

Resumé

Fred Martin Ralph

- Personal Work Address: University of California at San Diego
Scripps Institution of Oceanography
Climate, Atmospheric Science and Physical Oceanography
8810 Shellback Way La Jolla, CA 92037
Born on 21 June 1962 in Detroit Michigan
Citizenship: United States of America
Selective Service: Registered 21 January 1981
- Education Ph.D. in Atmospheric Sciences, December 1991
Dissertation title: Mesoscale studies using clear-air Doppler radar
University of California at Los Angeles, Department of Atmospheric Sciences

M.S. in Atmospheric Sciences, June 1987
Major field: Atmospheric Dynamics (GPA: 3.82)
University of California at Los Angeles, Department of Atmospheric Sciences

B.S. in Meteorology with Highest Distinction (GPA: 3.93), December 1984
Minor fields: Mathematics, Physics
University of Arizona, Department of Atmospheric Sciences
- Honors **Elected “Fellow” of the Cooperative Institute for Research in Environmental Sciences** at Univ. of Colorado, Boulder, (2013)
Dept. of Commerce Bronze Medal...for comprehensive flood mitigation efforts in response to a severely weakened Howard Hansen Dam project with the potential of catastrophic flooding (2012)
Fellow Cooperative Institute for Research in the Atmosphere (CIRA) (2010)
NOAA Administrator’s Award “for exemplary leadership of the NOAA Unmanned Aircraft System Program during its formative stage.” (2009)
NOAA/OAR Outstanding Scientific Paper Award for “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, Vol. 9 (2008).
Elected Fellow of the American Meteorological Society (2007)
NOAA Administrator’s Award to a NWS-OAR team “For the successful planning, implementation and initial deployment in the San Diego and Oxnard Areas of the first NOAA/USGS Debris-Flow Warning System.” (2007)
NOAA/OAR Outstanding Scientific Paper Award for “Flooding on California’s Russian River: Role of atmospheric rivers.” Geophysical Research Letters, Vol. 33 (2006)
Department of Commerce Bronze Medal to the Boulder Planning and Transition Team “For designing and implementing the consolidation of six research organizations in Boulder, CO into the new NOAA Earth System

Research Laboratory,” (2006)

NOAA/OAR Outstanding Scientific Paper Award for “The impact of a prominent rain shadow on flooding in California’s Santa Cruz mountains: A CALJET case study and sensitivity to the ENSO cycle.” J. Hydrometeorology, Vol. 4 (2004)

Department of Commerce Bronze Medal to the PACJET Research and Development Team “For the development of a snow-level algorithm for boundary layer wind profilers which will improve national winter weather forecasts,” (2003)

NOAA/Oceanic and Atmospheric Research, Employee of the Year, (1998)

Department of Commerce Silver Medal to the OAR/ETL/Meteorological Applications and Assessment Division and NMAO/Aircraft Operations Center “For the extraordinary response to NOAA’s call to study and forecast the unusual weather associated with the El Nino of 1997/98,” (1998)

National Research Council Research Associate at NOAA/WPL, 1991/1992

Jacob A. Bjerknes Memorial Award for excellence in research, University of California at Los Angeles, Department of Atmospheric Sciences, 1990

Morris Neiburger Memorial Award for excellence in teaching, University of California at Los Angeles, Department of Atmospheric Sciences, 1989

Chancellor's Fellowship, University of California at Los Angeles, 1985/1986

B.S. With Highest Honors, University of Arizona, Tucson Arizona, 1984

General Academic Scholarship, University of Arizona, Tucson Ariz., 1980-84

Elected member of Phi Beta Kappa National Honor Society, 1984

Memberships American Meteorological Society, American Geophysical Union

Employment Director, Center for Western Weather and Water Extremes, University of California San Diego, Scripps Institution of Oceanography, La Jolla, CA from 6/27/2013 to present. (MSP level C)
Researcher, Scripps Institution of Oceanography, UC San Diego, 2016 to present (Step 6, Full Professor equivalent)
Chief, Water Cycle Branch of the NOAA/ Earth System Research Laboratory /Physical Sciences Division, Boulder, CO from 10/01/06 to 06/26/2013.
Chief, Regional Weather and Climate Applications Division, NOAA Environmental Technology Lab., Boulder, CO. 07/01/01 – 09/30/0
Research meteorologist, NOAA/Environmental Technology Laboratory, Boulder, CO. 11/16/92 - 07/01/00. [Started 11/16/92 as GS-12. Promoted to GS-13 in 1994, and GS-14 in 1998. Promoted to ZP-V (GS-15 equivalent) in May 2000.]
National Research Council Research Associate, (NOAA/WPL) 01/20/92 to 11/15/92.
Teaching and Research Assistant, (UCLA, Dept. of Atmos. Sci.) roughly 09/01/86 to 12/31/91

Staff/Budget The Center for Western Weather and Water Extremes (CW3E) at UCSD/Scripps

Management started in 2013; as of March 2018, CW3E has 8 staff, 8 graduate students, 9 Post docs, 10 Scripps scientists partially supported, 10 subawards to other institutions.

NOAA position 2001-2013: Operated a Branch with 30-40 staff (combined federal, joint institute, contract). Provided strategic and tactical direction for the staff and facilities. Directly supervised 5-7 federal staff, who supervised 6-10 other federal staff, oversaw contract staff, and together advised 15-20 cooperative institute members and students. Responsible for the day-to-day operation of the branch, including management of personnel, budget, space, diversity, purchasing, travel approval, hiring, as well as performance evaluations and corrective actions. Responsible for strategic direction, fund raising, reporting and general execution of the mission. Overall budget was \$6-7 M/year, involving typical 15-20 projects.

Program Management - Program Manager, NOAA's Science, Technology & Infusion Program (ST&I), 2004-10. ST&I was a \$75 M/year matrix program within NOAA's formal Planning, Programming, Budgeting and Execution System (PPBES). It focused on research and its infusion into NOAA operational forecasting through test and evaluation. The Program Manager was responsible for Planning, Programming and Budgeting. ST&I included elements in NWS, OAR, and NESDIS, including NOAA's Weather laboratories (ESRL/PSD, ESRL/GSD, AOML/HRD, NSSL), USWRP, THORPEX, as well as NEXRAD Product Improvement, Phased Array Radar, AWIPS evolution, etc. By FY2011, ST&I had played leading roles in generating over \$15 M/year of new base funding for innovation, including for hurricane research (\$2 M/yr), severe weather research (\$2.5 M/yr), testing of unmanned aircraft systems applications (\$3-6 M/yr), phased array radar (\$6 M/yr) and water resources research (\$2 M/yr).

- Director of NOAA/US Weather Research Program (2004-2011) - allocated \$4-5 M/year for developing "Testbeds" linking weather research and forecasting.
- Program Manager of NOAA/Unmanned Aircraft Systems Program (2006-2009): created new program, allocated \$3-6 M/year, handed off to a full-time manager.
- Led the development of NOAA's Hydrometeorology Testbed (HMT).

Project Management "Forecast-Informed Reservoir Operations" – USACE project (2015-current)
"CalWater" - uncertainty in climate projections of precipitation (2009-2015)
NOAA's Unmanned Aircraft Systems "Major Project" (2005-2008)
New England High Resolution Temperature Forecasting Pilot Study
California Land-falling Jets experiment (CALJET), and its follow-on (PACJET)
USWRP Quantitative precipitation forecasting research at NOAA/ETL

Selected Field Work Atmospheric River Airborne Reconnaissance Campaign, PI (2016 - current)
CalWater Co-lead (ground, air, ship campaigns from 2009-2015)
CALJET & PACJET experiments, Chief Scientist (1997-98, & 2001)
ONR Coastal Meteorology Accelerated Research Initiative (1994-95)
Mesoscale Alpine Project (Alps 1999), CaPE experiment (Florida, 1991)

Research Atmospheric Rivers: dominant mechanism for horizontal water vapor transport

Hydrometeorological Processes: orographic precipitation
Mesoscale Processes: fronts, mountain waves, clear-air turbulence
Climate Processes: extreme precipitation, ENSO impacts on stream flow
Coastal Processes: coastally trapped disturbances, barrier jets

Applications Reservoir operations: Forecast-informed reservoir operations
Testbeds: Hydrometeorological Testbed
Precipitation forecasting: extreme precipitation, snow information
Aviation weather: clear-air turbulence
Observing systems: mesoscale observing system design, sensor development
Prototype performance measure development: extreme QPF, snow-level

Publications Refereed (In print): 118 Refereed (First authored): 30
Citations: 6380 (from “Google Scholar”) H-Index: 43

