. **Climate group co-leader**, National Research Council Committee on Hydrologic Science’s Workshop on Groundwater Fluxes across Interfaces, Green Bay, 2002.
 - **Moderator**, Water Education Foundation’s Annual Climate Change Briefings, 2003, 2007.
 - **Associate Editor**, Water Resources Research, 1998-2000. **Reviewer** for Climatic Change, International Journal of Climatology, assorted AMS and AGU journals, ongoing.
 - **Consulting Editor**, April 1996 issue of Odyssey Magazine (children’s science magazine), major theme: “Taking the Earth’s Temperature: Too Hot or Not?” **Invited reviewer**, Environmental Defense Fund’s “Climate Change and Los Angeles’ Water Supply”, 2000.
 - **Memberships**: American Geophysical Union; American Meteorological Society; American Association for Advancement of Science; Ecological Society of America
 - **Some recent collaborators**: Dave Peterson, Jim Verdin, Alan & Lori Flint, USGS; Dan Cayan, Hugo Hidalgo, Tapash Das, SIO; Michael Ghil, UCLA; Mike Healey & Steve Culbertson, CALFED; Jessica Lundquist, UW; Ed Maurer, Santa Clara U.; Mike Anderson, CA DWR; Henry Diaz, NOAA CDC; Connie Millar, USFS; Marty Ralph & Paul Neiman, NOAA ESRL; Dave Stahle, U. Arkansas Treering Lab; Sam Earman, DRI; Kelly Redmond, Western Regional Climate Center; Levi Brekke, USBR; Roger Bales, UC Merced; Joan Florsheim & Bill Reisen, UC Davis; Chris Funk, UCSB; Frank Gehrke, Calif. Cooperative Snow Surveys.

LIST OF PUBLICATIONS AND REPORTS

(as of June 2009)

REFEREED PAPERS AND BOOK CHAPTERS

1. Dettinger, M.D., and Wilson, J.L., 1981, First-order analysis of uncertainty in numerical models of groundwater flow, 1, *Mathematical development: Water Resources Research*, 17, 149-161.
2. 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.
3. Dettinger, M.D., and Cayan, D.R., 1995, Large-scale atmospheric forcing of recent trends toward early snowmelt in California: *Journal of Climate*, 8, 606-623.
4. Dettinger, M.D., Ghil, M., and Keppenne, C.L., 1995, Interannual and interdecadal variability of United States surface-air temperatures, 1910-1987: *Climatic Change*, 31, 35-66.
5. Dettinger, M.D., Ghil, M., Strong, C.M., Weibel, W., and Yiou, P., 1995, Software expedites singular-spectrum analysis of noisy time series: *Eos, Transactions of American Geophysical Union* 76(2), pp. 12, 14, 21.
6. McCabe, G.J., Jr., and Dettinger, M.D., 1995, Relations between monthly atmospheric circulation and winter precipitation simulated by the Geophysical Fluid Dynamics Laboratory general-circulation model: *International Journal of Climatology*, 15, 625-638.
7. Peterson, D.H., Cayan, D.R., DiLeo-Stevens, J., Noble, M., and Dettinger, M.D., 1995, The role of climate in estuarine variability: *American Scientist*, 83, 58-67
8. Peterson, D.H., Cayan, D.R., Dettinger, M.D., Noble, M.A., Riddle, L.G., Schemel, L.E., Smith, R.E., Uncles, R.J., and Walters, R.A., 1996, San Francisco Bay salinity: Observations, numerical simulations, and statistical models, in J.T. Hollibaugh (ed.), *San Francisco Bay: The Ecosystem: AAAS Monograph*, 9-34.
9. White, W.B., Lean, J., Cayan, D.R., and Dettinger, M.D., 1997, Response of global upper ocean temperature to changing solar irradiance: *Journal of Geophysical Research*, 102 (C2), 3255-3266.
10. Cayan, D.R., Dettinger, M.D., Diaz, H.F., and Graham, N., 1998, Decadal variability of precipitation over western North America: *Journal of Climate*, 11, 3148-3166.
11. Dettinger, M.D., Cayan, D.R., Diaz, H.F., and Meko, D., 1998, North-south precipitation patterns in western North America on interannual-to-decadal time scales: *Journal of Climate*, 11, 3095-3111.
12. Dettinger, M.D., and Ghil, M., 1998, Seasonal and interannual variations of atmospheric CO₂ concentrations and climate: *Tellus* 50B, 1-24.
