

American Water
Resources Association
OMAHA
MARCH 25 - 27



2019 Spring Specialty Conference
FINAL PROGRAM

Setting Conditions for the Success of
Integrated Water Resources Management



Embassy Suites by Hilton | Omaha, Nebraska

American Water Resources Association | 4 West Federal Street | P.O. Box 1626 | Middleburg, VA 20118-1626
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WELCOME



AWRA 2019 SPRING SPECIALTY CONFERENCE - Setting Conditions for the Success of Integrated

Omaha, NE | March 25 – 27, 2019

Integrated Water Resources Management (IWRM) principles support the sustainable management of water through collaboration, innovative science and technology, as well as community-based planning and implementation. At its best, IWRM applies knowledge from various disciplines and diverse stakeholders to devise and implement equitable and sustainable solutions to water-related issues. Since IWRM's inception in the early 1990s, a growing number of organizations have adopted or been empowered to enact the principles of IWRM in day-to-day activities.

Following in the steps of the 2011 and 2014 AWRA IWRM conferences, the 2019 AWRA Spring Specialty Conference will support dialog, sharing and learning about the tactics, strategies and policies that are helping IWRM succeed across North America and the world. Researchers, practitioners and academics will assemble in Nebraska - a state that has implementing IWRM for over a decade - to consider how IWRM can become the normative model of water management, or simply, "how we do things."

KEYOTE SPEAKER



Tony Willardson

Executive Director, Western States Water Council, Murray, UT

Water is an increasingly scarce and precious resource. An integrated, collaborative, and grassroots approach to water resources management is essential, and should be recognized as a critical public policy priority. Our vision is to ensure an adequate, secure and sustainable supply of water of suitable quality to meet our diverse economic and environmental needs now and in the future. This will require stronger collaboration and cooperation that transcends political and geographic boundaries between states, federal agencies, tribes, and local communities.

THE 2019 SPRING SPECIALTY CONFERENCE PLANNING COMMITTEE CHAIRS



Amy Zoller

Conference General Co-Chair

Integrated Water Management
Coordinator, Nebraska
Department of Natural Resources,
Lincoln, NE



Mike Antos

Conference General Co-Chair

Senior Integrated Water
Management Specialist,
Stantec Consulting Services, Inc.,
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Michael Campana

Technical Program Co-Chair

Professor,
Oregon State University
Corvallis, OR



Jesse Bradley

Conference General Co-Chair

Assistant Director Nebraska
Department of Natural Resources,
Lincoln, NE

TUESDAY, MARCH 26

8:00 am – 5:00 pm		Registration	
8:30 am – 10:00 am	Exhibits Open (Missouri)	Elkhorn A - SESSION 7 The Role of IWRM in Creation, Governance, Success of the Platte River Recovery Implementation Program	SESSION 8 Data Resources, Quality and Visualization (Elkhorn B)
10:00 am – 10:30 am		Networking Break (Missouri)	
10:30 am - 12:00 pm		SESSION 9 Applied Engineering Projects and Monitoring Assessments (Elkhorn A)	SESSION 10 Decision Support Systems and Optimization (Elkhorn B)
12:00 pm – 1:30 pm		Exhibitor Networking Bistro Luncheon	
1:30 pm – 3:00 pm		SESSION 11 Republic River Compact: Past, Present, and Future (Elkhorn A)	SESSION 12 Education, Outreach & Public Participation Endeavors (Elkhorn B)
3:00 pm – 3:30 pm		Networking Break (Missouri)	
3:30 pm – 5:00 pm		SESSION 13 Funding Solutions to Support IWRM (Elkhorn A)	SESSION 14 Citizen Based Studies and Assessments (Elkhorn B)

WEDNESDAY, MARCH 27

8:00 am – 12:00 pm		Registration	
8:30 am – 10:00 am		SESSION 15 Merging Collaboration with Technical Analysis for IWRM Solutions – From Theory to Practice (Elkhorn A)	SESSION 16 Diverse Water Quality Assessments (Elkhorn B)
10:00 am – 10:30 am		Networking Break (Missouri)	
10:30 am - 12:00 pm		SESSION 17 Stories of IWRM Transition (Elkhorn A)	SESSION 18 Insights and Tools for Stakeholder Engagement (Elkhorn B)
12:00 pm – 1:30 pm		Conference Luncheon Keynote Speakers (Platte) Michael Campana, Professor, Oregon State University The Global Water Partnership and Integrated Water Resources Management: 20 Years of Success Gerald Sehke, Past AWRA President Are Existing Water Policies and Laws Amendable to the Development and Implementation of IWRM in the US?	
1:30 pm – 3:00 pm		Interactive Workshop on AWRA-IWRM Policy Statement (Platte)	

TUESDAY SESSIONS



TUESDAY, MARCH 26

SESSION 7 | Elkhorn A | PANEL: The Role of IWRM in Creation, Governance, Success of the Platte River Recovery Implementation Program

Moderator – Scott Griebing, Headwaters Corporation, Lakewood, CO

Panelists:

- Jesse Bradley, Nebraska Department of Natural Resources, Lincoln, NE
- Thomas Econopouly, U.S. Fish and Wildlife Service, Lakewood, CO
- Brandi Flyer, Central Platte Natural Resources District, Grand Island, NE
- Jojo La, Colorado Water Conservation Board, Denver, CO
- Bill Taddicken, National Audubon Society (Rowe Sanctuary), Gibbon, NE