Committees Prado Dam Forecast-Informed Reservoir Operations Steering Cmte, Co-Chair (2017-present)
Atmospheric River Tracking Method Intercomparison Project (2016-present)
Lake Mendocino Forecast-Informed Reservoir Operations Steering Cmte, Co-Chair (2014-present)
Member, Advisory Board, Hydrology and Atmospheric Sciences Dept., Univ. of Arizona, (2014-present)
UCAR Member Representative for Scripps Inst. of Oceanography (2014-present)
Member Steering Committee for WMO/WWRP World Weather Research Open Science Conference in Montreal August 2014 (2013 to current)
Member GOES-R Science and Demonstration Executive Board (2012-current)
Member Council of Fellows, Coop. Inst. Research in the Atmos. (2010-current)
Member, Management Board, Developmental Testbed Center (2010-current)
OAR Lead on NWS Science & Technology Roadmap Development Team (2008)
Chair, NOAA’s USWRP Executive Committee (2004-2011)
NASA Global Precip. Mission, Ground Validation Advisory Panel (2006 -2010)
Co-Organizer, Symposium on Connections between Mesoscale processes and Climate Variability, (2006-07)
Member, NOAA’s Boulder Planning and Transition Team (2004-05)
Chair, NSF/NCAR Observing Facilities Advisory Panel (2003-04)
Chair, Amer. Meteorological Society Cmte. on Mesoscale Meteorology (2003-05)
NOAA THORPEX Science and Implementation Team (2003 to present)
Test & Evaluation Working Group, North Amer. Observing System (1999-2002)
U. S. Scientific Steering Committee, Mesoscale Alpine Project (1997-2001)
American Meteorological Society Committee on Radar Meteorology (1997-2000)
Co-Chair, 8th Conference on Mountain Meteorology (1996-1998)
Co-Chair, 4th International Symposium on Tropospheric Profiling (1996-1998)

Teaching* Air pollution
Climate and climate change
Climates of Other Worlds

Introduction to the atmospheric environment
*UCLA 1987-1991, Assistant

Refereed Publications

- Crochet, M., F. Cuq, F. M. Ralph, and S. V. Venkateswaran, 1990: Clear-air radar observations of the great October storm of 1987. *Dynam. Atmos. Oceans.*, **14**, 443-461.
- Ralph, F. M., 1991: Mesoscale studies using clear-air Doppler radar. Ph.D. Dissertation, University of California at Los Angeles, 177 pp.
- Ralph, F. M., M. Crochet, and S. V. Venkateswaran, 1992: A study of mountain lee waves using clear-air Doppler radar. *Quart. J. Royal Meteorol. Soc.*, **118**, 597-627.
- Ralph, F. M., C. Mazaudier, M. Crochet, and S. V. Venkateswaran, 1993: Doppler sodar and radar wind profiler observations of gravity wave activity associated with a gravity current. *Mon. Wea. Rev.*, **121**, 444-463.
- Ralph, F. M., M. Crochet, and S. V. Venkateswaran, 1993: Observations of a mesoscale ducted gravity wave. *J. Atmos. Sci.*, **50**, 3277-3291.
- Wilczak, J. M., R. G. Strauch, F. M. Ralph, B. L. Weber, D. A. Merritt, J. R. Jordan, D. E. Wolfe, L. K. Lewis, D. B. Wuertz, J. E. Gaynor, S. A. McLaughlin, R. R. Rogers, A. C. Riddle, and T. S. Dye, 1995: Contamination of wind profiler data by migrating birds: Characteristics of corrupted data and potential solutions. *J. Atmos. Oceanic Technol.*, **12**, 449-467.
- Chalon, J. P., J. -L. Brenguier, J. -P. Cammas, S. Chauzy, M. Chong, M. Crochet, G. Donnadieu, V. Ducrocq, J. -F. Gayet, P. Gondot, H. Isaka, P. Laroche, Y. Lemaitre, F. M. Ralph, and S. Soula, 1995: LANDES-FRONTES 84: Bilan d'une expérience d'étude des systèmes frontaux convectifs. *La Meteorologie*, **8**, 10-28.
- Ralph, F. M., 1995: Using radar-measured radial vertical velocities to distinguish precipitation scattering from clear-air scattering. *J. Atmos. Oceanic Technol.*, **12**, 257-267.
- Ralph, F. M., P. J. Neiman, D. W. van de Kamp, and D. C. Law, 1995: Using spectral moment data from NOAA's 404-MHz radar wind profilers to observe precipitation. *Bull. Amer. Meteor. Soc.*, **76**, 1717-1739.
- Ralph, F. M., P. J. Neiman, and D. Ruffieux, 1996: Precipitation identification from radar wind profiler spectral moment data: Vertical velocity histograms, velocity variance and signal power-vertical velocity correlations. *J. Atmos. Oceanic Technol.*, **13**, 545-559.
- Ralph, F. M., 1996: Observations of 250-km-wavelength clear-air eddies and 750-km-wavelength mesocyclones associated with a synoptic-scale midlatitude cyclone. *Mon. Wea. Rev.*, **124**, 1199-1210.
- Jin, Y., S. E. Koch, Y.-L. Lin, F. M. Ralph, and C. Chen, 1996: Numerical simulations of an

- observed gravity current and gravity waves in an environment characterized by complex stratification and shear. *J. Atmos. Sci.*, **53**, 3570-3588.
- Marwitz, J. D., M. K. Politovich, B. C. Bernstein, F. M. Ralph, P. J. Neiman, R. Ashenden, and J. F. Bresch, 1997: Meteorological conditions associated with the ATR-72 aircraft accident near Roselawn, Indiana on 31 October 1994. *Bull. Amer. Meteor. Soc.*, **78**, 41-52.
- Ralph, F. M., P. J. Neiman, T. L. Keller, D. Levinson, and L. Fedor, 1997: Observations, simulations and analysis of nonstationary trapped lee waves. *J. Atmos. Sci.*, **54**, 1308-1333.
- Ralph, F. M., P. J. Neiman, and D. Levinson, 1997: Lidar observations of a breaking mountain wave associated with extreme turbulence. *Geophys. Res. Lett.*, **24**, 663-666.
- Smith, R., J. Paegle, T. Clark, W. Cotton, D. Durran, G. Forbes, J. Marwitz, C. Mass, J. McGinley, H.-L. Pan, and F. M. Ralph, 1997: Local and remote effects of mountains on weather: Research needs and opportunities. *Bull. Amer. Meteor. Soc.*, **78**, 877-892.
- Ralph, F. M., 1997: Comments on Use of ducting theory in an observed case of gravity waves. *J. Atmos. Sci.*, **54**, 2237-2239.
- Neiman, P. J., F. M. Ralph, M. A. Shapiro, B. F. Smull, and D. Johnson, 1998: An observational study of fronts and frontal mergers over the Continental United States. *Mon. Wea. Rev.*, **126**, 2521-2554.
- Ralph, F. M., L. Armi, J. Bane, C. Dorman, W. D. Neff, P. J. Neiman, W. Nuss, and P. O. G. Persson, 1998: Observations and analysis of the 10-11 June 1994 coastally trapped disturbance. *Mon. Wea. Rev.* **126**, 2435-2465.
- Ralph, F. M., P. J. Neiman, and T. L. Keller, 1999: Deep-tropospheric gravity waves created by lee-side cold fronts. *J. Atmos. Sci.*, **56**, 2986-3009.
- Ralph, F. M., 2000: Reply. *J. Atmos. Sci.*, **57**, 599-608.
- Clark, T. L., W. D. Hall, R. M. Kerr, D. Middleton, L. Radke, F. M. Ralph, P. J. Neiman, and D. Levinson, 2000: On the origins of aircraft-damaging clear-air turbulence during the 9 December 1992 Colorado downslope windstorm: Numerical simulations and comparison with observations. *J. Atmos. Sci.* **57**, 1105-1131.
- Nuss, W. A., J. M. Bane, W. T. Thompson, T. Holt, C. E. Dorman, F. M. Ralph, R. Rotunno, J. B. Klemp, W. C. Skamarock, R. M. Samelson, A. M. Rogerson, C. Reason, and P. Jackson, 2000: Coastally trapped wind reversals: Progress toward understanding. *Bull. Amer. Meteor. Soc.*, **81**, 719-744.
- Ralph, F. M., P. J. Neiman, P. O. G. Persson, J. M. Bane, M. L. Cencillo, J. M. Wilczak, and W. Nuss, 2000: Kelvin waves and internal bores on the marine boundary layer inversion and