13. McCabe, G.J., Jr., and 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.
14. Dettinger, M.D., Cayan, D.R., McCabe, G.M., and Marengo, J.A., 2000, Multiscale streamflow variability associated with El Niño/Southern Oscillation, in H.F. Diaz and V. Markgraf, V. (eds.), *El Niño and the Southern Oscillation--Multiscale Variability and Global and Regional Impacts: Cambridge University Press*, 113-146.
15. Dettinger, M.D., and Diaz, H.F., 2000, Global characteristics of streamflow seasonality and variability: *Journal of Hydrometeorology*, 1, 289-310.
16. Pandey, G.R., Cayan, D.R., Dettinger, M.D., and Georgakakos, K.P., 2000, A hybrid model for interpolating daily precipitation in the Sierra Nevada of California during winter: *Journal of Hydrometeorology*, 1, 491-506.
17. Peterson, D.H., Smith, R.E., Dettinger, M.D., Cayan, D.R., and Riddle, L., 2000, An organized signal in snowmelt runoff over the western United States: *Journal of American Water Resources Association*, 36 (2), 421-432.
18. Wilby, R.L., and Dettinger, M.D., 2000, Streamflow changes in the Sierra Nevada, California,

- simulated using statistically downscaled general circulation model output, *in* S. McLaren and D. Kniveton (eds.), “Linking Climate Change to Land Surface Change”: Advances in Global Change Research, v. 6, Kluwer Academic Publishers, 99-121.
19. Cayan, D.R., Kammerdiener, S., Dettinger, M.D., Caprio, J.M., and Peterson, D.H., 2001, Changes in the onset of spring in the western United States: *Bulletin, American Meteorological Society*, 82, 399-415.
 20. Dettinger, M.D., Battisti, D.S., Garreaud, R.D., McCabe, G.J., and 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.
 21. Stahle, D.W., Therrell, M.D., Cleaveland, M.K., Cayan, D.R., Dettinger, M.D., and Knowles, N., 2001, Ancient blue oaks reveal human impact on San Francisco Bay salinity: *Eos*, 82, 141, 144-145.
 22. White, W.B., Cayan, D.R., Dettinger, M.D., and Auad, G., 2001, Sources of global warming in upper ocean temperature during El Nino: *Journal of Geophysical Research*, 106 (C3), 4349-4367.
 23. Ghil, M., Allen, M.R., Dettinger, M.D., Ide, K., Kondrashov, D., Mann, M.E., Robertson, A.W., Saunders, A., Y.Tian, Varadi, F., and Yiou, P., 2002, Advanced spectral methods for climatic time series: *Reviews of Geophysics*, 40(3), 1003, doi:10.1029/2000RG000092, 1-41.
 24. McCabe, G.J., and 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.
 25. Naftz, D.L., Susong, D.D., DeWayne Cecil, L., Schuster, P.F., Dettinger, M.D., Michel, R.L., and Kendall, C., 2002, Ice-core evidence of air temperature increases during the last 200 years in alpine areas of the Wind River Range, Wyoming: *Journal of Geophysical Research*, 107(13), D10.1029/2001JD000621, 1-16.
 26. Cayan, D.R., Dettinger, M.D., Redmond, K.T., McCabe, G.J., Knowles, N., and Peterson, D.H., 2003, The transboundary setting of California’s water and hydropower systems--Linkages between the Sierra Nevada, Columbia River, and Colorado River hydroclimates: Chapter 11 in Diaz, H.F., and Woodhouse, B. (eds.), *Climate and Water—Transboundary challenges in the Americas*, Kluwer Academic Publishers, *Advances in Global Change Research*, 16, 237-262.
 27. Dettinger, M.D., and Cayan, D.R., 2003, Interseasonal covariability of Sierra Nevada streamflow and San Francisco Bay salinity: *Journal of Hydrology*, 277 (3/4), 164-181 [doi:10.1016/S0022-1694(03)00078-7].
 28. Lundquist, J.D., Cayan, D.R., and Dettinger, M.D., 2003, Meteorology and hydrology in Yosemite National Park: A sensor network application, *in* F. Zhao and L.Guibas (eds.), *Information Processing in Sensor Networks*: Springer-Verlag, 518-528.
 29. Westerling, A.L., Brown, T.J., Gershunov, A., Cayan, D.R., and Dettinger, M.D., 2003, Climate and wildfire in the western United States: *Bulletin, American Meteorological Society*, 84, 595-604.
 30. White, W.B., Dettinger, M.D., and Cayan, D.R., 2003, Sources of global warming of the upper ocean on decadal period scales: *Journal of Geophysical Research*, 108 (C8), 4-1 to 4-15 [doi:10.1029/2002JC001396].
