

Robert Cifelli, Ph.D.

PRESENT POSITION

Chief, Hydrology Applications Division, ZP1340/5
Physical Science Laboratory (PSL)
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EDUCATION

B.A. (1983) Geology, University of Colorado, Boulder, Colorado
M.S. (1986) Hydrogeology, West Virginia University, Morgantown, West Virginia (H. Rauch, Advisor)
Ph.D. (1996) Atmospheric Science, Colorado State University, Fort Collins, Colorado (S. Rutledge, Advisor)

PROFESSIONAL EMPLOYMENT

2022-Present: Chief, Hydrology Applications Division, NOAA, PSL, Boulder Colorado, ZP 1340/5

- Lead for 25 member research group focused on precipitation extremes, hydrologic modeling, and hydroclimate applications
- NOAA lead for Study of Precipitation, Lower Atmosphere, and Surface for Hydrometeorology ([SPLASH](#))

2015-2022: Hydrometeorology Modeling and Applications Team Lead, NOAA PSL, Boulder, Colorado, ZP 1340/5

- Lead for 12 person research group focused on improving physical process understanding and guiding model development associated with water extremes, both too little and too much
- Lead and manage numerous research projects, including the Advanced Quantitative Precipitation Information (AQPI) system, a \$19.2M research effort aimed at improving precipitation, streamflow, and coastal flooding in the San Francisco Bay Area. Project includes over 35 people across 3 NOAA Labs and a total of 7 organizations.
- Manage team budget (\$5M+), align personnel to research projects, and provide strategic/tactical leadership on resource allocations
- Work with PSL leadership to provide strategic direction to the Laboratory's research portfolio

2011-2014: Hydrometeorology Science Team Lead and Deputy Water Cycle Branch Chief (2013-2014), NOAA PSD, Boulder, Colorado ZP 1340/4

- Managed team budget (\$2M+) and align personnel to research projects
- Managed budget (\$2M+) and provided strategic direction for HMT

- Responsible for the planning and coordination of HMT research to operations (R2O) activities

2009-2011: Field Coordinator, Hydrometeorology Testbed (HMT), NOAA PSD and Cooperative Institute for Research in the Atmosphere (CIRA), Boulder, Colorado

- Responsible for the planning, coordination, and execution of HMT field activities

1999-2009: Research Scientist, Department of Atmospheric Science, Colorado State University, Fort Collins, Colorado

- Lead scientist on numerous field campaigns around the world, including EPIC-2001 (East Pacific, 2001), CRYSTAL-FACE (Florida Everglades, 2002), NAME (Mazatlan, MX, 2004), NAMMA (Republic of Cape Verde, 2006), and C3VP (Ontario, Canada, 2007). Responsibilities during these campaigns included planning and logistics of instrument deployments (radar and ancillary instrumentation such as rain gauges, disdrometers, and sounding networks) as well as oversight of radar operations and analysis of data sets. For several campaigns, assisted in the development of flight tracks for aircraft sampling that were needed to complement the ground based sampling and satisfy the overall mission goals
- Extensive experience in the analysis of radar and other observational and modeling data sets to further understanding of storm dynamics (single and multiple Doppler retrievals) precipitation processes (interpretation of polarimetric observations) and improve/evaluate quantitative precipitation estimation algorithms
- PI or Co-PI on numerous grants
- First in Atmospheric Science Department to be promoted to Senior Research Scientist (2007)
- Co-led a team to expand the Community Collaborative Rain Hail and Snow (CoCoRaHS) network nationwide
- Developed and taught undergraduate course (weather and climate) and graduate courses (radar meteorology) at Colorado State University

1997-1999: Assistant Research Professor, Joint Center for Earth Systems Technology, University of Maryland Baltimore County, Baltimore, Maryland and Tropical Rainfall Measuring Mission Office, Laboratory for Atmospheres, NASA Goddard Space Flight Center, Greenbelt, Maryland

- Lead scientist on numerous field campaigns around the world, including SCSMEX (South China Sea, 1998), TEFLUN-B (Melbourne, FL, 1998), TRMM-LBA (Rondonia, Brazil, 1999), KWAJEX (Marshall Islands, 1999)
- Developed and taught an undergraduate course in climate change at University of Maryland Baltimore County