- their relationship to coastally trapped wind reversals. *Mon. Wea. Rev.*, **128**, 283-300.
- White, A. B., J. R. Jordan, B. E. Martner, F. M. Ralph, and B. W. Bartram, 2000: Extending the dynamic range of an S-band radar for cloud and precipitation studies. *J. Atmos. Oceanic Technol.*, **17**, 1226-1234.
- Lehmiller, G. S., H. B. Bluestein, P. J. Neiman, F. M. Ralph, and W. F. Feltz, 2001: Wind structure in a supercell thunderstorm as measured by a UHF wind profiler. *Mon. Wea. Rev.*, **129**, 1968-1986.
- Neiman, Paul J., F. Martin Ralph, Robert L. Weber, Taneil Uttal, Louisa B. Nance, David H. Levinson, 2001: Observations of nonclassical frontal propagation and frontally forced gravity waves adjacent to steep topography. *Mon. Wea. Rev.*, **129**, 2633-2659.
- Neiman, P.J., F.M. Ralph, A.B. White, D.A. Kingsmill, and P.O.G. Persson, 2002: The statistical relationship between upslope flow and rainfall in California's coastal mountains: Observations during CALJET. *Mon. Wea. Rev.*, **130**, 1468-1492.
- White, Allen B., Daniel J. Gottas, Eric T. Strem, F. Martin Ralph, Paul J. Neiman, 2002: An automated brightband height detection algorithm for use with Doppler radar spectral moments. *J. Atmos. Oceanic Technol.*, **19**, 687-697.
- White, A. B., P. J. Neiman, F. M. Ralph, D. E. Kingsmill, and P. O. G. Persson, 2003: Coastal orographic rainfall processes observed by radar during the California Land-Falling Jets experiment. *J. Hydrometeor.*, **4**, pp. 264-282.
- Ralph, F. M., Neiman, P. J., D. E. Kingsmill, P. O. G. Persson, A. B. White, E. T. Strem, E. D. Andrews, and R. C. Antweiler, 2003: The impact of a prominent rain shadow on flooding in California's Santa Cruz mountains: A CALJET case study and sensitivity to the ENSO cycle. *J. Hydrometeor.*, **4**, 1243-1264.
- Neiman, P.J., P.O.G. Persson, F.M. Ralph, D.P. Jorgensen, A.B. White, and D.A. Kingsmill, 2004: Modification of Fronts and Precipitation by Coastal Blocking during an Intense Landfalling Winter Storm in Southern California: Observations during CALJET. *Mon. Wea. Rev.*, **132**, 242-273.
- Andrews, E. D., R. C. Antweiler, P. J. Neiman, and F. M. Ralph, 2004: Influence of ENSO on flood frequency along the California coast. *J. Climate*, **17**, 337-348.
- Ralph, F.M., P.J. Neiman, and G.A. Wick, 2004: Satellite and CALJET aircraft observations of atmospheric rivers over the eastern North-Pacific Ocean during the El Niño winter of 1997/98. *Mon. Wea. Rev.*, **132**, 1721-1745.
- Ralph, F. M., P. J., Neiman and R. Rotunno, 2005: Dropsonde observations in low-level jets over the Northeastern Pacific Ocean from CALJET-1998 and PACJET-2001: Mean vertical-profile and atmospheric-river characteristics. *Mon. Wea. Rev.*, **133**, 889-910.

- Neiman, P. J., B. E. Martner, A. B. White, G. A. Wick, F. M. Ralph, D. E. Kingsmill, 2005: Wintertime nonbrightband rain in California and Oregon during CALJET and PACJET: Geographic, interannual, and synoptic variability. *Mon. Wea. Rev.*, **133**, 1199-1223.
- Persson, P.O.G., P.J. Neiman, B. Walter, J.-W. Bao and F.M. Ralph, 2005: Contributions from California coastal-zone surface fluxes to heavy coastal precipitation: A CALJET case study During the Strong El Niño of 1998. *Mon. Wea. Rev.*, **133**, 1175-1198.
- Dabberdt, W. F., T. W. Schlatter, F. H. Carr, E. W. J. Friday, D. Jorgensen, S. Koch, M. Pirone, F. M. Ralph, J. Sun, P. Welsh, J. W. Wilson, and X. Zou, 2005: Multifunctional Mesoscale Observing Networks. *Bull. Amer. Meteor. Soc.*, **86**, 961-982.
- Matrosov, S. Y., D. E. Kingsmill, B. E. Martner, and F. M. Ralph, 2005: The utility of X-band polarimetric radar for quantitative estimates of rainfall parameters. *J. Hydrometeor.*, **6**, 248-262.
- Ralph, F. M., R. M. Rauber, B. F. Jewett, D. E. Kingsmill, P. Pisano, P. Pugnèr, R. M. Rasmussen, D. W. Reynolds, T. W. Schlatter, R. E. Stewart and J. S. Waldstreicher, 2005: Improving short-term (0-48 hour) Cool-season quantitative precipitation forecasting: Recommendations from a USWRP Workshop. *Bull. Amer. Meteor. Soc.*, **86**, 1619-1632.
- Bao, J.-W., S. A. Michelson, P.J. Neiman, F. M. Ralph and J. M. Wilczak, 2006: Interpretation of enhanced integrated water vapor bands associated with extratropical cyclones: Their formation and connection to tropical moisture. *Mon. Wea. Rev.*, **134**, 1063-1080.
- Stensrud, D. J., N. Yossouf, M. E. Baldwin, J. T. McQueen, J. Du, B. Zhou, B. Ferrier, G. Manikin, F. M. Ralph, J. M. Wilczak, A. B. White, I. Djalalova, J.-W. Bao, R. J. Zamora, S. G. Benjamin, P. A. Miller, T. L. Smith, T. Smirnova, and M. F. Barth, 2006: The New England High-Resolution Temperature Program (NEHRTP). *Bull. Amer. Meteor. Soc.*, **87**, 491-498.
- Neiman, P. J., F. M. Ralph, A. B. White, D. D. Parrish, J. S. Holloway, and D. L. Bartels, 2006: A multiwinter analysis of channeled flow through a prominent gap along the Northern California coast during CALJET and PACJET. *Mon. Wea. Rev.*, **134**, 1815-1841.
- Kingsmill, D. E., P. J. Neiman, F. M. Ralph, and A. B. White, 2006: Synoptic and topographic variability of Northern California precipitation characteristics in landfalling winter storms observed during CALJET. *Mon. Wea. Rev.*, **134**, 2072-2094.
- Ralph, F. M., P. J. Neiman, G. A. Wick, S. I. Gutman, M. D. Dettinger, D. R. Cayan, and A. B. White, 2006: Flooding on California's Russian River: Role of atmospheric rivers. *Geophys. Res. Lett.*, **33**, L13801, doi:10.1029/2006GL026689.

- Williams, C. R., A. B. White, K. S. Gage, and F. M. Ralph, 2007: Vertical structure of precipitation and related microphysics observed by NOAA profilers and TRMM during NAME 2004. *J. Climate*, **20**, 1693-1712.
- Morss, R. E., and F. M. Ralph, 2007: Use of information by National Weather Service Forecasters and emergency managers during the CALJET and PACJET-2001. *Wea. Forecast.*, **22**, 539-555.
- Neiman, P. J., F. M. Ralph, G. A. Wick, J. D. Lundquist and M. D. Dettinger, 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. Hydrometeor.*, **9**, 22-47.
- Lundquist, J.D., P J. Neiman, B. Martner, A.B. White, D.J. Gottas, and F.M. Ralph, 2008: Rain versus snow in the Sierra Nevada, California: Comparing radar and surface observations of melting level. *J. Hydrometeor.*, **9**,194-211.
- Martner, B. E., S. E. Yuter, A. B. White, S. Y. Matrosov, D.E. Kingsmill, and F. M. Ralph, 2008: Raindrop size distributions and rain characteristics in California coastal rainfall for periods with and without a radar bright band. *J. Hydrometeor.*, **9**, 408-425.
- Wick, G. A., Y. Kuo, F. M. Ralph, T. Wee, and P. J. Neiman, 2008: Intercomparison of integrated water vapor retrievals from SSM/I and COSMIC, *Geophys. Res. Lett.*, **35**, L21805, doi:10.1029/2008GL035126.
- Neiman, P. J., F. M. Ralph, G. A. Wick, Y.-H. Kuo, T.-K. Wee, Z. Ma, G. H. Taylor, and M. D. Dettinger, 2008: Diagnosis of an intense atmospheric river impacting the Pacific Northwest: Storm summary and offshore vertical structure observed with COSMIC satellite retrievals. *Mon. Wea. Rev.*, **136**, 4398-4420.
- Coplen, T. B., P. J. Neiman, A. B. White, J M. Landwehr, F. M. Ralph, and M. D. Dettinger, 2008: Extreme changes in stable hydrogen isotopes and precipitation characteristics in a landfalling Pacific storm, *Geophys. Res. Lett.*, **35**, L21808, doi:10.1029/2008GL035481.
- Neiman, P.J., A.B. White, F.M. Ralph, D.J. Gottas, and S.I. Gutman, 2009: A Water Vapor Flux Tool for Precipitation Forecasting. U.K. *Journal of Water Management*, **162**, 83-94.
- Neiman, P.J., E. M. Sukovich, F. M. Ralph, and M. Hughes, 2010: A seven-year wind profiler-based climatology of the windward barrier jet along California's Sierra Nevada. *Mon. Wea. Rev.* **138**, 1206-1233.
- White, A., B., D. J. Gottas, A. F. Henkel, P. J. Neiman, F. M. Ralph, S. I. Gutman, 2010: Developing a performance measure for snow-level forecasts. *J. Hydrometeor* **11**, 739-753.
- Ralph, F. M., E. Sukovich, D. Reynolds, M. Dettinger, S. Weagle, W. Clark, P.J. Neiman, 2010:

- Assessment of extreme quantitative precipitation forecasts and development of regional extreme event thresholds using data from HMT-2006 and COOP observers. *J. Hydrometeor.*, **11**, 1288-1306.
- Ralph, F. M., P. J. Neiman, G. N. Kiladis, K. Weickman, and D. W. Reynolds, 2011: A multi-scale observational case study of a Pacific atmospheric river exhibiting tropical-extratropical connections and a mesoscale frontal wave. *Mon. Wea. Rev.*, **139**, pp. 1169-1189, doi: 10.1175/2010MWR3596.1.
- Ma, Z., W. Y.-H. Kuo, F. M. Ralph, P. J. Neiman, G. A. Wick, E. Sukovich, and B. Wang, 2011: Assimilation of GPS radio occultation data for an intense atmospheric river with the NCEP Regional GSI system. *Mon. Wea. Rev.*, **139**, 2170 – 2183.
- Dettinger, M.D., Ralph, F.M., Das, T., Neiman, P.J., and Cayan, D., 2011: Atmospheric rivers, floods, and the water resources of California. *Water*, **3** (Special Issue on Managing Water Resources and Development in a Changing Climate), 455-478.
- Ralph, F.M., and M.D. Dettinger, 2011: Storms, Floods and the Science of Atmospheric Rivers. *EOS, Transactions, Amer. Geophys. Union.*, **92**, 265-266.
- Ault, A., C. Williams, A. White, P. Neiman, J. Creamean, C. Gaston, M. Ralph, and K. Prather, 2011: Detection of Asian Dust in California Orographic Precipitation. *J. Geophys. Res. – Atmospheres*, **116**, D16205, doi:10.1029/2010JD015351.
- Zamora, R. J., F. M. Ralph, E. Clark and T. S. Schneider, 2011: The NOAA Hydrometeorology Testbed soil moisture observing networks: Design, instrumentation and preliminary results. *J. Atmos. Oceanic Technol.*, **28**, 1129-1140, doi: 10.1175/2010JTECHA1465.1.
- Neiman, P. J., L. J. Schick, F. M. Ralph, M. Hughes, G. A. Wick, 2011: Flooding in Western Washington: The Connection to Atmospheric Rivers. *J. Hydrometeor.*, **12**, 1337-1358, doi: 10.1175/2011JHM1358.1.
- Dettinger, M. D., F. M. Ralph, M. Hughes, T. Das, P. J. Neiman, D. Cox, G. Estes, D. Reynolds, R. Hartman, D. Cayan, and L. Jones, 2012: Design and quantification of an extreme winter storm scenario for emergency preparedness and planning exercises in California, *Nat. Hazards*, **60**, 1085-1111.
- White, A. B., B. Colman, G. M. Carter, F. M. Ralph, R. S. Webb, D. G. Brandon, C. W. King, P. J. Neiman, D. J. Gattas, I. Jankov, K. F. Brill, Y. Zhu, K. Cook, H. E. Buehner, H. Opitz, D. W. Reynolds, L. J. Schick, 2012: NOAA's Rapid Response to the Howard A. Hanson Dam Flood Risk Management Crisis. *Bull. Amer. Meteorol. Soc.*, **93**, 189-207, doi: 10.1175/BAMS-D-11-00103.1.
- Moore, B.J., P.J. Neiman, F.M. Ralph, F. Barthold, 2012: Physical processes associated with heavy flooding rainfall in Nashville, Tennessee and vicinity during 1-2 May 2010: The role of an atmospheric river and mesoscale convective systems. *Mon. Wea. Rev.*, **140**,

358-378.

Ralph, F. M., and M. D. Dettinger, 2012: Historical and national perspectives on extreme West Coast precipitation associated with atmospheric rivers during December 2010. *Bull. Amer. Meteor. Soc.*, **93**, 783-790.

Newman, M., G. N. Kiladis, K. M. Weickman, F. M. Ralph and P.D. Sardeshmukh, 2012: Relative contributions of synoptic and low-frequency eddies to time-mean atmospheric moisture transport, including the role of atmospheric rivers. *J. Climate*, **25**, 7341-7361.

Hughes, M., P. J. Neiman, E. Sukovich and F. M. Ralph, 2012: Representation of the Sierra Barrier Jet in 11 years of a high-resolution dynamical reanalysis downscaling compared with long-term wind profiler observations. *J. Geophys. Res. – Atmos.*, **117**, D18116, doi:10.1029/2012JD017869.

Creamean, J. M., K. J. Suski, D. Rosenfeld, A. Cazorla, P. J. DeMott, R. C. Sullivan, A. B. White, F. M. Ralph, P. Minnis, J. M. Comstock, J. M. Tomlinson, K. A. Prather, 2013: Dust and Biological Aerosols from the Sahara and Asia Influence Precipitation in the Western U.S. *Science*, **339**, 1572-1578 (2013). DOI: 10.1126/science.1227279

Wick, G. A., P.J. Neiman, and F.M. Ralph, 2013: Description and validation of an automated objective technique for identification and characterization of the integrated water vapor signature of atmospheric rivers. *IEEE Trans. Geosci. Remote Sensing*, **51**, 2166-2176.

Ralph, F. M., T. Coleman, P.J. Neiman, R. Zamora, and M.D. Dettinger, 2013: Observed impacts of duration and seasonality of atmospheric-river landfalls on soil moisture and runoff in coastal northern California. *J. Hydrometeor.*, **14**, 443-459.

Neiman, P.J., F.M., Ralph, B.J. Moore, M. Hughes, K.M. Mahoney, J.M. Cordeira and M.D. Dettinger, 2013: The landfall and inland penetration of a flood-producing atmospheric river in Arizona. Part 1: Observed synoptic-scale, orographic and hydrometeorological characteristics. *J. Hydrometeor.*, **14**, 460-484.

Ralph, F.M., J. Intrieri, D. Andra Jr., S. Boukabara, D. Bright, P. Davidson, B. Entwistle, J. Gaynor, S. Goodman, J. Gwo-Jiing, A. Harless, J. Huang, G. Jedlovec, J. Kain, S. Koch, B. Kuo, J. Levit, S.T. Murillo, L.P. Riishojgaard, T. Schneider, R. Schneider, T. Smith, and S. Weiss, 2013: The emergence of weather-focused testbeds linking research and forecasting operations. *Bull. Amer. Meteor. Soc.*, **94**, 1187-1210.

Kingsmill, D.K., P.J. Neiman, B.J. Moore, M. Hughes, S.E. Yuter and F.M. Ralph, 2013: Kinematic and thermodynamic structures of Sierra barrier jets and overrunning atmospheric rivers during a land-falling winter storm in Northern California. *Mon. Wea. Rev.*, **141**, 2015-2036.

White, A.B., M.L. Anderson, M.D. Dettinger, F.M. Ralph, A. Hinojosa, D.R. Cayan, R.K. Hartman, D.W. Reynolds, L.E. Johnson, T.L. Schneider, R. Cifelli, Z. Toth, S.I. Gutman,

