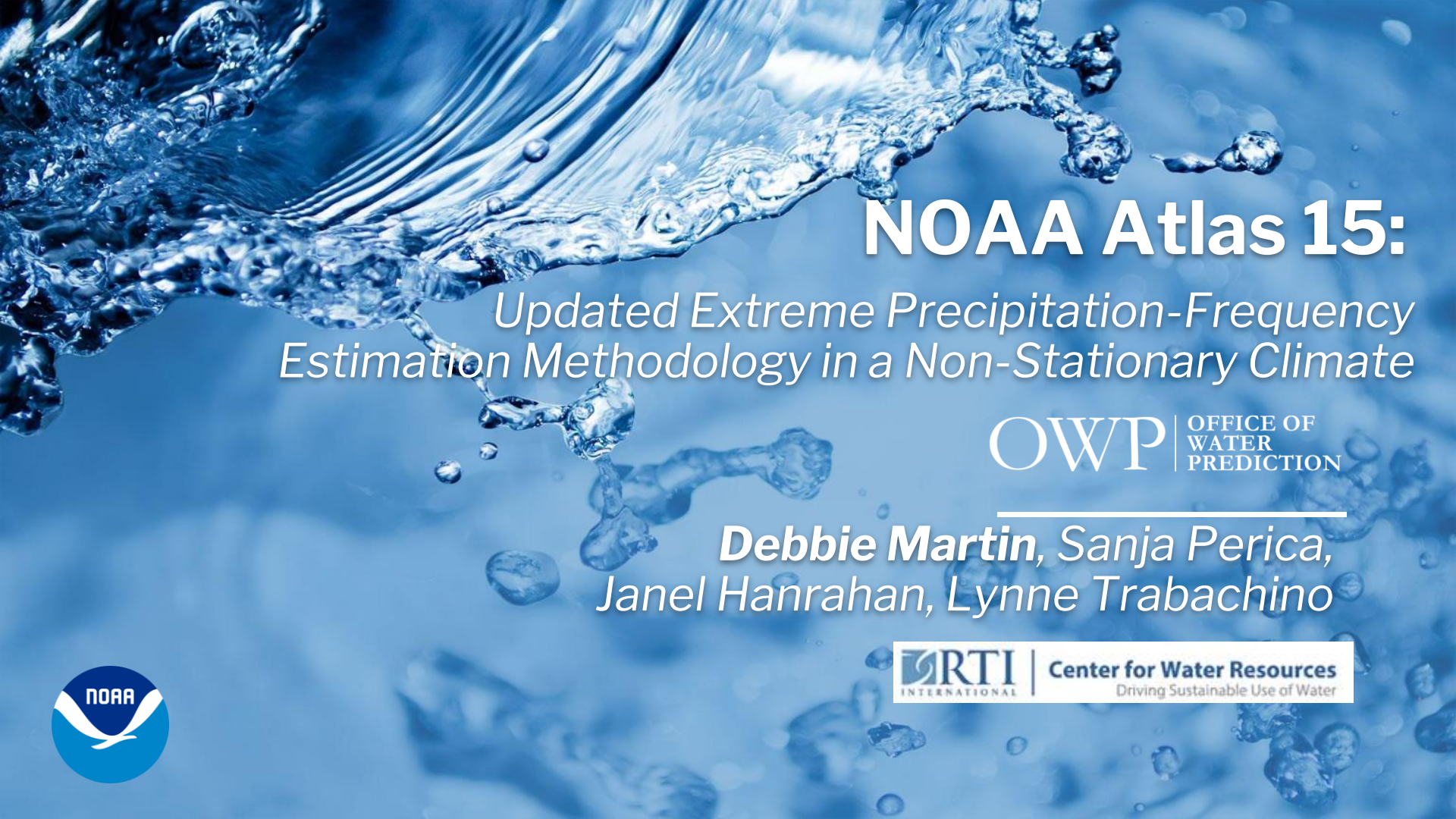

NOAA Atlas 15:

Updated Extreme Precipitation-Frequency Estimation Methodology in a Non-Stationary Climate

OWP | OFFICE OF WATER PREDICTION

Debbie Martin, *Sanja Perica, Janel Hanrahan, Lynne Trabachino*

RTI INTERNATIONAL | Center for Water Resources
Driving Sustainable Use of Water

NOAA

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RTI International, Center for Water Resources