SESSION 8 | Elkhorn B | Data Resources, Quality and Visualization

Moderator – Garrett Yager, Michael Baker International, Anchorage, AK

Assessment of Uncertainty in Doppler-Radar Estimated Precipitation - Colin Bloor, Hromadka & Associates, Southfield, MI (co-authors - T.V. Hromadka II, H. McInvale, M.Scioletti, P. Rao)

A Geohydrologic Data Visualization Framework with an Extendable User Interface Design - Zhenghong Tang, University of Nebraska-Lincoln, Lincoln, NE (co-authors - J. Wang; J. Wu; H. Yu)

Stream Hydrology and Rainfall Knowledge System (SHARKS): an Interactive Web App for Retrieval, Visualization, and Analysis of Hydrologic and Meteorological Time Series Data - Conrad Brendel, Virginia Tech, Roanoke, VA (co-authors - R. Dymond, M. Aguilar)

NHDPlus HR - Uses of NHDPlus HR - Michele Basile, U.S. Geological Survey, Denver, CO

SESSION 9 | Elkhorn A | Applied Engineering Projects and Monitoring Assessments

Moderator – Jessie Strom, Nebraska Department of Natural Resources, Lincoln, NE

Applying Systems Engineering and Systems Dynamics Tools to Advance Integrated Regional Water Supply Planning - Ed Weaver, Tarrant Regional Water District, Fort Worth, TX

Latest Integrated Water Resources Management Approach for Saline Wetland Restoration: Saline Groundwater Pump Distribution System - Gordon Coke, The Flatwater Group, Lincoln, NE (co-authors - J. Cermak, T. Riley)

Unmanned Aircraft System (UAS) for Playa Wetland and Monitoring Assessment - Qiao Hu, University of Nebraska Lincoln, Lincoln, NE (co-authors - Tang, Z., Woldt, W.)

Real-Time Flood Monitoring in the Colville River Delta and National Petroleum Reserve- Alaska - Garrett Yager, Michael Baker International, Anchorage, AK

SESSION 10 | Elkhorn B | Decision Support Systems and Optimization

Moderator – Brandi Flyer, Central Platte Natural Resources District, Grand Island, NE

Integrated Water Resource Management to Optimize and Sustain Agricultural and Municipal Water Use - Bruce Lytle, Lytle Water Solutions, LLC, Highlands Ranch, CO (co-author – C. M.D. Fehn)

Multi-scaled Data Management to Support Integrated Water Resources Management - Carrie Wiese, Nebraska Department of Natural Resources, Lincoln, NE, and John Engel, HDR Inc., Omaha, NE

Key Strategies for the Platte River Decision Support System for Excess Flow - Jennifer Schellpeper, Nebraska Department of Natural Resources, Lincoln, NE (co-author – D. Schlautman)

Irrigation District Helps Desert Farmers Cash in on Farm-Level Water Efficiency and Conservation Incentives - Matt Ables, KISTERS, Sacramento, CA

SESSION 11 | Elkhorn A | Republican River Compact: Past, Present, and Future

Moderator – Jesse Bradley, Nebraska Department of Natural Resources, Lincoln, NE

Interstate Relations and the Challenges of Integrated Water Resources Management in the 21st Century - Brian Dunnigan, Olsson Associates, Lincoln, NE (co-author - J. Schneider)

Navigating Muddy Waters - How Nebraska Successfully Complies with the Republican River Compact - James Schneider, Olsson Associates, Lincoln, NE (co-author - B. Dunnigan)

The Nebraska Cooperative Republican Platte Enhancement Project is a Success in Helping Managing Stream Flow in the Republican and Platte Rivers – Jack Russell, Middle Republican Natural Resources District, Curtis, NE

From Litigation to Cooperation: The Changing World in the Republican River Basin - Carol J. Myers Flaute, Nebraska Department of Natural Resources, Lincoln, NE (co-authors - J. Bradley, K. Burgert)

Assessment of Uncertainty in Doppler-Radar Estimated Precipitation

Presenting from the Manuscript:
Doppler Radar Precipitation Analysis

By Ted Hromadka (1), Valmir Bucaj (2), Tyson Walsh (2), Michael Scioletti (2)

(1) Professor, Department of Mathematical Sciences, USMA, West Point, NY

(2) Assistant Professor, Department of Mathematical Sciences, USMA, West
Point, NY