1996-1997: Visiting Fellow, CIRES, University of Colorado, Boulder, Colorado (S. Avery Advisor)

- Developed algorithm to retrieve drop size distribution characteristics from wind profiler data

SPECIAL ASSIGNMENTS

Detail (half time), NOAA Office of Water Prediction (OWP), Tuscaloosa, AL, 2016

- Evaluation of forcings for hydrologic prediction, physical process representation in the National Water Model, and coordination of quantitative precipitation estimation and forecast efforts across NOAA to address internal OWP and external stakeholder needs
Detail, Bureau of Reclamation, Lakewood, CO, 2016, President's Management Council
Interagency Rotation Program
- Focused on developing improved weather, climate, and water forecasts of extreme events to better meet water management needs. Co-led development and execution of a forecast competition to improve S2S forecasts of temperature and precipitation with Bureau of Reclamation, NOAA Climate Prediction Center, NOAA Physical Sciences Division, and the National Integrated Drought Information System

HONORS and AWARDS

- CO-LABS Governor's Award for High Impact Research, 2019
- Department of Commerce Bronze Medal, 2017 (Award to PSD for El Nino Rapid Response Field Campaign)
- NOAA Administrator's Award, 2017 (Russian River Habitat Blueprint)
- UCAR Education and Outreach Award Recipient, 2009
- Visiting Fellow, Cooperative Institute for Research in Environmental Sciences, University of Colorado, 1996

DEVELOPMENT ACCOMPLISHMENTS

- Bay Area Advanced Quantitative Precipitation Information System, California Department of Water Resources, \$19.2M, (10/117-9/30/21), PI.
- National Water Model Assessment for Reclamation's Water Management Needs, U.S. Bureau of Reclamation, \$297,000 (11/1/18-12/31/20), PI.
- Forecast Forcings Evaluation, NOAA Office of Water Prediction, \$87,000 (10/1/17-9/30/18), PI.
- San Francisco Bay Coastal Flooding, California Department of Water Resources, \$500,000 (6/1/15-5/31/16), PI.
- Frost Forecast System Maintenance Operations, Sonoma County Water Agency, \$100,300, (8/1/15-5/31/16), PI.
- Phase 2 of HMT Activities Supporting the Sonoma County Water Agency, Sonoma County Water Agency, \$815,000, (3/1/13-6/31/15), Co-PI.
- Studies of Convection and Precipitation Physics Under PMM, National Aeronautics and Space Administration, \$500,000, (1/1/10-12/31/12), Co-I.
- GPM Ground Validation Studies at Colorado State University, National Aeronautics and Space Administration, \$30,000 (5/30/), Co-I.
- Studies of Convection in NAME, National Science Foundation, \$565,001 (11/1/07-10/31/10), Co-I.
- GPM Ground Validation Studies at Colorado State University, National Aeronautics and Space Administration, \$90,013 (12/01/07-10/30/08), Co-I.

- CoCoRaHS: Enhancing Environmental Literacy Through Participation in Climate Monitoring and Research, National Oceanic and Atmospheric Administration \$585,000 (10/01/06-09/30/09), Co-PI.
- Radar-based Studies of Convection, Easterly Waves and Developing Tropical Storms in NAMMA, National Aeronautics and Space Administration, \$388,828 (06/01/06-05/31/09), PI.
- Development and Application of EPIC Integrated Datasets for Atmospheric and Coupled Modeling, National Oceanic and Atmospheric Administration, \$109,255 (05/01/06-04/30/07), PI.
- S-POL Radar Studies in NAME, National Science Foundation, \$350,000, (02/01/04-01/31/07), Co-PI.
- Ship-Based Radar, Sounding, and Flux Observations in Support of NAME” National Oceanic and Atmospheric Administration, \$220,000, (04/01/04-03/31/07), Co-PI.
- Physically-based Observational Studies for TRMM and Concept Development for GPM Validation, National Aeronautics and Space Administration, \$930,000, (07/01/03-06/30/06), Co-PI.
- The Community Collaborative Rain and Hail Study - Science Education Through Participation in Community-Based Research, National Science Foundation, \$897,341 (12/01/02-11/30/05), P.I.
- Improving Quantitative Precipitation Estimation Through Combined Use Of Dual Polarimetric Radar And A High Density Volunteer Precipitation Network”, Cooperative Program for Operational Meteorology, Education, and Training (COMET) Cooperative Project, \$74,517 (06/01/02-05/31/04), P.I.
- Polarimetric Radar Measurements of Tropical Convection in Support of CRYSTAL-FACE. National Aeronautics and Space Administration, \$55,547 (01/01/02-12/31/03), Co-PI.
- Analysis of Data from TRMM/LBA for the Purpose of Validating TRMM Cloud Models. National Aeronautics and Space Administration, NRA-99-OES-03, \$591,104 (10/1/00 - 9/30/03), Co-I.
- Shipboard Radar Observations of Precipitating Convection in EPIC2001. National Science Foundation, \$515,870 (01/01/01-12/31/03), Co-PI.
- Profiler Observations in TRMM: Validation for Latent Heating and Precipitation Measurements. National Aeronautics and Space Administration, NRA-98-OES-02, \$255,120 (10/1/98 - 9/30/01), PI.