 31. White, W.B., Turre, Y.M., Barlow, M., and Dettinger, M.D., 2003 A delayed action oscillator shared by biennial, interannual, and decadal signals in the Pacific basin: *Journal of Geophysical Research*, 108 (C3), 15-1 to 15-18, [doi:10.1029/2002JC001490].
 32. Dettinger, M.D., Cayan, D.R., Meyer, M.K., and 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.
 33. Dettinger, M.D., Redmond, K.T., and Cayan, D.R., 2004, Winter orographic-precipitation

- ratios in the Sierra Nevada—Large-scale atmospheric circulations and hydrologic consequences: *J. Hydrometeorology*, 5, 1102-1116.
34. Hanson, R.T., Newhouse, M.W., and Dettinger, M.D., 2004, A methodology to assess relations between climatic variability and variations in hydrologic time series in the southwestern United States: *Journal of Hydrology*, 287, 252-269.
 35. Lundquist, J.D., Cayan, D.R., and Dettinger, M.D., 2004, Spring onset in the Sierra Nevada—When is snowmelt independent of elevation?: *J. Hydrometeorology*, 5, 325-340.
 36. Pagano, T., Pasteris, P., Dettinger, M., Cayan, D., and Redmond, K., 2004, Spring 2004—Western water managers feel the heat: *Eos*, v. 85, pp. 385, 392-393.
 37. Simpson, J.J., Dettinger, M.D., Gerhke, F., McIntyre, T.J., and Hufford, G.I., 2004, Hydrologic scales, cloud variability, remote sensing and models—Implications for forecasting snowmelt and streamflow: *Weather and Forecasting*, 19, 251-276.
 38. Stewart, I., Cayan, D.R., and 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.
 39. Dettinger, M.D., 2005, From climate-change spaghetti to climate-change distributions for 21st Century California: *San Francisco Estuary and Watershed Science*, 3(1), <http://repositories.cdlib.org/jmie/sfews/vol3/iss1/art4>.
 40. Hanson, R.T., and 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.
 41. Hidalgo, H.G., Cayan, D.R., and Dettinger, M.D., 2005, Sources of variability of evapotranspiration in California: *Journal of Hydrometeorology*, 6, 3-19.
 42. Lundquist, J.D., and Dettinger, M.D., 2005, How snowpack heterogeneity affects diurnal streamflow timing: *Water Resources Research*, 41, W05007, doi:10.1029/2004WR003649, 14 p.
 43. Lundquist, J.D., Dettinger, M.D., and Cayan, D.R., 2005, Snow-fed streamflow timing at different basin scales: Case study of the Tuolumne River above Hetch Hetchy, Yosemite, California: *Water Resources Research*, 41, W07005, doi:10.1029/2004WR003933, 14 p.
 44. Peterson, D.H., Smith, R., Hager, S., Hicke, J., Dettinger, M., and Huber, K., 2005, River chemistry as a monitor of Yosemite Park mountain hydroclimates: *Eos, Transactions of American Geophysical Union*, 86, 285-288.
 45. Stewart, I., Cayan, D., and Dettinger, M., 2005, Changes towards earlier streamflow timing across western North America: *Journal of Climate*, 18, 1136-1155.
 46. Bales, R., Molotch, N., Painter, T., Dettinger, M., Rice, R., and Dozier, J., 2006, Mountain hydrology of the western US: *Water Resources Research*, 42, W08432, doi:10.1029/2005WR004387, 13 p.
 47. Dettinger, M.D., 2006, A component-resampling approach for estimating probability distributions from small forecast ensembles: *Climatic Change*, 76, 149-168, doi:10.1007/s10584-005-9001-6.
 48. Hanson, R.T., Dettinger, M.D., and Newhouse, M.W., 2006, Relations between climatic variability and hydrologic time series from four alluvial basins across the southwestern United States: *Hydrogeology Journal*, doi:10.1007/s10040-006-0067-7, 25 p.
 49. Knowles, N., Dettinger, M., and Cayan, D., 2006, Trends in snowfall versus rainfall for the Western United States: *Journal of Climate*, 19(18), 4545-4559.
 50. Ralph, F.M., Neiman, P.J., Wick, G., Gutman, S., Dettinger, M., Cayan, D., and White, A.B., 2006, Flooding on California's Russian River—Role of atmospheric rivers: *Geophysical Research Letters*, 33 (L13801), 5 p, doi:10.1029/2006GL026689. [NOAA OAR Outstanding Paper Award, 2007]
 51. Florsheim, J.L., and Dettinger, M., 2007, Climate and floods still govern California levee breaks: *Geophysical Research Letters*, 34(L22403), doi:10.1029/2007GL031702, 5 p.