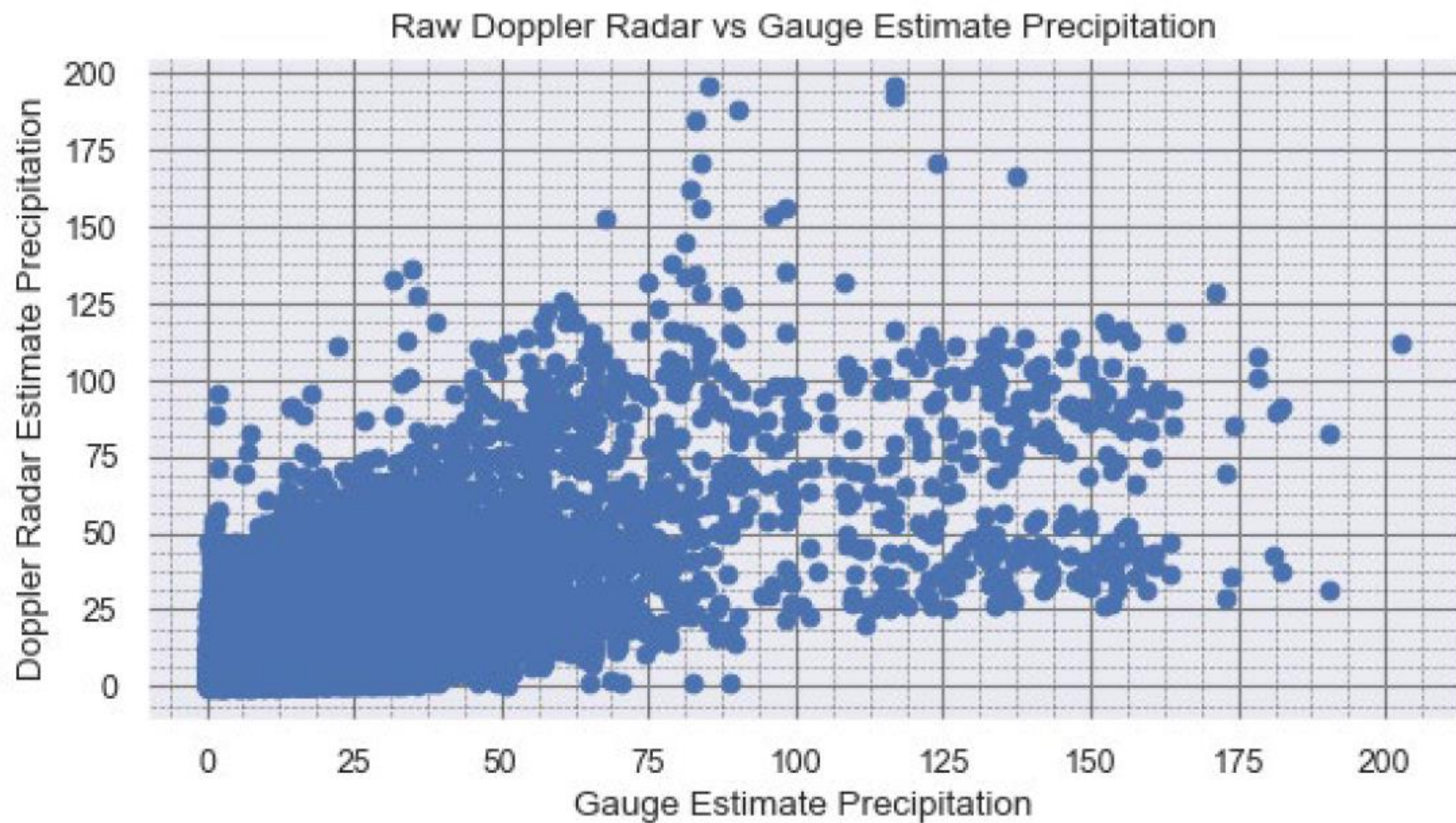
The Reason

- Can we use the radar data we currently have available (despite its imperfections) to improve our hydrometeorology, engineering, floodplain management, etc.?

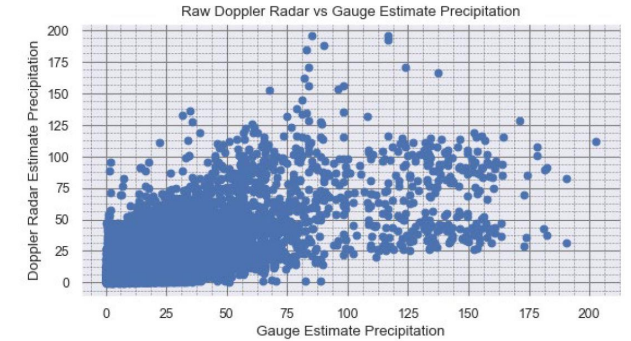
The Research

- Correlations of Doppler radar data and corresponding gage estimates of precipitation
- Prior studies have highlighted factors that can affect the reliability of radar predictions, including the ZR Power law relationship, radar calibration, range effects, etc.
- This research focuses on assessing the uncertainty in radar data in order to apply such uncertainty (a probabilistic distribution) into application models