TRANSITION OF RESEARCH TO APPLICATIONS

- Technical Lead for transition of NOAA/CIRA and USGS experimental precipitation, streamflow, and coastal flooding products to San Francisco Bay Area Water Agencies through the Advanced Quantitative Precipitation Information System, 2017-2021.
- Technical Lead for transition of experimental gap-filling radar products from NOAA/CIRA to NOAA National Weather Service operational radar product system (Multi Radar - Multi Sensor), 2017-2021.
- Transitioning Evaporative Demand Drought Index (EDDI) experimental product from NOAA PSD to an operational product at the NOAA OWP, 2016-2019.

- Transitioning research on extreme precipitation and future climate for incorporation in 2019 Colorado Dam Safety Rules on Spillway Design, November 2019.

SELECTED PRESENTATIONS

- “Toward Greater Resilient Water Infrastructure to Future Hydrometeorological and Climate Extremes: Lessons from Oroville Dam and Hurricane Harvey”, American Geophysical Union Annual Meeting, December 2019
- “An Advanced Quantitative Precipitation Information System for the Bay Area”, Resource and Infrastructure, Bay Planning Coalition, September 2019 (Invited)
- “Improved Monitoring and Prediction of Precipitation, Streamflow, and Coastal Flooding in the Bay Area”, Storms, Flooding, and Sea Level Defense: Science and Impacts Conference, December 2019 (Invited)
- “Rainfall Estimation and Performance Characterization Using X-band Dual-Polarization Radar”, American Geophysical Union Annual Meeting, December 2016 (Invited)
- “Improving Radar Quantitative Precipitation Estimation Over Complex Terrain in the San Francisco Bay Area”, American Geophysical Union Annual Meeting, December 2017 (Invited)
- “Prototype Development of Coupled Precipitation and Hydrologic Prediction Systems for Urban Environments”, A Next Generation Weather Information Service Engine (WISE) Workshop, Seoul, South Korea, November, 2015 (Invited)
- “Application of Hydrological Radars for Urban Flood Management”, Korea Institute of Construction Technology , Seoul, South Korea, June 2013 (Invited)

PROFESSIONAL AFFILIATIONS / ACTIVITIES / SERVICE

- Chair, American Meteorological Society, Water Resources Committee
- Member, American Geophysical Union
- Member of NOAA National Water Initiative Research and Development and Modeling teams
- Member of the Interagency Climate Change and Water Working Group
- Member NASA PMM Science Team
- Session Co-Chair, “Utilizing Precipitation Datasets and Quantifying Associated Uncertainties in Hydrometeorological and Climate Impact Applications”, American Geophysical Union Annual Meeting, 2016
- Session Co-Chair, “Advances in Radar Remote Sensing of Clouds and Precipitation: Observations, Data Processing, Weather, and Water Model Applications”, American Geophysical Union Annual Meeting, 2018 and 2019
- Session Co-chair, “Hydrology and Adaptive Management in Arid and Semiarid Environments”, American Geophysical Union Annual Meeting, 2019
- Convenor, “Water and Society: Enhancing and Communicating Hydroclimate and Weather Forecasts of Extreme Events for Water Resources Decision-Making”, American Geophysical Union Annual Meeting, 2019
- NOAA OAR Representative, Russian River Habitat Blueprint, 2015-Present