52. Malamud-Roam, F., Dettinger, M.D., Ingram, B.L., Hughes, M., and Florsheim, J., 2007, Holocene climates and connections between the San Francisco Bay estuary and its watershed—A review: *San Francisco Estuary and Watershed Science*, 5(1), 28 p., <http://repositories.cdlib.org/jmie/sfews/vol5/iss1/art3>
53. Barnett, T.P., Pierce, D.W., Hidalgo, H., Bonfils, C., Santer, B., Das, T., Bala, G., Wood, A., Nozawa, T., Mirin, A., Cayan, D., and Dettinger, M., 2008, Human-induced changes in the hydrology of the western United States: *Science*, 316, 1080-1083.
54. Brekke, L.D., Dettinger, M.D., Maurer, E.P., and Anderson, M., 2008, Significance of model credibility in projection distributions for regional hydroclimatological impacts of climate change: *Climatic Change*, 89, doi:10.1007/s10584-007-9388-3, 371-394.
55. Cayan, D.R., Bromirski, P., Hayhoe, K., Tyree, M., Dettinger, M., and Flick, R., 2008, Climate change and the potential for sea-level extremes along the California coast: *Climatic Change*, 87 (Suppl 1), doi:10.1007/s10584-007-9376-7, S57-S73.
56. Cayan, D.R., Maurer, E.P., Dettinger, M.D., Tyree, M., and Hayhoe, K., 2008, Climate change scenarios for the California region: *Climatic Change*, 87(Suppl 1), doi:10.1007/s10584-007-9377-6, S21-S42.
57. Coplen, T., Neiman, P., White, A., Landwehr, J., Ralph, F.M., and Dettinger, M., 2008, Extreme changes in stable hydrogen isotopes and precipitation characteristics in a landfalling Pacific storm: *Geophysical Research Letters*, L21808, doi:10.1029/2008GL035481, 5 p.
58. Dettinger, M.D., and Culberson, S., 2008, Internalizing climate change—Scientific resource management and the climate change challenges: *San Francisco Estuary and Watershed Science*, 17 p, <http://repositories.cdlib.org/jmie/sfews/vol6/iss2/art6>.
59. Dettinger, M.D., and LaRiviere, J., 2008, *San Diego Focus 2050 Working Papers—Chapter 4, Water*: San Diego Foundation report, p. 40-52.
60. Flint, A.L., Flint, L. E., and Dettinger, M.D., 2008, Modeling soil moisture processes and recharge under a melting snowpack: *Vadose Zone Journal*, 7, 350-357, doi:10.2136/vzj2006.0135.
61. Funk, C., Dettinger, M., Brown, M., Verdin, J., Michaelsen, J., Barlow, M., and Hoell, A., 2008, Warming of the Indian Ocean threatens eastern and southern Africa food security, but could be mitigated by agricultural development: *Proceedings, National Academies of Science*, 105, doi/10.1073/pnas.0708196105, 11081-11086.
62. Healey, M. Dettinger, M., Culberson, S., and Bottorff, L., 2008, Water supply (Chapter 6), in Healey, M., Dettinger, M., and Norgaard, R. (eds.), 2008 *State of Bay-Delta Science: CALFED Bay-Delta Program report*, 18 p.
63. Neiman, P.J., Ralph, F.M., Wick, G.A., Kuo, Y.H., Wee, T.K., Ma, Z., Taylor, G.H., and Dettinger, M.D., 2008, Diagnosis of an intense atmospheric river impacting the Pacific Northwest—Storm summary and offshore vertical structure observed with COSMIC satellite retrievals: *Monthly Weather Review*, 136, 4398-4420, doi:10.1175/2008MWR2550.1.
64. Neiman, P.J., Ralph, F.M., Wick, G.A., Lundquist, J.D., and Dettinger, M.D., 2008, Meteorological characteristics and overland precipitation impacts of atmospheric rivers affecting the West Coast of North America based on eight years of SSM/I satellite observations: *J. Hydrometeorology*, 9, 22-47, doi:10.1175/2007JHM855.1.
65. Pierce, D., Barnett, T., Hidalgo, H., Das, T., Bonfils, C., Santer, B., Bala, G., Dettinger, M., Cayan, D., Mirin, A., Wood, A., Nozawa, T., 2008, Attribution of declining western US snowpack to human effects: *Journal of Climate*, doi:10.1175/2008JCLI2405.1, 20 p.