The Data

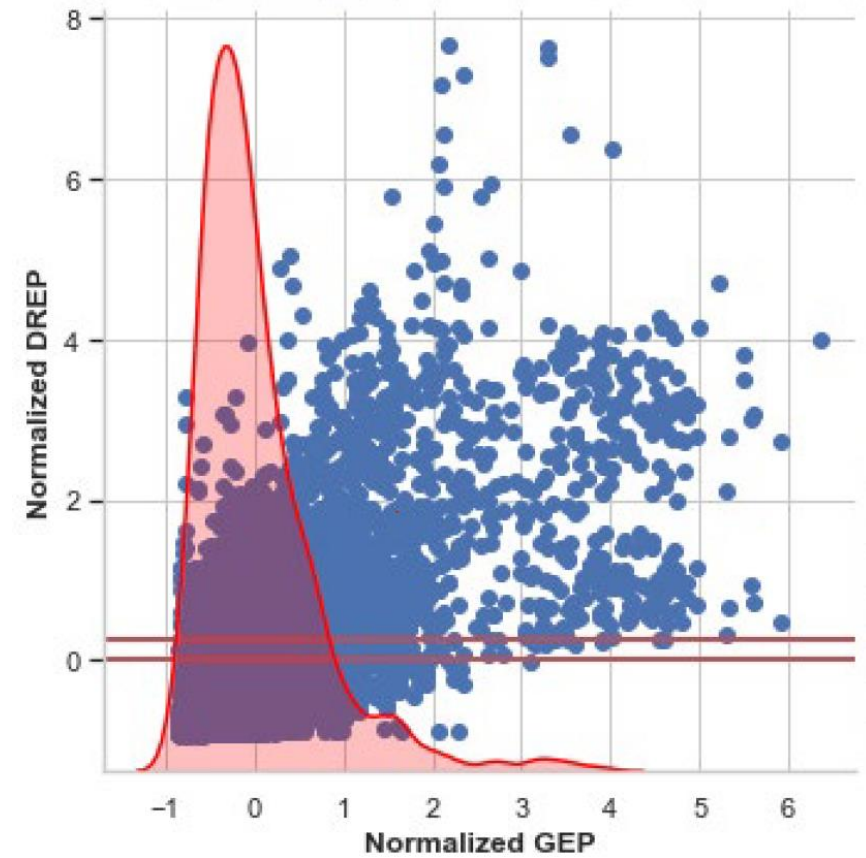
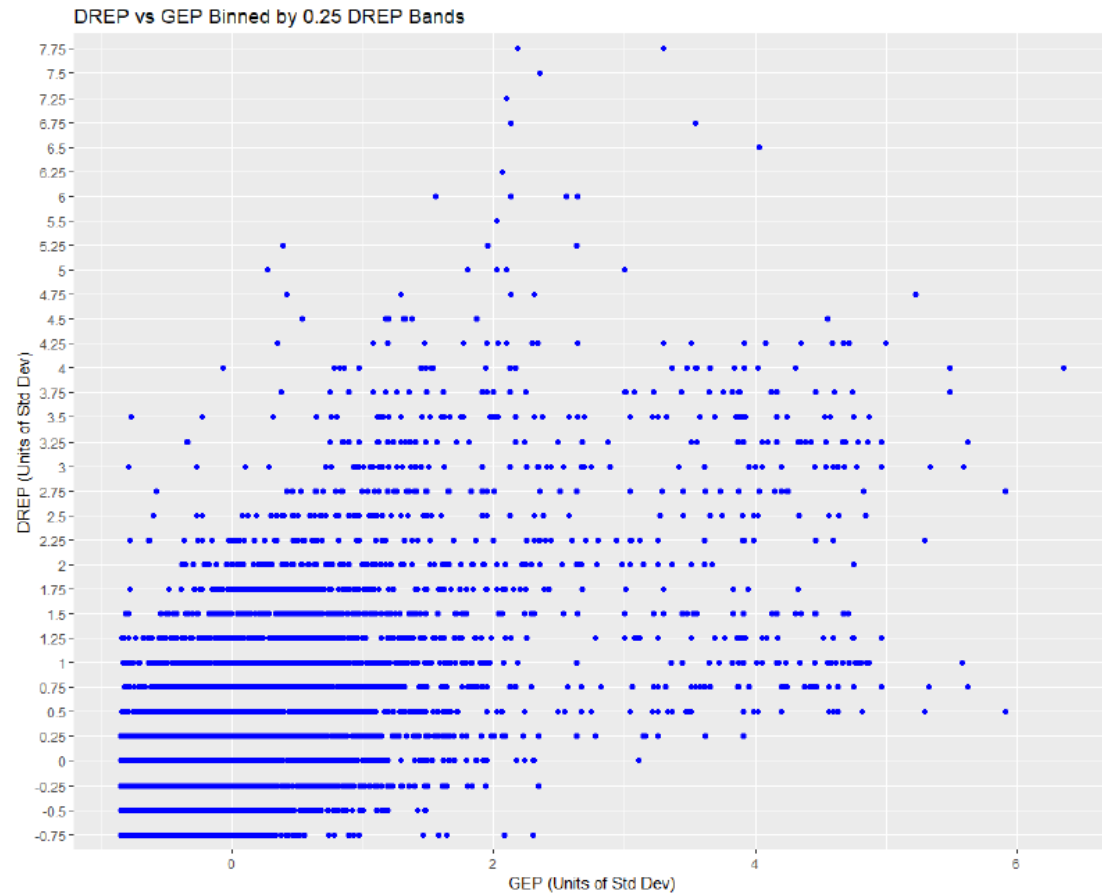


The Data



- Source: Published literature in cited references 1-10
- Type: Comparison of the Doppler radar derived rainfall estimates with the observed local gauge values, spread across multiple storms and geographical domains with the overwhelming majority categorized via total storm accumulation.
- Final Results: A set of ordered pairs (8,846) in millimeters
 - Doppler Radar Estimated Precipitation (“DREP”) from WSR-88D
 - Gauge Estimated Precipitation (“GEP”)

The Data Processing



Turning Data Into Realizations

$$DR = \{-0.3, 0.1, 0.4, 1, 3, 1.9, 1.4, 2.3, 2.8, 3.2, 3.5, 2.1, 0.9\}$$

- For each day in the Doppler-Radar data daily string, a single day's Doppler-Radar reading is developed into a distribution of probable daily precipitation outcome readings via randomly sampling from each of the respective GEP marginal distributions. Each of these outcome estimates are candidates to being an estimate of the actual precipitation measurement on the ground.