- C.W. King, F. Gehrke, P.E. Johnston, C. Walls, D. Mann, D.J. Gottas and T. Coleman, 2013: A 21st century California observing network for monitoring extreme weather events. *J. Atmos. Ocean. Technol.*, **30**, 1585-1603.
- Cordeira J.M., F.M. Ralph and B.J. Moore, 2013: The development and evolution of two atmospheric rivers in proximity to Western North Pacific tropical cyclones in October 2010. *Mon. Wea. Rev.*, **141**, 4234–4255.
- Wick, G.A., P.J. Neiman, F.M. Ralph, and T.M. Hamill, 2013: Evaluation of forecasts of the water vapor signature of atmospheric rivers in operational numerical weather prediction models. *Wea. Forecasting*, **28**, 1337-1352.
- Neiman, P.J., M. Hughes, B.J. Moore, F.M. Ralph and E.M. Sukovich, 2013: Sierra barrier jets, atmospheric rivers and precipitation characteristics in Northern California: A composite perspective based on a network of wind profilers. *Mon. Wea. Rev.*, **141**, 4211-4233.
- Rutz, J.J., W.J. Steenburgh, and F.M. Ralph, 2014: Climatological characteristics of atmospheric rivers and their inland penetration over the western United States. *Mon. Wea. Rev.*, **142**, 905-921.
- Matrosov, S.Y., F.M. Ralph, P.J. Neiman, A.B. White, 2014: Quantitative assessment of operational weather radar rainfall estimates over California's Northern Sonoma County using HMT-West data. *J. Hydrometeor.*, **15**, 393–410.
- Ralph, F. M., M. Dettinger, A. White, D. Reynolds, D. Cayan, T. Schneider, R. Cifelli, K. Redmond, M. Anderson, F. Gherke, J. Jones, K. Mahoney, L. Johnson, S. Gutman, V. Chandrasekar, J. Lundquist, N.P. Molotch, L. Brekke, R. Pulwarty, J. Horel, L. Schick, A. Edman, P. Mote, J. Abatzoglou, R. Pierce and G. Wick, 2014: A vision for future observations for Western U.S. extreme precipitation and flooding– Special Issue of *J. Contemporary Water Resources Research and Education*, Universities Council for Water Resources, Issue 153, pp. 16-32.
- Neff, W., G.P. Compo, F.M. Ralph and M.D. Shupe, 2014: Continental heat anomalies and the extreme melting of the Greenland ice surface in 2012 and 1889. *J. Geophys. Res.*, **119**, doi:10.1002/2014JD021470.
- Sukovich, E. M., F. M. Ralph, F. E. Barthold, D. W. Reynolds and D. R. Novak, 2014: Extreme quantitative precipitation forecast performance at the Weather Prediction Center from 2001 to 2011. *Wea. Forecast.*, **29**, 894-911.
- Neiman, P.J., F.M. Ralph, B.J. Moore and R. J. Zamora, 2014: The regional influence of an intense Sierra Barrier Jet and landfalling atmospheric river on orographic precipitation in northern California: A case study. *J. Hydrometeor.*, **15**, 1419-1439.
- Hughes, M., K.M. Mahoney, P.J. Neiman, B.J. Moore, M. Alexander and F.M. Ralph, 2014: The landfall and inland penetration of a flood-producing atmospheric river in Arizona. Part II:

- Sensitivity of modeled precipitation to terrain height and atmospheric river orientation. *J. Hydrometeor.*, **15**, 1954-1974.
- Neiman, P.J., G.A. Wick, B.J. Moore, F.M. Ralph, J.R. Spackman and B. Ward, 2014: An Airborne Study of an Atmospheric River over the Subtropical Pacific during WISPAR: Dropsonde Budget-box Diagnostics, and Precipitation Impacts in Hawaii. *Mon. Wea. Rev.*, **142**, 3199-3223.
- Creamean, J.M., C. Lee, T.C. Hill, A.P. Ault, P.J. DeMott, A.B. White, F.M. Ralph, and K.A. Prather, 2014: Chemical properties of insoluble precipitation residue particles. *J. Aerosol Sci.*, **76**, 13-27.
- Gorodetskaya, I.V., M. Tsukernik, K. Claes, F.M. Ralph, W.D. Neff, and N.P.M. Van Lipzig, 2014: The role of atmospheric rivers in anomalous snow accumulation in East Antarctica. *Geophys. Res. Lett.*, **41**, 6199-6206.
- Neiman, P.J., D.J. Gattas, A.B. White, L.J. Schick and F.M. Ralph, 2014: The use of snow-level observations derived from vertically profiling radars to assess hydrometeorological characteristics and forecasts over Washington's Green River basin. *J. Hydrometeor.*, **15**, 2522-2541.
- Mahoney, K., F.M. Ralph, K. Wolter, N. Doesken, M. Dettinger, D. Gattas, T. Coleman, and A. White, 2015: Climatology of extreme daily precipitation in Colorado and its diverse spatial and seasonal variability. *J. Hydrometeor.* **16**, 781-792.
- Rutz, J.J., J.W. Steenburgh and F.M. Ralph, 2015: The Inland Penetration of Atmospheric Rivers over Western North America: A Lagrangian Analysis. *Mon. Wea. Rev.*, **143**, 1924-1944.
- White, A.B., P.J. Neiman, J.M. Creamean, T. Coleman, F.M. Ralph and K.A. Prather, 2015: The Impacts of California's San Francisco Bay Area Gap on Precipitation Observed in the Sierra Nevada during HMT and CalWater. *J. Hydrometeor.*, **16**, 1048-1069.
- Creamean, J.M., A.P. Ault, A.B. White, P.J. Neiman, F.M. Ralph, P. Minnis and K.A. Prather, 2015: Impact of interannual variations in sources of insoluble aerosol species on orographic precipitation over California's central Sierra Nevada. *Atmos. Chem. Phys.*, **15**, 6535-6548.
- Lavers, D.A., F.M. Ralph, D.E. Waliser, A. Gershunov and M.D. Dettinger, 2015: Climate change intensification of horizontal water vapor transport in CMIP5. *Geophys. Res. Lett.*, **42**, doi:10.1002/2015GL064672.
- Coplen, T.B., P.J. Neiman, A.B. White and F.M. Ralph, 2015: Categorisation of Northern California rainfall for periods with and without a radar bright band using stable isotopes and a novel automated precipitation collector. *Tellus B*, **67**, 28574, <http://dx.doi.org/10.3402.tellusb.v67.28574>
-

- Dettinger, M., F. M. Ralph, and D. Lavers, 2015: Setting the stage for a global science of atmospheric rivers, *EOS*, **96**, doi:10.1029/2015EO038675.
- Ralph, F.M., K. A. Prather, D. Cayan, J.R. Spackman, P. DeMott, M. Dettinger, C. Fairall, R. Leung, D. Rosenfeld, S. Rutledge, D. Waliser, A. B. White, J. Cordeira, A. Martin, J. Helly, and J. Intrieri, 2016: CalWater Field Studies Designed to Quantify the Roles of Atmospheric Rivers and Aerosols in Modulating U.S. West Coast Precipitation in a Changing Climate. *Bull. Amer. Meteorol. Soc.*, **97**, 1209-1228.
- Neiman, P.J., B.J. Moore, A.B. White, G.A. Wick, J. Aikins, D.L. Jackson, J.R. Spackman, and F.M. Ralph, 2016: An airborne and ground-based study of a long-lived and intense atmospheric river impacting California during the CalWater-2014 Early-Start field campaign. *Mon. Wea. Rev.*, **144**, 1115-1144.
- Guan, B., D. E. Waliser, F. M. Ralph, E. J. Fetzer, and P. J. Neiman, 2016: Hydrometeorological characteristics of rain-on-snow events associated with atmospheric rivers. *Geophys. Res. Lett.*, **43**, 2964–2973, doi:[10.1002/2016GL067978](https://doi.org/10.1002/2016GL067978).
- Ralph, F. M., J. M. Cordeira, P. J. Neiman and M. Hughes, 2016: Landfalling atmospheric rivers, the Sierra barrier jet and extreme daily precipitation in northern California’s upper Sacramento river watershed. *J. Hydrometeor.*, **17**, 1905-1914.
- Lavers, D. A., D. E. Waliser, F. M. Ralph, and M. D. Dettinger, 2016: Predictability of horizontal water vapor transport relative to precipitation: Enhancing situational awareness for forecasting western U.S. extreme precipitation and flooding, *Geophys. Res. Lett.*, **43**, 2275–2282, doi:[10.1002/2016GL067765](https://doi.org/10.1002/2016GL067765).
-
- Cordeira, J. M., F. M. Ralph, A. Martin, N. Gaggini, J. R. Spackman, P. J. Neiman, J. J. Rutz and R. Pierce, 2017: Forecasting atmospheric rivers during CalWater 2015. *Bull. Amer. Meteor. Soc.*, **98**, 449-459.
- Oakley, N. S., J. T. Lancaster, M. L. Kaplan, and F. M. Ralph, 2017: Synoptic conditions associated with cool season post-fire debris flows in the Transverse Ranges of southern California. *Natural Hazards*, 1-28. doi:10.1007/s11069-017-2867-6
- Hu, H., F. Dominguez, Z. Wang, D. A. Lavers, G. Zhang and F. M. Ralph, 2017: Linking Atmospheric River Hydrological Impacts on the U.S. West Coast to Rossby Wave Breaking. *J. Clim.*, **30**, 3381-3399.
- Ralph, F.M., M. Dettinger, D. Lavers, I. V. Gorodetskaya, A. Martin, M. Viale, A. B. White, N. Oakley, J. Rutz, J. R. Spackman, H. Wernli and J. Cordeira, 2017: Atmospheric Rivers Emerge as a Global Science and Applications Focus. *Bull. Amer. Meteorol. Soc.*, **98**, 1969-1973. <https://doi.org/10.1175/BAMS-D-16-0262.1>.
- Gershunov A., T.M. Shulgina, F.M. Ralph, D. Lavers and J.J. Rutz, 2017: Assessing climate-

scale behavior of Atmospheric Rivers affecting western North America. *Geophysical Research Letters*, **44**, 7900-7908. DOI: 10.1002/2017GL074175.