66. Reisen, W.K., Cyan, D.R., Tyree, M., Barker, C.M., Eldridge, B., and Dettinger, M., 2008, Impact of climate variations on mosquito abundance in California: *Journal of Vector Ecology*, 33, 89-98.
67. Brekke, L.D., Maurer, E.P., Anderson, J., Dettinger, M.D., Townsley, E.S., Harrison, A., and

- Pruitt, T., 2009, Assessing reservoir operations risk under climate change: *Water Resources Research*, W04411, doi:10.1029/2008WR006941, 16 p.
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- Lundquist, J., Cayan, D., and Dettinger, M., 2004, Hydrology and meteorology in Yosemite National Park, California—A monitoring network to improve understanding of the Sierra Nevada’s response to global change: International Conference on Hydrology of Mountain Environments.
- Lundquist, J., Flint, A., Dettinger, M., and Cayan, D., 2004, The 2004 onset of snowmelt and streamflow—Shading and the solar equinox: American Geophysical Union Fall 2004 Meeting, San Francisco.
- McCabe, G.J., J.L. Betancourt, M.A. Palecki, and M.D. Dettinger, 2004, Hydroclimatology of drought and the future of water resources in the western United States: Institute for the Study of Planet Earth, University of Arizona, Tucson, Arizona
- McCabe, G.J., J.L. Betancourt, M.A. Palecki, and M.D. Dettinger, 2004, Decadal-scale variability and the hydroclimatology of drought: Western Governor’s Association Drought Workshop, Phoenix, Arizona.
- Stewart, I., Cayan, D., and Dettinger, M., 2004, The climate connection for North American streamflow timing changes: 21st Annual PACLIM Workshop, Pacific Grove, CA, May 2004.
- Stewart, I., Cayan, D., and Dettinger, M., 2004, Temperature-driven advances in snowmelt-driven streamflow timing throughout western North America: 3rd Biennial CALFED Science Conference, Sacramento, CA, October 2004.
- Cayan, D., Dettinger, M., and Tyree, M., 2005, Northern Hemisphere spring warming during the last five decades: links to snow cover losses: 16th AMS Symposium on Global Change and Climate Variations, San Diego, January 2005.
- Dettinger, M.D., 2005, A long-term historical perspective on flood-generating winter storms in the American River basin: California Extreme Precipitation Symposium, Sacramento, CA, April 2005.
- Dettinger, M.D., 2005, Climate and hydrology interactions at Yosemite National Park—Observations and projections: Invited, Yosemite Public Forum, Yosemite National Park, October 2005.

- Dettinger, M.D., 2005, Consensus and scatter among recent climate-change projections for California: American Geophysical Union Fall Meeting, San Francisco, Dec. 2005.
- Dettinger, M.D., 2005, Global warming and western water supplies: Invited, Western Urban Water Workshop, Las Vegas, NV, September 2005.
- Dettinger, M.D., 2005, Long-term Pacific-climate perspectives on flood-generating winter storms in the central Sierra Nevada: US Geological Survey seminar series, Menlo Park, October 2005.
- Dettinger, M.D., 2005, Probabilistic climate-change projections for California: Invited, 2nd Annual Climate Change Research Conference, Sacramento, CA, Sept. 2005.
- Dettinger, M.D., 2005, Projections of 21st Century hydro-climatic change in Nevada: Desert Research Institute seminar, Reno, NV, April 2005.
- Dettinger, M.D., 2005, Projections of 21st Century hydro-climatic change in the eastern Sierra Nevada: Invited, Nevada Water Resources Association Symposium, Reno, NV, October 2005.
- Dettinger, M.D., and Cayan, D.C., 2005, Climate changes in the western US—Past and, especially, Future: Invited, USGS/Fish and Wildlife Service Future Challenges Workshop, Sacramento, CA, June 2005.
- Dettinger, M.D., Cayan, D.C., and Jeton, A.E., 2005, Projected watershed responses to 21st Century climate change in the American River basin: Invited, American River Watershed Conference, Sacramento, CA, April 2005.
- Dettinger, M., Knowles, N., and Cayan, D., 2005, Trends in the temperature dependence of snow vs rain in the Western US, 1949-2001: 1st Biennial MTNCLIM Workshop, Chico Hot Springs, March 2005.
- Earman, S., and Dettinger, M., 2005, Warming trends and groundwater recharge in western mountains, with implications for groundwater and surface-water resources: 1st Biennial MTNCLIM Workshop, Chico Hot Springs, March 2005.