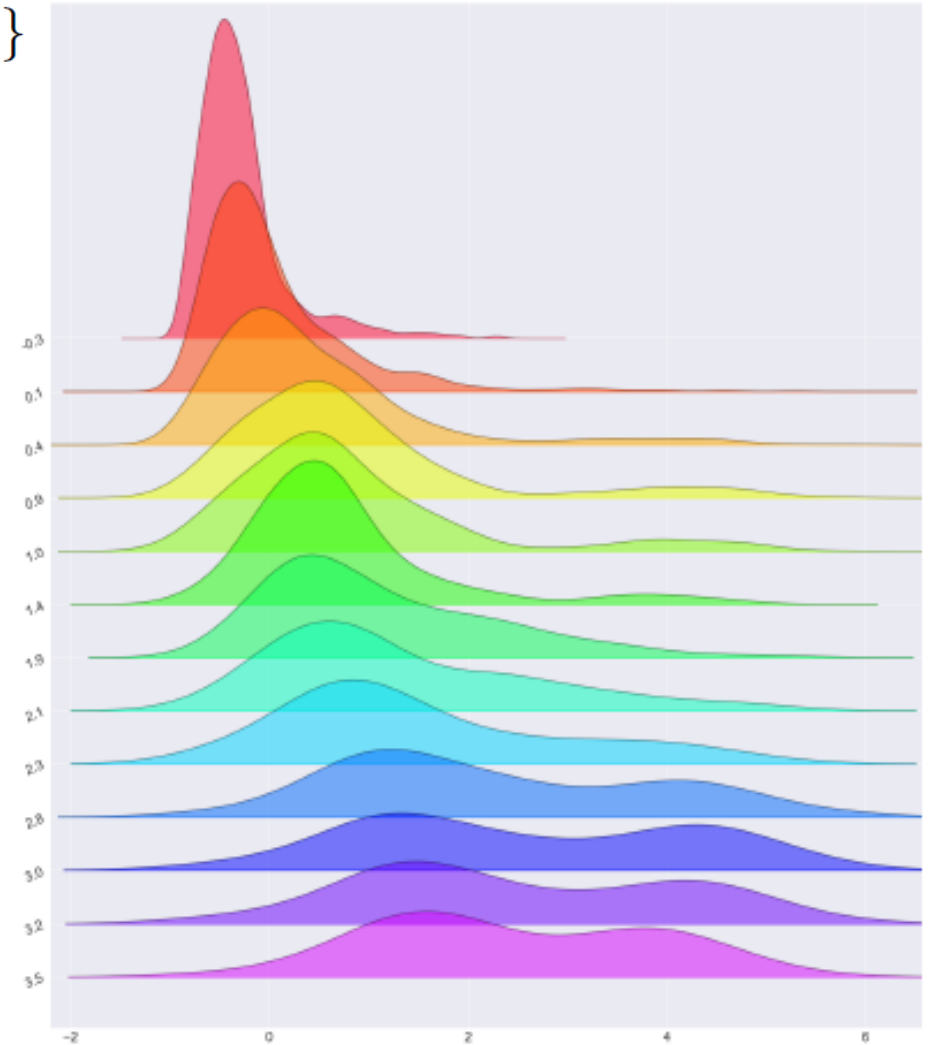
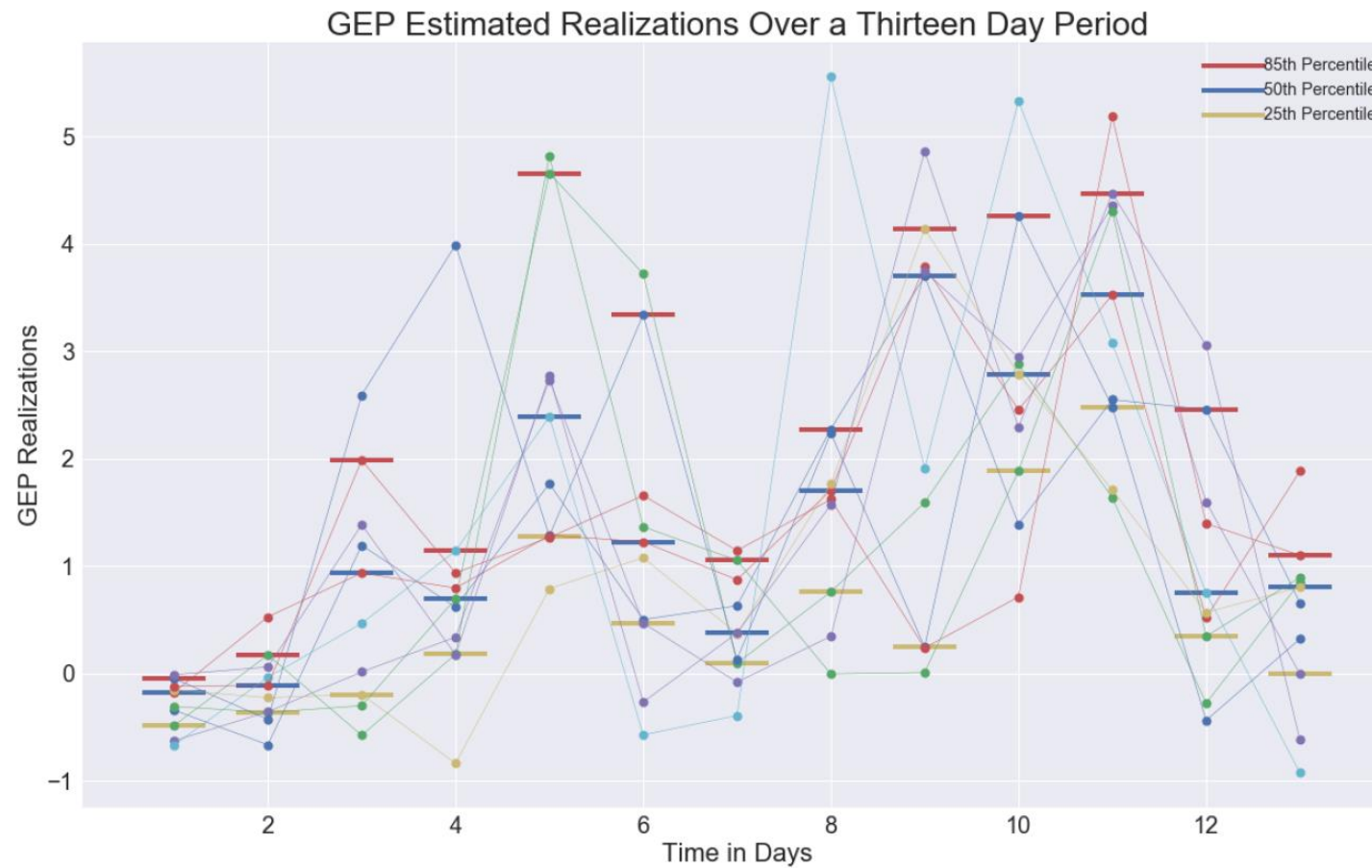