- Lamjiri, M.A., M. D. Dettinger, F. M. Ralph, Bin Guan, 2017: Hourly storm characteristics along the U.S. West Coast: Role of atmospheric rivers in extreme precipitation. *Geophys. Res. Lett.*, DOI: 10.1002/2017GL074193.
- Ralph, F. M., S. F. Iacobellus, P. J. Neiman, J. M. Cordeira, J. R. Spackman, D. E. Waliser, G. A. Wick, A. B. White, and C. Fairall, 2017: Dropsonde observations of total water vapor transport within North Pacific atmospheric rivers. *J. Hydrometeor.* **18**, 2577-2596.
- Ralph, F.M., and T. J. Galarneau Jr., 2017: The Chiricahua Gap and the role of easterly water vapor transport in southeastern Arizona monsoon precipitation. *J. Hydrometeor.*, **18**, 2511-2520.
- Guan, B., D. E. Waliser, and F. M. Ralph, 2018: An Inter-comparison between reanalysis and dropsonde observations of the total water vapor transport in individual atmospheric rivers. *J. Hydrometeor.*, **19**, 3211-337.
- Ralph, F. M., M. D. Dettinger, M. M. Cairns, T. Galarneau, and J. Eylander, 2018: Development of the definition of the term “atmospheric river” for the Glossary of Meteorology. *Bull. Amer. Meteor. Soc.*, (in press, Nov 2017).
- DeFlorio, M. J., D. E. Waliser, B. Guan, D. A. Lavers, F. M. Ralph and F. Vitart, 2018: Global assessment of atmospheric river prediction skill. *J. Hydrometeorol.*, **19**, 409-426.
- Flint, L.E., A.L. Flint, J. Mendoza, J. Kalansky, F.M. Ralph, 2018: Characterizing drought in California: New drought indices and scenario-testing in support of resource management. *Ecological Processes*, **7**, DOI 10.1186/s13717-017-0112-6.
- Dettinger, M. D., F. M. Ralph, and J. J. Rutz, 2017: Historical return periods of the strongest atmospheric rivers on the U. S. West Coast. *J. Geophys. Res. – Atmos.* (submitted May 2017).
- Ralph, F. Martin, Jonathan J. Rutz, Jason M. Cordeira, Michael Dettinger, Michael Anderson, David Reynolds, Lawrence J. Schick and Chris Smallcomb, 2018: A Scale to Characterize the Strength and Impacts of Atmospheric Rivers. *Bull. Amer. Meteorol. Soc.*, (submitted, January 2018).
- Nardi, K.M., E.A. Barnes, and F. M. Ralph, 2018: Assessment of Numerical Weather Prediction Model Re-Forecasts of the Occurrence, Intensity, and Location of Atmospheric Rivers along the West Coast of North America. *J. Hydrometeor.* (submitted, February 2018).
- Demirdjian, R., F.M. Ralph, J. Norris, A. Martin, 2018: Dropsonde Observations of the Ageostrophy within the Pre-Cold-Frontal Low-Level Jet Associated with Atmospheric

Rivers. *Mon. Wea. Rev.*, (submitted, March 2018).

Books

Ralph, F.M. (Chief Editor), M.D. Dettinger, D. Waliser, J. Rutz (Co-Editors): Atmospheric Rivers. Springer (in preparation, with 30 co-authors across 8 sections). Target publication date: November 2018.

Cayan, D.R., Dettinger, M.D., Pierce, D., Das, T., Knowles, N., Ralph, F.M., and E. Sumargo, 2016: Natural Variability, Anthropogenic Climate Change, and Impacts on Water Availability and Flood Extremes in the Western United States, pp 17-44. In *Water Policy and Planning in a Variable and Changing Climate*. K.A. Miller, A.F. Hamlet, D.S. Kenney and K.T. Redmond. eds. CRC Press, 434 pp, ISBN 9781482227970.

Other reports:

NOAA, 2012: Understanding the Water Cycle: Findings from NOAA's Water Cycle Science Challenge Workshop, 60 pp, F. M. Ralph and R. Davis Co-Chairs, <http://www.esrl.noaa.gov/psd/events/2011/pdf/waterCycle-report-reformat.final.pdf>.

Porter, Keith, Wein, Anne, Alpers, Charles, Baez, Allan, Barnard, Patrick, Carter, James, Corsi, Alessandra, Costner, James, Cox, Dale, Das, Tapash, Dettinger, Michael, Done, James, Eadie, Charles, Eymann, Marcia, Ferris, Justin, Gunturi, Prasad, Hughes, Mimi, Jarrett, Robert, Johnson, Laurie, Dam Le-Griffin, Hanh, Mitchell, David, Morman, Suzette, Neiman, Paul, Olsen, Anna, Perry, Suzanne, Plumlee, Geoffrey, Ralph, Martin, Reynolds, David, Rose, Adam, Schaefer, Kathleen, Serakos, Julie, Siembieda, William, Stock, Jonathon, Strong, David, Sue Wing, Ian, Tang, Alex, Thomas, Pete, Topping, Ken, and Wills, Chris; Jones, Lucile, Chief Scientist, Cox, Dale, Project Manager, 2011: Overview of the ARkStorm scenario: U.S. Geological Survey Open-File Report 2010-1312, 183 p. and appendixes.

CalWater Science White Paper, 2012: Precipitation, aerosols and Pacific atmospheric rivers experiment. <http://www.esrl.noaa.gov/psd/calwater/pdf/CalWater2-08July14.pdf>, 29 pp, F.M. Ralph, K. Prather, D. Cayan (co-leads), R. Spackman, M. Dettinger, C. Fairall, R. Leung, D. Rosenfeld, S. Rutledge, D. Waliser.

FIRO Steering Committee Workplan, 2015: Lake Mendocino Forecast-Informed Reservoir Operations Viability Assessment Workplan, 329 pp, F. M. Ralph and J. Jasperse (co-chairs), M. Anderson, L. Brekke, M. Dillabough, R. Hartman, C. Jones, M. Dettinger, P. Rutten, C. Talbot, R. Webb.

Lake Mendocino FIRO Preliminary Viability Assessment, 2017: 72 pp, F. M. Ralph and J. Jasperse (co-chairs), M. Anderson, L. Brekke, M. Dillabough, R. Hartman, C. Jones, M. Dettinger, P. Rutten, C. Talbot, R. Webb.

Panels, Invited Presentations, Academic Seminars and selected other Presentations

- 2018, Panelist, AMS Washington Policy Forum, Washington, DC, April 2018.
- 2018, Invited speaker, Southwestern Extreme Precipitation Symp., La Jolla, CA, Mar. 2018
- 2018, Seminar, Water Resources Research Center, Tucson, AZ, Feb. 2018.
- 2018, Panelist, California Irrigation Institute, Sacramento, CA, Jan. 2018.
- 2017, Invited presentation, New Zealand Annual Weather Conference, “Recent developments in atmospheric river science, prediction and applications,” Dunedin, New Zealand, Nov. 2017.
- 2017, Seminar, European Centre for Medium-Range Weather Forecasting (ECMWF), “Recent developments in atmospheric river science, prediction and applications,” in concert with the ECMWF Atmospheric River Meeting, Reading, U.K., 7 Sept. 2017.
- 2017, Invited presentation, Mesoscale Meteorology Conference, “Emergence of the Concept of Atmospheric Rivers,” San Diego, CA 25 July 2017.
- 2017, Keynote presentation, World Environmental and Water Resources Congress (EWRI-ASCE), “Atmospheric Rivers: Recent Developments in Science and Applications,” Sacramento, CA, 22 May 2017.
- 2017, Seminar, Universidad de Chile, “Atmospheric Rivers: Recent developments in science and applications,” Santiago Chile, 25 April 2017.
- 2017, Invited presentation, American Society of Civil Engineers California Annual Infrastructure Conference, “Unlocking the Science of Atmospheric rivers,” Los Angeles, CA, 31 March 2017
- 2017, Seminar, University of Arizona, Hydrology and Atmospheric Sciences Dept., “The Chiricahua Gap: A key to the wettest monsoon days in southeastern Arizona,” Tucson, AZ, 3 Feb 2017
- 2017, Seminar, Seattle Public Utilities Climate Science Seminar Series, “Unlocking the Science of Atmospheric rivers,” Seattle, WA, 23 Jan 2017
- 2016, Invited presentation, AGU, “Emergence of applications of the atmospheric river concept,” San Francisco, CA, 15 Dec 2016
- 2016, Keynote presentation, Association of California Water Agencies (ACWA), “Unlocking the Science of Atmospheric rivers,” Anaheim, CA, 30 Nov 2016
- 2016, National Water Resources Association (NWRA), Advanced weather forecasting and water supply panel, “Atmospheric rivers,” San Diego, CA 14 Nov 2016
- 2016, American Water Works Association/California-Nevada Section, Invited Banquet Speaker, “Atmospheric rivers,” San Diego, CA 25 Oct 2016
- 2016, California Extreme Precipitation Symposium, “Forecast-Informed Reservoir Operations on Lake Mendocino,” Sacramento, CA 6 Sep 2016
- 2016, Keynote presentation, “Evolution of the Concept of Atmospheric Rivers,” International Atmospheric Rivers Conference, La Jolla, CA, 8 Aug 2016
- 2016, Congressional Briefing on Frontiers in Western Water Operations, U.S. House of Representatives, Washington DC, 13 Jul 2016
- 2016, San Diego Regional Chamber of Commerce, San Diego, CA, 7 July 2016
- 2016, Atmospheric Rivers, Water Management Workshop, Sacramento, CA 30 June 2016