- Working across Line Offices (NOS, NMFS, NWS, OAR), developed concept strategy to improve water supply reservoir operations using state-of-the-art forecast information (Forecast-Based Operations, later became Forecast Informed Reservoir Operations)
- NOAA GPM Advisory Panel Co-Chair on Precipitation Measurement from Space
- Lead for planning and implementation of PSD workshop on water research activities
 - provided recommendations for future directions in water research to PSD leadership, 2019

REFERENCES

V. Chandrasekar, Ph.D., University Distinguished Professor, Department of Electrical Computer Engineering, Colorado State University, 1373 Campus Delivery Fort Collins, CO, 80523-1373, 970-491-7981, chandra@colostate.colostate.edu

Tom Graziano, Director, NOAA Office of Water Prediction, 1325 East West Highway Silver Spring, MD 20910, 301-427-6904, thomas.graziano@noaa.gov

Mike Anderson, Ph.D., P.E., California State Climatologist, California Department of Water Resources, Division of Flood Management, Hydrology and Flood Operations Office, Hydrology Branch, 3310 El Camino Ave, Sacramento, CA 95821, 916 574-2830, Michael.L.Anderson@water.ca.gov

PUBLICATIONS IN REVIEWED LITERATURE

Published over 60 articles in peer-reviewed literature

H-Index 26 (Web of Science); H-Index 29 (Google Scholar)

- English, J. M., D. D. Turner, D. C. Dowell, T. I. Alcott, W. Moninger, R. Cifelli, and J. L. Bytheway, 2023: Probabilistic Forecasts of Atmospheric River events using the HRRR Ensemble. *J. Operational Meteor.*, accepted.
- Wang, L., H. Chen, R. Cifelli and Z. Li, 2023: Improving Surface Rainfall Mapping in Complex Terrain Regions Through Lowering the Minimum Scan Elevation Angle of Operational Weather Radar. *IEEE Geoscience and Remote Sensing Letters*, vol. 20, pp. 1-5, 2023, doi: [10.1109/LGRS.2023.3270912](https://doi.org/10.1109/LGRS.2023.3270912).
- Cifelli, R. + many co-authors, 2022: The Advanced Quantitative Precipitation Information System: Improving Monitoring and Forecasts of Precipitation, Streamflow, and Coastal Flooding in the San Francisco Bay Area. *Bull. Amer. Meteor. Soc.*, (Online), <https://doi.org/10.1175/BAMS-D-21-0121.1>.
- Yao, S., H. Chen, E. J. Thompson and R. Cifelli, 2022: "An Improved Deep Learning Model for High-Impact Weather Nowcasting," in *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, doi: [10.1109/JSTARS.2022.3203398](https://doi.org/10.1109/JSTARS.2022.3203398).
- Biswas, S. K., R. Cifelli, and V. Chandrasekar, 2022: Quantitative precipitation estimation using X-band radar for orographic rainfall in the San Francisco Bay Area. *IEEE Trans. Geoscience and Remote Sensing.*, doi: [10.1109/TGRS.2022.3207829](https://doi.org/10.1109/TGRS.2022.3207829).