- Hayhoe, K., Kalkstein, L., Miller, N., Moser, S., Sheridan, S., and Dettinger, M., 2005, Extreme heat and health impacts in California: American Meteorological Society Annual Meeting, Heat and Health—Reducing the Risks, San Diego, January 2005.
- Hidalgo, H., Cayan, D., and Dettinger, M., 2005, Variability of Penman-based evapotranspiration estimates in California: 19th AMS Conference on Hydrology, San Diego, January 2005.
- Hidalgo, H., Cayan, D., and Dettinger, M., 2005, Sensitivity of spring-summer drought to warming in montane and arid regions of the western US: American Geophysical Union Fall Meeting, San Francisco, Dec. 2005.
- Knowles, N., Dettinger, M., and Cayan, D.R., 2005, Trends in snowfall versus rainfall for the Western United States: 1st Biennial MTNCLIM Workshop, Chico Hot Springs, March 2005.
- Knowles, N., Dettinger, M., and Cayan, D.R., 2005, Trends in snowfall versus rainfall for the Western United States: American Geophysical Union Fall Meeting, San Francisco, December 2005.
- Nemani, R., White, M., Schwartz, M., Saatchi, S., Myneni, R., Dettinger, M., and Cayan, D., 2005, Multi-sensor analysis of growing season dynamics across northern North America since 1998: American Geophysical Union Fall Meeting, San Francisco, Dec. 2005.
- NPN Workshop Organizing Committee, 2005, Update on plans to establish a National Phenology Network in the USA: American Geophysical Union Fall Meeting, San Francisco, Dec. 2005.
- Reisen, W.K., Eldridge, B.F., Barker, C.M., Cayan, D.R., Dettinger, M.D., Tyree, M., Kramer, V.L., and Mulligan, S., 2005, Use of climate variation to forecast mosquito abundance and encephalitis risk in California: National West Nile Workshop, San Jose, February 2005.
- Brekke, L., Anderson, M., Dettinger, M., and Maurer, E., 2006, Weighted-estimation of climate projection distributions over California: 4th Biennial CALFED Science Conference, Sacramento, October 2006.
- Cayan, D., Bormirski, P., Hayhoe, K., Tyree, M., Dettinger, M., and Flick, R., 2006, Projected sea level rise along the California coast and in the Bay/Delta: 4th Biennial CALFED Science Conference, Sacramento, October 2006.
- Cayan, D., Bromirski, P., Dettinger, M., and Flick, R., 2006, Projecting California coastal climate and sea-level changes: California and the World Ocean '06, Long Beach, September 2006.
- Dettinger, M.D., 2006, Climate-change probabilities, impact probabilities, and the impact-model bottleneck: Annual California Water and Environmental Modeling Forum, Pacific Grove, March 2006.
- Dettinger, M.D., 2006, Translating climate change uncertainties into impacts uncertainties: Invited, 3rd California Climate Change Research Conference, Sacramento, September 2006.
- Dettinger, M., 2006, Warm storms in a warmer world and floods from the Sierra Nevada: 4th Biennial CALFED Science Conference, Sacramento, October 2006.
- Dettinger, M., Lundquist, J., Cayan, D., and Meyer, J., 2006, The 16 May 2005 flood in Yosemite National Park—A glimpse into high-country flood generation in the Sierra Nevada: MTNCLIM Workshop, Timberline, OR, September 2006.
- Dettinger, M., Lundquist, J., Cayan, D., and Meyer, J., 2006, The 16 May 2005 flood in Yosemite National Park—A glimpse into high-country flood generation in the Sierra Nevada: American Geophysical Union Fall Meeting, San Francisco, December 2006.
- Earman, S., and Dettinger, M., 2006, Possible impacts of warming-induced changes in groundwater recharge in western mountains on surface-water resources: American Geophysical Union Fall Meeting, San Francisco,

December 2006.

- Florsheim, J., Dettinger, M., Malamud-Roam, F., Ingram, B.L., and Mount, J., 2006, Geomorphic response to global warming in the Anthropocene--Levee breaches in California's Sacramento-San Joaquin watershed: American Geophysical Union Fall Meeting, San Francisco, December 2006.
- Hidalgo, H., Cayan, D., and Dettinger, M., 2006, Drought variability contrasts between montane and arid parts of the western US: Pacific Climate (PACLIM) Workshop, Pacific Grove, March 2006.
- Hidalgo, H., Cayan, D., and Dettinger, M., 2006, Variability of spring-summer drought in regions of high and low evaporative efficiency: American Geophysical Union Fall Meeting, San Francisco, December 2006.