- 2016, Progress on FIRO at Scripps, FIRO Workshop, La Jolla, CA, 27 June 2016
- 2016, Congressional Briefing on Basic Geoscience Support of American Security, Sponsored by AGU, U.S. House of Representatives, Washington, DC, 12 May 2016
- 2016, Western U.S. Observational Needs Supporting Water Management, NOAA-Western States Water Council Workshop on Western Water Information Needs, NCEP, College Park MD, 29 April 2016
- 2016, Seminar, UC Irvine, “Atmospheric Rivers – Progress in Understanding and Applications,” Irvine, CA, April 2016
- 2016, California Environmental Dialogue, “Atmospheric Rivers,” Universal City, CA, March 2016
- 2016, Scripps Institution of Oceanography, CASPO Science Seminar, “Horizontal Water Vapor Transport: The role of atmospheric rivers and impacts on precipitation,” La Jolla, CA 5 Jan 2016
- 2015, AGU, Invited presentation, “Atmospheric river forecasting: Current capabilities, gaps and emerging directions,” San Francisco, CA 17 Dec 2015.
- 2015, Western States Water Council strategy meeting with Lower Colorado River water managers for subseasonal to seasonal precipitation forecasting for the western U.S., “The role of extreme events in seasonal precipitation,” Las Vegas, NV, 15 Dec 2015
- 2015, USGS Innovation Summit, invited presentation, “Pacific storms of the future,” Menlo Park, CA 11 Dec 2015.
- 2015, Association of California Water Agencies annual winter meeting, Panel discussion on atmospheric rivers with water managers, Indian Wells, CA 3 Dec 2015
- 2015, Winter Outlook Workshop, “The role of coastal SST anomalies during a strong El Nino in amplifying landfalling atmospheric river intensity,” Scripps Inst. Of Oceanography, La Jolla, CA 19 Nov 2015.
- 2015, Western States Water Council strategy meeting with Upper Colorado River Basin water managers for subseasonal to seasonal precipitation forecasting for the western U.S., “The roles of summer monsoon and winter atmospheric rivers in western U.S. extreme precipitation,” Salt Lake City UT, 19 Oct 2015.
- 2015, Western States Water Council, Water Resources Committee, “Westwide Weather and Water Monitoring System Needs and Summary of a Concept for Forecast-Informed Reservoir Operations (FIRO),” Manhattan KS, 8 Oct 2015.
- 2015, Atmospheric River Workshop, “A brief history of atmospheric rivers as a US West Coast focus,” Scripps Inst. of Oceanography, La Jolla, CA 15 June 2015.
- 2015, UCAR Weather Day on the Hill, Seasonal Prediction Panel, Wash. DC 14 May 2015.
- 2015, AMS Washington Policy Forum, Water Resources Panel, Wash. DC, 21-23 April 2015.
- 2015, “Atmospheric Rivers: California’s Rainmakers,” Perspectives on Ocean Science Public Lecture Series at Birch Aquarium, La Jolla, CA 13 April 2015.
- 2015, Sonoma County Climate Adaptation Forum, Panel on “Extreme Weather Science – Drought & Deluge in Sonoma County,” Sonoma St. Univ., Rohnert Park, CA 8 Apr 2015.
- 2015, California Water Policy Conference, Panel on “Atmospheric Rivers and Reservoirs: The Solution to California’s Drought?,” Claremont, CA, 19 March 2015.
- 2015, “Anticipating extreme precipitation events,” Panel on “Climate Change: The New Normal, Bay Area Flood Protection Agencies Association (BAFPAA), Oakland, CA, 19 Feb 2015.

- 2015, Kickoff presentation at the Media Day for “CalWater-2015” field experiment, Sacramento, CA 3 Feb 2015.
- 2015, “CalWater 2015 field experiment,” AMS Annual Meeting, Phoenix, AZ, 7 Jan 2015.
- 2014, “Forecast-informed reservoir operations: A concept supporting water supply and flood control.” Presented at a Congressional Hill briefing on Univ. of California Water Research, House Rayburn Building, Wash. DC, 6 May 2014.
- 2013, “Atmospheric rivers: A brief review and emerging directions.” Seminar at Univ. of Notre Dame’s “*Environmental Fluid Dynamics & Environmental Change Initiative*” seminar series within the *Dept. of Civil and Environmental Engineering & Earth Sciences*,” South Bend, Indiana, September 2013.
- 2013, “Current and emerging directions in atmospheric river research and applications.” Keynote presentation at Univ. of Arizona’s *Atmospheric and Interdisciplinary Research Symposium*,” Tucson, Arizona, April 2013.
- 2013, “Storms, floods and atmospheric rivers—Putting the extreme into West Coast extremes” An invited public lecture, Victoria, Canada, March 2013.
- 2013, “Atmospheric rivers Research and Applications” OAR seminar, Silver Spring, MD, Feb 2013.
- 2013, “A whirl-wind testbed tour: First stop, HMT.” Special symposium on advancing weather and climate forecasts: Innovative techniques and applications, Austin, Texas, Jan 2013.
- 2012, “Observed impacts of duration and seasonality of atmospheric-river landfalls on soil moisture and runoff in coastal northern California and the role of long-duration atmospheric rivers in creating extreme hydrometeorological events,” Invited presentation at Fall AGU session on “Hotspots on a Changing Planet: Identifying Water-Energy-Food Security Challenges Under a Changing Climate,” San Francisco, CA, Dec 2012.
- 2012, “Recent and emerging science and applications relating to precipitation and atmospheric rivers in the Western U.S.,” Seminar at University of California at Irvine, Oct 2012.
- 2012, Panel on “Perspectives on Emerging Mountain-Climate Institutions,” Mountain Climate Research Conference - 2012, Estes Park, Colorado, Oct 2012.
- 2012, “The emerging science of flooding in the Russian River watershed.” Seminar at Sonoma State Univ., Santa Rosa, California, Sept 2012.
- 2012, “21st Century Western Observing System for Extreme Precipitation: Research Developments and Implementation Alternatives.” Workshop on Extreme Weather Events: Science, Planning and Preparedness Sponsored by the Western States Water Council, San Diego, California, July 2012.
- 2012, “NOAA’s Hydrometeorology Testbed - HMT.” NOAA Testbed Workshop, Boulder, Colorado, May 2012.

- 2012, "Atmospheric rivers and observing networks." Pacific Northwest Weather and Climate Outlook Forum: Dealing with Extreme Events – The Pacific Northwest. Sponsored by NOAA and Western Governors Association, Seattle, Washington, Apr 2012.
- 2012, "Physical understanding and forecasting of extreme west coast precipitation." Presented to National Academy of Sciences/Boards of Atmospheric Sciences and Climate, La Jolla, California, Apr 2012.
- 2012, "Recent and emerging science and applications relating to precipitation and atmospheric rivers in the Western U.S.," Seminar at University of Colorado Hydrology Research Series (invited), Boulder, Colorado, Mar 2012.
- 2012, "Recent and emerging science and applications relating to precipitation and atmospheric rivers in the Western U.S.," Seminar at University of Utah (invited), Salt Lake City, Utah, Mar 2012.
- 2012, "Recent and emerging science and applications relating to precipitation and atmospheric rivers in the Western U.S.," Seminar at NASA Jet Propulsion Laboratory, part of Colloquium Series on Water Resources (invited), Pasadena, California, Feb 2012.
- 2011, "Extreme events: Water hazards, and water supply," Symposium on Vulnerability and adaptation to extreme events in California in the context of a changing climate: New scientific findings, Scripps Institution of Ocean. (invited) La Jolla, CA, Dec 2011.
- 2011, "Physical understanding and forecasting of extreme precipitation events and flooding: Atmospheric Rivers," AGU Fall Meeting, Hydroclimate Extremes: Monitoring, Diagnosis and Prediction (invited) San Francisco, Dec. 2011.
- 2011, "An Observing Network Design for Extreme Precipitation, Flooding and Climate," Workshop on Extreme Weather and Water Conditions in the Western U.S. – Linkages Between Data Collection Needs and Extreme Event Monitoring, Forecasting, Science and Hydroclimate Trend Detection (invited), Western States Water Council meeting, Idaho Falls, ID, Oct 2011.
- 2011, "Atmospheric Rivers," Univ. of Arizona (invited), Tucson, Arizona, Sep 2011
- 2011, "Observing System Needs – Hydrometeorology Testbed," AMS Summer Community Meeting, Boulder, CO, Aug. 2011
- 2011, "A Vision of Observations for Extreme Precipitation and Flooding in the Western U.S.," Western States Water Council, Bend, OR, Jul 2011.
- 2011, "ARkStorm: An Emergency Preparedness Scenario," Luncheon presentation at the National Hydrologic Warning Council conference, San Diego, CA, May 2011.