- Sthapit, E., T. Lakhankar, M. Hughes, R. Khanbilvardi, R. Cifelli, K. Mahoney, and W. R. Carrier, 2022: Evaluation of Snow and Streamflow in Noah-MP and WRF-Hydro Model in Aroostook River Basin, Maine. *J. Water*. 14, 2145, <https://doi.org/10.3390/w14142145>.
- McCoy, A., K. Jacobs, J. Vano, J. Wilson, S. Martin, and R. Cifelli, 2022: The Press and Pulse of Extreme Events in the Colorado River Basin. *J. Amer. Water Resources Assoc.*, <https://doi.org/10.1111/1752-1688.13021>.
- Chen, H., L. Sun, R. Cifelli, and Pingping Xie, 2021: Deep learning for bias correction of satellite retrievals of orographic precipitation. *IEEE Trans. Geosci. Remote Sensing*, <https://doi.org/10.1109/TGRS.2021.3105438>.
- Bytheway, J.L., M. Hughes, R. Cifelli, Kelly Mahoney, and Jason M. English, 2021: Demonstrating a probabilistic QPE for evaluating precipitation forecasts in complex terrain, *Wea. Forecasting*, 37, 45-64, <https://doi.org/10.1175/WAF-D-21-0074.1>.
- English, J.M., D. D. Turner, T.I. Alcott, W. R. Moninger, J. L. Bytheway, R. Cifelli, and M. Marquis, 2021: Evaluating Operational and Experimental HRRR model forecasts of Atmospheric River events in California, *Wea. Forecasting*, 36(6), 1925-1944, <https://doi.org/10.1175/WAF-D-21-0081.1>.
- Hughes, M., D. Swales, J. Scott, M. Alexander, K. Mahoney, R. McCrary, R. Cifelli, and M. Bukovsky, 2021: Changes in extreme IVT on the US west coast in NA-CORDEX, and relationship to mountain and inland precipitation. *Clim. Dynamics*, <https://doi.org/10.1007/s00382-022-06168-6>.
- Cifelli, R., L. E. Johnson, J. Kim, T. Coleman, G. Pratt, L. Herdman, R. Martyr-Koller, J. A. FinziHart, L. Erikson, P. Barnard, and M. Anderson (January 2021): Assessment of Flood Forecast Products for a Coupled Tributary-Coastal Model. *Water*, 13, 312, <https://doi.org/10.3390/w13030312>.
- Ma, Y., V. Chandrasekar, H. Chen, and R. Cifelli, 2021: Quantifying the potential of AQPI gap-filling radar network for streamflow simulation through a WRF-Hydro experiment. *J. Hydrometeor.*, 22, 1869-1882, <https://doi.org/10.1175/JHM-D-20-0122.1>.
- Penland, C., M. D. Fowler, D. L. Jackson, and R. Cifelli, 2021: Forecasts of opportunity for Northern California soil moisture. *Land*, 10, no. 7, 713. <https://doi.org/10.3390/land10070713>.
- Chen, H., V. Chandrasekar, R. Cifelli, and P. Xie, 2020: A machine learning system for precipitation estimation using satellite and ground radar network observations. *IEEE Trans. Geosci. Remote Sens.*, 58(2), 982-994, <https://doi.org/10.1109/TGRS.2019.2942280>.
- Chen, H., R. Cifelli, and A. White, 2020: Improving Operational Radar Rainfall Estimates Using Profiler Observations over Complex Terrain in Northern California. *IEEE Trans. Geosci. Remote Sens.*, 58(3), 1821-1832, <https://doi.org/10.1109/TGRS.2019.2949214>.
- Bytheway, J. L., M. Hughes, K. Mahoney, and R. Cifelli, 2020: On the uncertainty of high resolution hourly Quantitative Precipitation Estimates in California. *J. Hydrometeor.*, (Online), <https://doi.org/10.1175/JHM-D-19-0160.1>.
- Kim, J., L. Read, L., L.E. Johnson, D. Gochis, R. Cifelli, and H. Han: 2020: An Experiment on Reservoir Representation Schemes to Improve Hydrologic Prediction:

Based on Coupling the National Water Model with the HEC-ResSim. *Hydrological Sciences Journal (ONLINE)*, <https://doi.org/10.1080/02626667.2020.1757677>