- Hidalgo, H., Dettinger, M., and Cayan, D., 2006, Downscaling US daily precipitation and temperature fields with constructed analogues: 3rd Annual Climate Change Research Conference, Sacramento, CA, Sept. 2006.
- Lundquist, J., Cayan, D., and Dettinger, M., 2006, Hydrology and climate in the Sierra Nevada—Disproving the myth of linear gradients with elevation: American Geophysical Union Fall Meeting, San Francisco, December 2006.
- Ralph, F.M., Nieman, P.J., Kingsmill, D., and Dettinger, M., 2006, Addressing Sacramento flood risks—Atmospheric rivers, the Hydrometeorological Testbed (HMT) and next generation observations: 4th Biennial CALFED Science Conference, Sacramento, October 2006.
- Stahle, D., Griffin, D., Meko, D., Cayan, D., Dettinger, M., and Redmond, K., 2006, Blue oak reconstructions of California precipitation and streamflow history: 4th Biennial CALFED Science Conference, Sacramento, October 2006.
- Barnett, T.P., Pierce, D.W., Hidalgo, H., Bonfils, C., Das, T., Santer, B., Cayan, D., Dettinger, M., Bala, G., Mirin, A., and Wood, A., 2007, Human induced changes in the hydrological cycle of the western United States: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Bonfils, C., Santer, B.D., Pierce, D.W., Bala, G., Barnett, T.P., Hidalgo, H., Wood, A.W., Dettinger, M., Cayan, D.R., Mirin, A., and Das, T., 2007, Detection and attribution of temperature changes in the mountainous western United States: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Brekke, L., Anderson, M., Dettinger, M., and Maurer, E., 2007, Weighted-estimation of climate projection distributions over California: 3rd Working Group on Numerical Experimentation (WGNE) Workshop on Systematic Errors in Climate and NWP Models, San Francisco, February 2007.
- Das, T., Hidalgo, H., Dettinger, M., Cayan, D., Pierce, D., and Bala, G., 2007, Structure and Origins of Trends in Hydrologic Measures over the Western US: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Dettinger, M.D., 2007, Past and future effects of climate change on western water: Invited, USGS National Water Sciences Meeting, New Orleans, January 2007.
- Dettinger, M.D., 2007, Climate change and the Sierra Nevada: Invited, Nevada Water Resources Association Annual Meeting, Reno, NV, February 2007.
- Dettinger, M.D., 2007, Climate change and California water: Invited, California Water Education Forum, Sacramento, CA, February 2007.
- Dettinger, M.D., 2007, Climate change and water supplies in the West: Invited, First Western Forum on Energy, Water, and Sustainability, UC Santa Barbara, March 2007.
- Dettinger, M.D., 2007, Climate change and California water supplies: California Department of Water Resources Education Committee Annual Meeting, San Diego, March 2007.
- Dettinger, M., 2007, Climate change and western water: Invited seminar, UC Los Angeles Dept of Civil and Environmental Engineering, April 2007.
- Dettinger, M.D., 2007, Climate change in the West--How will we manage?: Keynote, Western Managers Meeting of Fish and Wildlife Service, Sacramento, May 2007.
- Dettinger, M., 2007, Water supply forecasts and climate change: Western States Water Council, Irvine, CA, May 2007.
- Dettinger, M., and Earman, S., 2007, Options for monitoring climate-driven recharge changes in western mountains: Invited, American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Earman, S., and Dettinger, M., 2007, Possible impacts of climate change on groundwater and surface water resources in the western USA: Geological Society of America "Climate Change Hydrology" session, Fall 2007.
- Earman, S., and Dettinger, M., 2007, Climate Influences on Groundwater Recharge: Implications for Western Groundwater and Surface Water Resources in the Face of Climate Change: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Flint, A.L., Flint, L.E., and Dettinger, M.D., 2007, Evaluating the effects of a +3°C climate change with a regional recharge model: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Funk, C., Dettinger, M., and Verdin, J., 2007, The potential impact of a warming ocean on food insecure Africa--Concerns and mechanisms for abrupt climate change: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Nghiem, S.V., Brakenridge, G.R., Cline, D., Dettinger, M., Dole, R.M., Houser, P.R., LeComte, D., Neumann, G., Njoku, E.G., Perovich, D.K., Rodriguez, E., Steffen, K., Sturm, M., Verdin, J., Wilhite, D.A., Yueh, S.H., and Zhang, T., 2007, Global observations of land-surface water with satellite active and passive microwave sensors:

- Satellite Observations of the Global Water Cycle Workshop, UC Irvine, March 2007.