- 2011, "Atmospheric Rivers," Western States Water Council, San Diego, CA, Mar 2011
- 2010, "The role of atmospheric rivers in generating precipitation via orographic processes," COMET Forecaster Training Course on Intense QPF, Boulder, CO, Nov. 2010.
- 2010, "CalWater – Monitoring aerosols and atmospheric rivers," Invited presentation at the 2010 Water and Climate Change Adaptation Symposium," Long Beach, CA 19 October.
- 2010, "A multi-scale observational case study of a Pacific atmospheric river exhibiting tropical-extratropical connections and a mesoscale frontal wave," CMMAP (Center for Multi-scale Modeling of Atmospheric Processes) team meeting, 3 August 2010, Fort Collins, CO.
- 2010, "Weather, Water, and Climate Service Needs and Science Priorities," panelist at "NOAA SES Summit," 3 June 2010, Lansdowne, VA.
- 2010, "Grand Challenges in NOAA Water and Weather Science," Invited presentation at the "Workshop on Strengthening NOAA Science," 20 April 2010, Washington, DC.
- 2010, "Atmospheric Rivers," seminar at INSTAAR, 19 April 2010, Boulder, CO.
- 2010, "Climate systems observations and analysis: Summary and way forward," Presentation at ESRL Physical Sciences Lab Review, 11 March 2010, Boulder, CO.
- 2010, "Research to improve climate, weather and water services," Presentation at ESRL Physical Sciences Lab Review, 10 March 2010, Boulder, CO.
- 2009, "A Climatic look forward - Precipitation," invited presentation, South Platte Forum, Longmont, Colorado, 21 October 2009.
- 2009, "Water resources management and hydrology," Joint Executive Meeting of NOAA and the Indian Ministry of Earth Sciences (MoES), Delhi, India, 6 October 2009.
- 2009, "A Winter storm scenario for the USGS Multihazards demonstration project." Extreme Precipitation Symposium, Davis, CA, 24 June 2009.
- 2009, NCAR Advanced Study Program Seminar Series, "Atmospheric Rivers," 19 May 2009, Boulder, CO.
- 2009, AMS Annual Meeting, Opening presentation at the 13th Conference on Integrated Observing and Data Assimilation Systems; "Exploring the Potential of Unmanned Aircraft Systems (UAS) to Meet NOAA Mission Requirements Involving Weather, Water, Climate and Marine Ecosystems", 12 January 2009, Phoenix, AZ.
- 2008, Kickoff meeting of the USGS-led Multi-Hazards Project Winter Storm Scenario Planning, "California's Super Storm: Plausible Hydrometeorological Characteristics of a "Worst-Case"

- Winter Storm in California,” 29 October 2008, CalTech University, Pasadena, CA.
- 2008, NOAA Science Advisory Board; Overview of NOAA’s UAS Project, 17 July 2008, Sandusky, OH
- 2008, NOAA Research Council; status report on the NOAA Unmanned Aircraft Systems Project – from Planning to execution, 5 May 2008, Silver Spring, MD.
- 2008, NOAA/OAR Senior Research Council; presentation of “Flooding on California’s Russian River: Role of atmospheric rivers,” which had been selected as an “OAR Outstanding Paper,” 10 March 2008, Washington, DC
- 2007, Panel on “Industry, FAA and Agency Vision for Unmanned Aircraft Systems” at the Symposium on “Civilian Applications of Unmanned Aircraft Systems,” 2 October 2007, Boulder, Colorado
- 2007: “A 21st Century Observing System for California Weather and Climate: Current Plans and Future Possibilities,” California Climate Change Conference, 11 September 2007, Sacramento, California
- 2007: “Town Hall Meeting on Use of Unmanned Aircraft Systems in NOAA,” at Association for Unmanned Vehicle Systems International (AUVSI) Conference, 8 August 2007, Washington, DC
- 2007: “Atmospheric Rivers: Connecting weather and climate in the water cycle,” Seminar, Stanford University, 7 May 2007, Palo Alto, California.
- 2007: “Atmospheric Rivers: Connecting weather and climate in the water cycle,” Presidential Forum at the 2007 AMS Annual meeting, 15 January 2007, San Antonio, Texas.
- 2006: “Testbeds: Bridging the Gap Between Observing Systems and Predictions,” (Dedication of the Earth Systems Research Laboratory - ESRL, Boulder, CO, 24 Aug)
- 2006: Panelist on “Feasibility of Multi-Partner, Multifunctional Mesoscale Observing Networks,” 2nd Annual Summer Community Meeting of the AMS Commission on the Weather, Climate Enterprise, 26-29 June 2006, Boulder, CO.
- 2006: “Atmospheric Rivers and Hydrometeorological Testbed” Panelist for H2Open Forum at American Water Works Association Annual Meeting, San Antonio, TX, 14 June
- 2006: “Profiling Needs for Boundary Layer Mesoscale Research and Operations,” Keynote address at 7th International Symposium on Tropospheric Profiling: Needs and Technologies. Boulder, CO, 12 June.
- 2005: “NOAA Research Perspective on: Hydrometeorological Testbed.” Presentation to the National Academy of Sciences’, Committee on “The future of Rainfall Measuring

Satellite Missions. Washington, DC 18 October.

- 2004: A Southern California Hydrometeorology and Flash Flood Forecasting. @ Presentation to The National Academies= A Committee to Assess NEXRAD Flash Flood Forecasting Capabilities at Sulphur Mountain, California. Ventura, CA.
- 2004: A Atmospheric Rivers: Connecting weather and climate in the water cycle. @ 21st Annual Pacific Climate (PACLIM) Workshop, Monterey, CA.
- 2004: A Atmospheric Rivers: Connecting weather and climate in the water cycle. @ SCRIPPS Climate Seminar, La Jolla, CA.
- 2003: A Radar applications to winter-season West Coast research and forecasting in the CALJET and PACJET experiments. @ Amer. Meteor. Soc. Conference on Radar Meteorology, Seattle, WA.
- 2001: A Structure and Origins of Coastally Trapped Winds in Land-Falling Pacific Winter Storms in California. @ Gordon Research Conference on Coastal Ocean Circulation, New London, NH.
- 2001: "West Coast Precipitation." Lecture at COMET Hydrometeorological training Course for river forecasters, 30 November 2001.
- 2000: Pacific Coast Winter Storms: Societal Impacts, The Forecast Problem, and Exploring Solutions. Operation Sierra Storm, 19 January, 2000, South Lake Tahoe, NV. Symposium, 27-29 March, Boulder, CO.
- 1999: Mountain Wave Behavior and Forecasting. Lecture at COMET Mesoscale Analysis and Prediction Course, 23 August, Boulder, CO.
- 1999: The California Land-falling Jets Experiment (CALJET): Motivation, strategy, and description of a flooding event. Seminar at the California Weather Symposium, Sacramento, CA.
- 1999: A summary of CALJET observing systems for improved winter coastal storm prediction. National Weather Service Western Region Marine Forecaster Training Course, 25-28 May, Monterey, CA.
- 1998: Wind profiler applications and lee-side cold fronts. Winter Weather Workshop at the Denver office of the National Weather Service, Denver, CO.
- 1998: Observations of the marine environment: Profilers and other vertical structure along the coast. National Weather Service Western Region Marine Forecaster Training Course, 23-26 June, Monterey, CA.
- 1997: An overview of recent applications of wind profiler and RASS measurements in

mesoscale meteorological studies and forecasting in the western United States. COST-76 Profiler Workshop, Engelberg, Switzerland.

1997: Appropriate roles of surface-based and in-situ observations. U. S. Weather Research Program, Data Assimilation Workshop, 8-10 December, Monterey, CA.