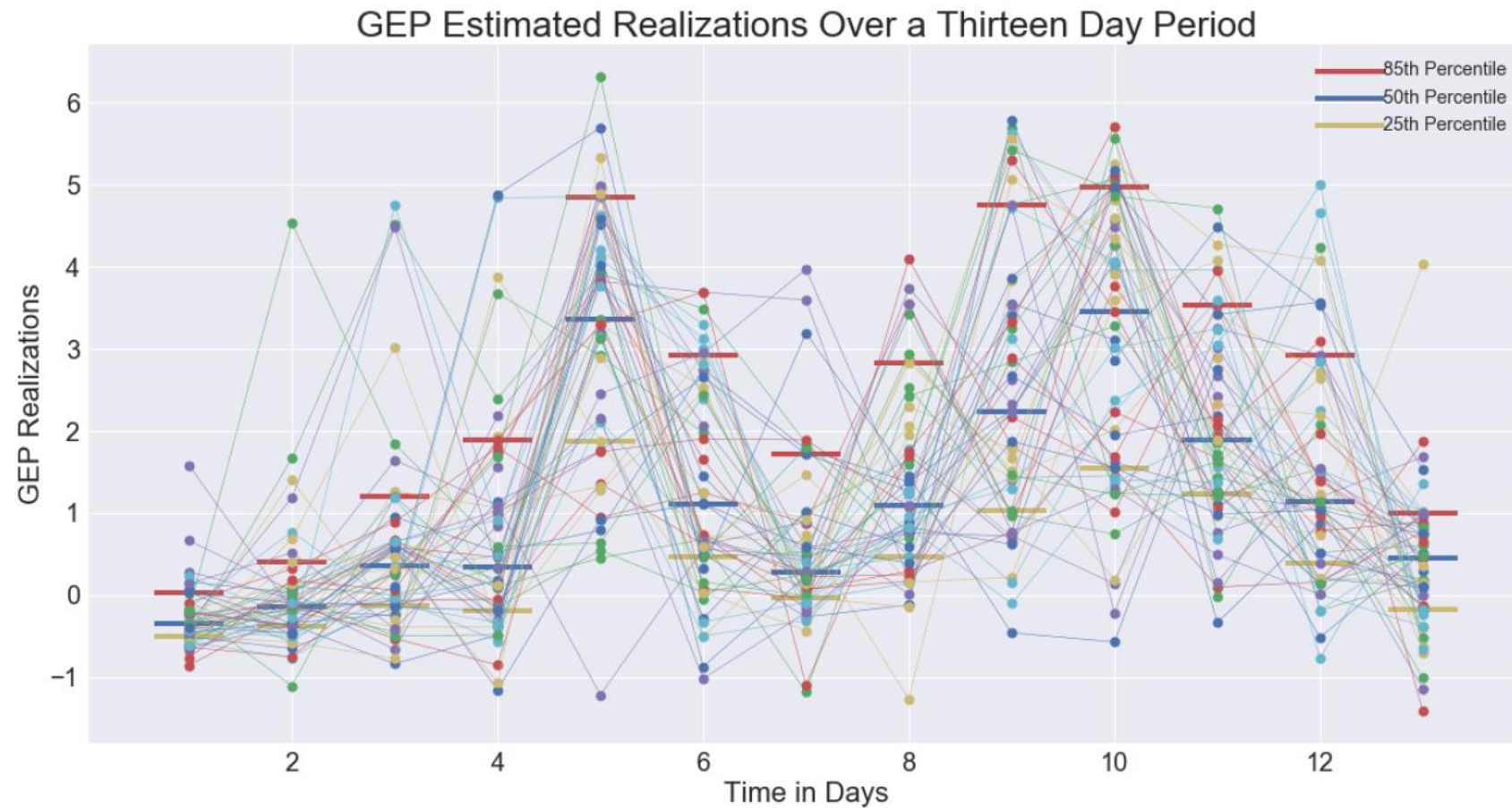