- Pierce, D.W., Barnett, T.P., Hidalgo, H., Das, T., Bonfils, C., Bala, G., Mirin, A., Santer, B., Cayan, D., Dettinger, M., and Wood, A., 2007, Detection and attribution of anthropogenically induced changes in snowpack over the western US: American Geophysical Union 2007 Fall Meeting, San Francisco, Dec 2007.
- Burns, J., Gershunov, A., Rodo, X., Bainto, E., Dettinger, M., Tyree, M., and Cayan, D., 2008, An International database to investigate the seasonality of Kawasaki Syndrome occurrences: International Kawasaki Syndrome Conference.
- Das T., Hidalgo H.G., Dettinger M.D. and Cayan D.R. 2008, Flood analysis in the Sacramento-San Joaquin Valleys under changing climate: American Geophysical Union 2008 Fall Meeting, San Francisco, Dec 2008.
- Dettinger, M., 2008, Impact of climate change on California spring runoff—Importance to mosquito populations: Mosquito and Vector Control Association of California Annual Meeting, Palm Springs, January 2008.
- Dettinger, M., 2008, Forecastability of seasonal water supplies in the Western US: Invited, 1st Southwest US/Northwest Mexico Regional Climate Workshop, Ensenada, MX, April 2008.
- Dettinger, M., 2008, Global warming—Western style: USGS Public Lectures Forum, Menlo Park, May 2008.
- Dettinger, M., 2008, Global warming in the west—Science management alternatives: USGS Lunchtime Lecture, Menlo Park, May 2008.
- Dettinger, M., 2008, Climate change and western water supplies: Invited, Utah Water Users Annual Meeting, March 2008.
- Dettinger, M., 2008, Climate change and western snowpacks: Invited, 1st Biennial CUAHSI Science Symposium, Boulder, June 2008.
- Dettinger, M., 2008, Climate change and ground-water resources: Keynote speech, California Groundwater Resources Association, Sacramento, August 2008.
- Dettinger, M.D., 2008, Translating climate-change probabilities into impact risks—Overcoming the impact-model bottleneck: Invited, American Geophysical Union 2008 Fall Meeting, San Francisco, Dec 2008.
- Dettinger, M.D., 2008, The CASCaDE Project—Overview and climate-change scenarios: CALFED Science Conference, Sacramento, October 2008.
- Dettinger, M.D., Cayan, D.R., and Hidalgo, H., 2008, CASCaDE Climate Scenarios—Description and availability: CALFED Science Conference, Sacramento, October 2008.
- Dettinger, M.D., 2008, Projected 21st Century climatic contexts for change in aridic soils: Geological Society of America Annual Meeting, Houston, TX, October 2008.
- Hanson, R.T., Dettinger, M.D., Schmid, W., and Faunt, C., 2008, Assessment of water availability in regional aquifer systems with potential climate change using MODFLOW with the Farm Process: California Irrigation Institute, Sacramento, January 2008.
- Maurer, E.P., Hidalgo, H., Cayan, D., Dettinger, M., and Das, T., 2008, Improving statistically downscaled daily data using bias correction: California Climate Change Conference, September, 2008.
- Neiman, P.J., Wick, G.A., Ralph, F.M., Kuo, Y.H., Wee, T.K., Ma, Z., Taylor, G.H., and Dettinger, M.D., 2008, The detection of an intense atmospheric river impacting the Pacific Northwest using satellite-based COSMIC soundings: Proceedings, 12th Conference on IOAS-AOLS, American Meteorological Society, January 2008.
- Dettinger, M.D., 2009, Climate-change context for western ecosystem science: USGS Western Ecological Research Center Annual Meeting, Davis, January 2009.
- Dettinger, M.D., 2009, California's Delta and the future of state-scale water supplies: UCSD Environmental and Sustainability Initiative seminar series, March 2009.
- Dettinger, M.D., 2009, Climate-change and western water: NWS Western Region Annual Meeting, Boulder, CO, April 2009.
- Dettinger, M.D., 2009, California Applications Project—Climate services for California: NWS Western Region Annual Meeting, Boulder, CO, April 2009.
- Verdin, J., Funk, C., Dettinger, M., and Brown, M., 2009, Estimating probabilistic rainfall and food security outcomes for eastern and southern Africa: American Geophysical Union 2009 Spring Meeting, Toronto, May 2009.
- White, A.B., Anderson, M., Dettinger, M., and McGinley, J., 2009, 21st Century observation and modeling activities in support of the California Department of Water Resources Flood Protection Plan: AMS 13th Conference on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface, Jan 2009.