- Chen, H., R. Cifelli, and A. White, 2020: Improving Operational Radar Rainfall Estimates Using Profiler Observations over Complex Terrain in Northern California. *IEEE Transactions on Geoscience and Remote Sensing*, *58*(3), 1821-1832, <https://doi.org/10.1109/TGRS.2019.2949214>.
- Viterbo, F., K. Mahoney, L. Read, F. Salas, B. Bates, J. Elliott, B. Cosgrove, A. Dugger, D. Gochis, R. Cifelli, 2020: A Multi-Scale, Hydro-Meteorological Forecast Evaluation of National Water Model Forecasts of the May 2018 Ellicott City, MD Flood. *J. Hydrometeorol.*, *21* 475-499, <https://doi.org/10.1175/JHM-D-19-0125.1>
- Tehranirad, B.; L. Herdman, K. Nederhoff, L. Erikson, R. Cifelli, G. Pratt, M. Leon, and P. Barnard, 2020: Effect of Fluvial Discharges and Remote Non-Tidal Residuals on Compound Flood Forecasting in San Francisco Bay. *Water*, *12*, 2481, <https://doi.org/10.3390/w12092481>.
- Viterbo, F., L. Read, K. Nowak, A. Wood, D. Gochis, R. Cifelli, and M. Hughes, 2020: Assessment of National Water Reservoir Inflows for Bureau of Reclamation Water Management Needs., *J. Water*, *2020*, *12*, 2897, <https://doi.org/10.3390/w12102897>.
- Bytheway, J., M. Hughes, K. Mahoney, and R. Cifelli, 2019: A Multiscale evaluation of multisensor quantitative precipitation estimation in the Russian River Basin. *J. Hydromet.*, *20*, 447-466, <https://doi.org/10.1175/JHM-D-18-0142.1>.
- Chen, H., V. Chandrasekar, R. Cifelli, and P. Xie, 2019: A Machine Learning System for Precipitation Estimation Using Satellite and Ground Radar Network Observations. *IEEE Trans. Geosci. Remote Sens.*, <https://doi.org/10.1109/TGRS.2019.2942280>.
- Chen, H., R. Cifelli, V. Chandrasekar, and Y. Ma, 2019: A Flexible Bayesian Approach to Bias Correction of Radar-derived Precipitation Estimates over Complex Terrain: Model Design and Initial Verification. *J. Hydrometeorol.*, <https://doi.org/10.1175/JHM-D-19-0136.1>.
- Johnson, L. E., R. Cifelli, and A. White, 2019: Benefits of an Advanced Quantitative Precipitation Information System. *J. Flood Risk Mgt.*, <https://doi.org/10.1111/jfr3.12573>.
- Kim, J., H. Han, L. E. Johnson, S. Lim, and R. Cifelli, 2019: Hybrid Machine Learning Framework for Hydrological Assessment. *J. Hydrol.*, *577*, 123913, <https://doi.org/10.1016/j.jhydrol.2019.123913>.
- Chen, H., V. Chandrasekar, H. Tan, and R Cifelli, R. 2019: Rainfall Estimation from Ground Radar and TRMM Precipitation Radar Using Hybrid Deep Neural Networks. *Geophys Res Lett*, *46*, <https://doi.org/10.1029/2019GL084771>.
- Kim, J., L. Johnson, R. Cifelli, A. Thorstensen, and V. Chandrasekar, 2019: Assessment of antecedent moisture condition on flood frequency: An experimental study in Napa River Basin, CA. *J. Hydrol. Reg. Studies*, *26*, 100629, <https://doi.org/10.1016/j.ejrh.2019.100629>.
- Vano, J.A., M.D. Dettinger, R. Cifelli, D. Curtis, A. Dufour, K. Miller, J.R. Olsen, and Wilson, A.M., 2019: Hydroclimatic extremes as challenges for the water management community: Lessons from Oroville Dam and Hurricane Harvey. *Bull. Amer. Meteor. Soc.*, Explaining Extreme Events of 2017 Special Supplement, *100*, S9-S14.

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- Willie, D., H. Chen, V. Chandrasekar, R. Cifelli, C. Campbell, D. Reynolds, S. Matrosov, and Y. Zhang, 2017: Evaluation of Multisensor Quantitative Precipitation Estimation in the Russian River Basin. *J. Hydrologic Eng.*, **10**, [10.1061/\(ASCE\)HE.1943-5584.0001422](https://doi.org/10.1061/(ASCE)HE.1943-5584.0001422), E5016002.
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- Zhang, Y., D. Kitzmiller, D.J. Seo, D-S Kim, and R. Cifelli: 2015: Creation of Multisensor Precipitation Products from WSI NOWrad Reflectivity Product. *J. Hydrologic, Eng.*, DOI: 10.1061/(ASCE)HE.1943-5584.0001216.
- Moore, B.J., M.S.; K. Mahoney, E. Sukovich, R. Cifelli, T. Hamill, 2015: Climatology and Environmental Characteristics of Extreme Precipitation Events in the Southeastern United States. *Mon. Wea. Rev.*, **143**, 718-741.
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