Figure 1: Marginal distributions for GEP realizations

Turning Data into Realizations



Turning Data into Realizations



Rare Events

- Of particular interest are "rare weather events." Hence, it is necessary to understand the distribution of the probable maximal outcomes of precipitation estimates. Understandably, these distributions can be highly sensitive to a particular string of daily Doppler-Radar measurements, and as such an effective method is to build these distributions for each specific string of daily measurements. In practice, one first generates the "N strings of probable outcomes of precipitation estimates" on the ground, and from each collect the maximal value and build an estimated distribution for the entire collection of these maximal value.

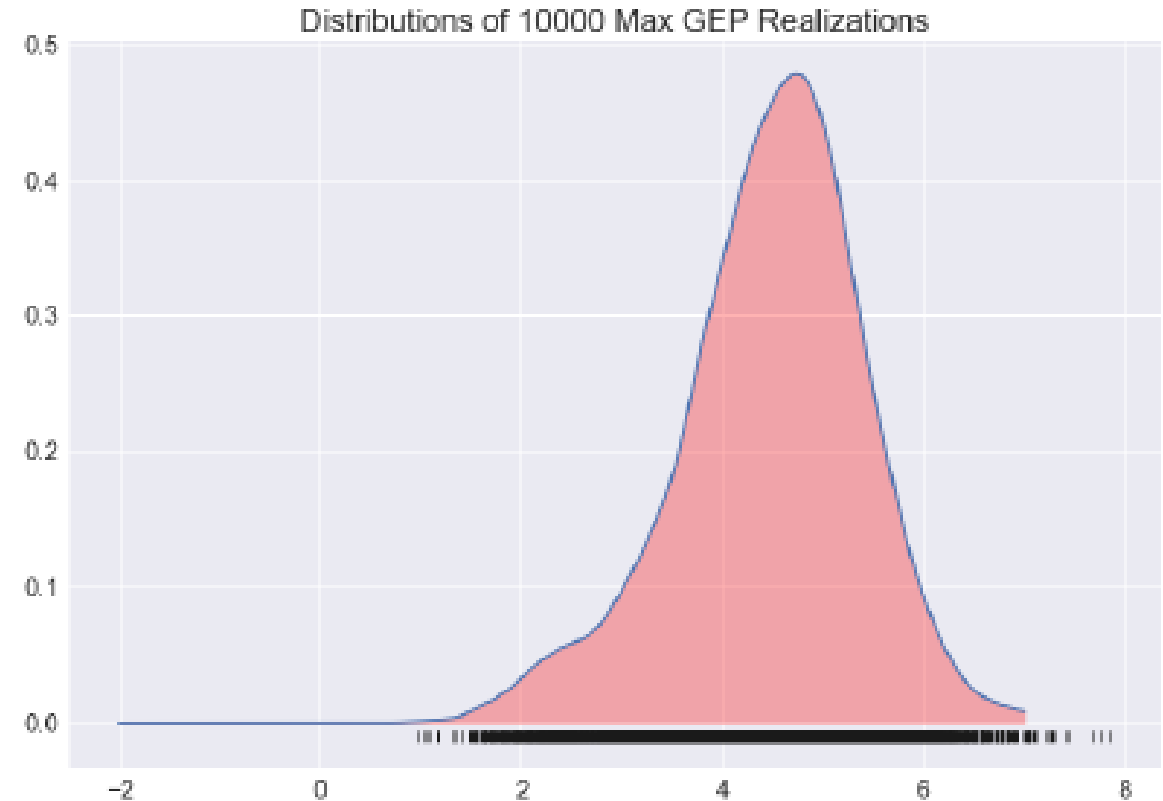


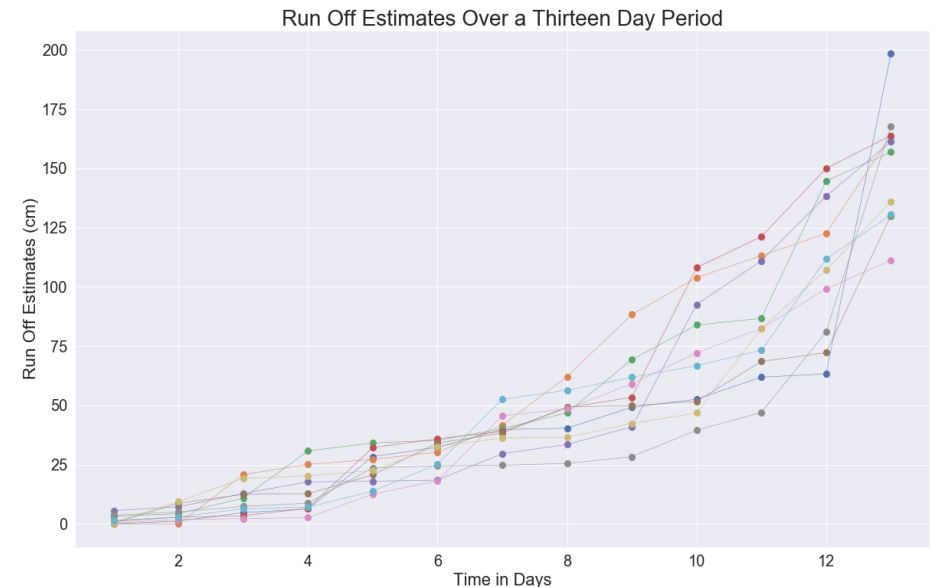
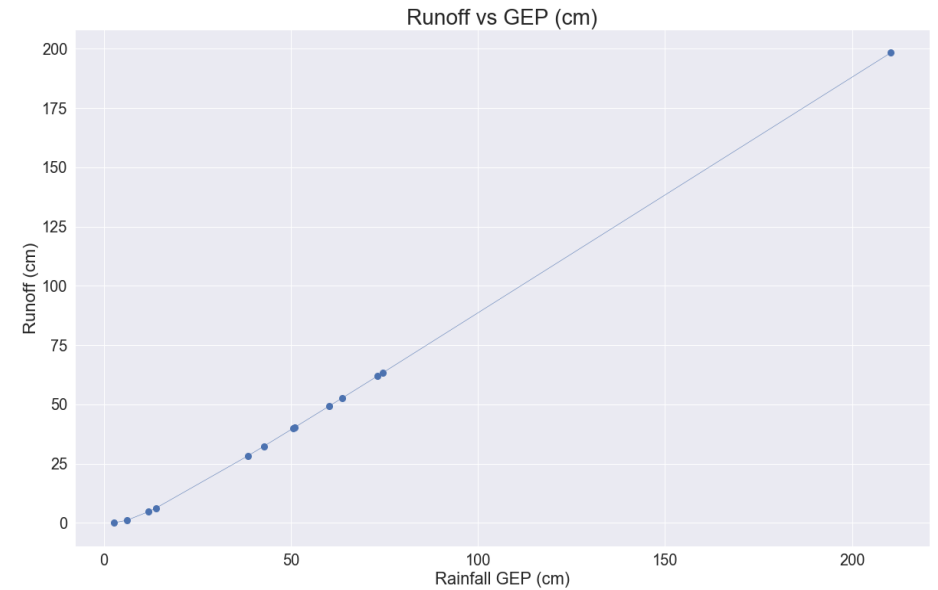
Figure 7: Distribution of GEP Max Readings for 10000 Samples

Runoff Estimates

- Utilizing the realizations from the above method, an effective example application is in determining the approximate amount of direct runoff from a rainfall event in a particular area.

For this, we use the TR-55 method:
(<https://www.lmnoeng.com/Hydrology/hydrology.php>)

Using arbitrary inputs, the visualization here depicts runoff estimates over 13 days of measurements with the realizations calculated using the process in the manuscript.



References

1. Baeck, M. L., & Smith, J. A. (1998). Rainfall Estimation by the WSR-88D for Heavy Rainfall Events. *Weather and Forecasting*, 13(2), 416-436.
2. Gourley, J. J., Maddox, R. A., Howard, K. W., & Burgess, D. W. (2002). An Exploratory Multisensor Technique for Quantitative Estimation of Stratiform Rainfall. *Journal of Hydrometeorology*, 3(2), 166-180.
3. Fulton, R. (2000). Hydrometeorology Group's Projects and Plans for Improving WSR-88D Rainfall Algorithms and Products, Retrieved from http://www.nws.noaa.gov/oh/hrl/papers/2000mou_pdf/chapter1.pdf.
4. Jayakrishnan, R., Srinivasan, R., & Arnold, J. (2004). Comparison of raingage and WSR-88D Stage III precipitation data over the Texas-Gulf basin. *Journal of Hydrology*, 292(1-4), 135-152.
5. Klazura, G. E., Thomale, J. M., Kelly, D. S., & Jendrowski, P. (1999). A Comparison of NEXRAD WSR-88D Radar Estimates of Rain Accumulation with Gauge Measurements for High- and Low-Reflectivity Horizontal Gradient Precipitation Events. *Journal of Atmospheric and Oceanic Technology*, 16(11), 1842-1850.
6. Morin, E., Maddox, R. A., Goodrich, D. C., & Sorooshian, S. (2005). Radar Z-R Relationship for Summer Monsoon Storms in Arizona. *Weather and Forecasting*, 20(4), 672-679.
7. Seo, D., & Breidenbach, J. P. (2002). Real-Time Correction of Spatially Nonuniform Bias in Radar Rainfall Data Using Rain Gauge Measurements. *Journal of Hydrometeorology*, 3(2), 93-111.
8. Seo, B., Dolan, B., Krajewski, W. F., Rutledge, S. A., & Petersen, W. (2015). Comparison of Single- and Dual-Polarization-Based Rainfall Estimates Using NEXRAD Data for the NASA Iowa Flood Studies Project. *Journal of Hydrometeorology*, 16(4), 1658-1675.
9. Cunha, L. K., Smith, J. A., Baeck, M. L., & Krajewski, W. F. (2013). An Early Performance Evaluation of the NEXRAD Dual-Polarization Radar Rainfall Estimates for Urban Flood Applications. *Weather and Forecasting*, 28(6), 1478-1497.
10. Seo, B., & Krajewski, W. F. (2010). Scale Dependence of Radar Rainfall Uncertainty: Initial Evaluation of NEXRAD's New Super-Resolution Data for Hydrologic Applications. *Journal of Hydrometeorology*, 11(5), 1191-1198.