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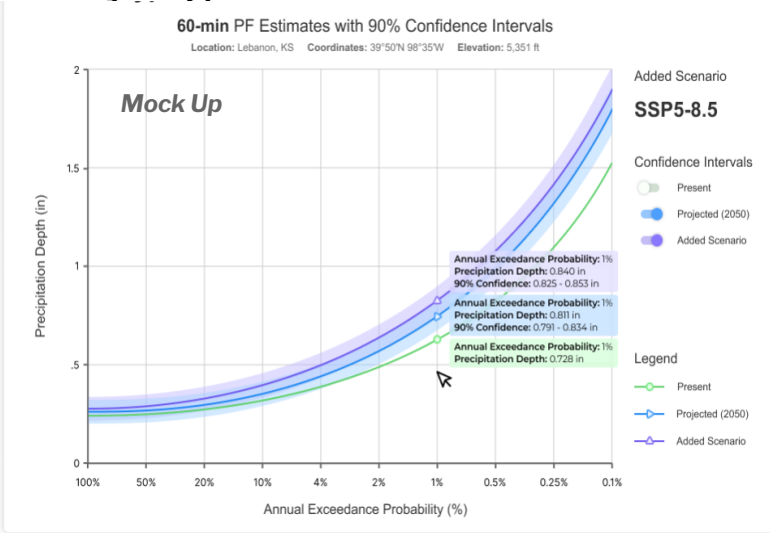
- Sanja Perica (Chief Scientist)
- Lynne Trabachino, Janel Hanrahan, Bowen Pan, Joshua Eston (Hydrometeorologists)

Overview

Following on to Assessment Report: *Analysis of impact of nonstationary climate on NOAA Atlas 14 estimates (2022)* → nonstationary regional maximum likelihood approach

- **Volume 1**
  - Accounts for temporal trends in historical observations
  - 5-minute to 60-day durations
  - 1/2 to 1/1000 Exceedance Probabilities
  - CONUS and OCONUS
- **Volume 2**
  - Future estimates for all years until year 2100 based on future climate model data up to 5℃ of warming
    - Scenarios options: SSP2-4.5, SSP5-8.5



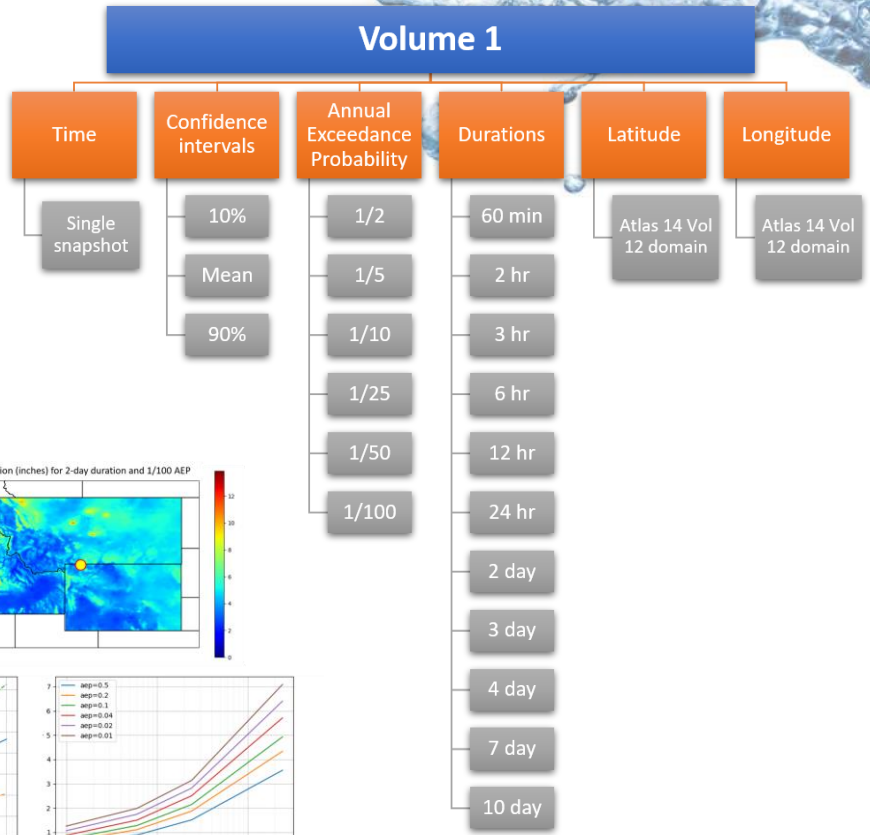
- ➢ Peer Review of Pilot - 2024
- ➢ Peer Review of CONUS - mid-2025

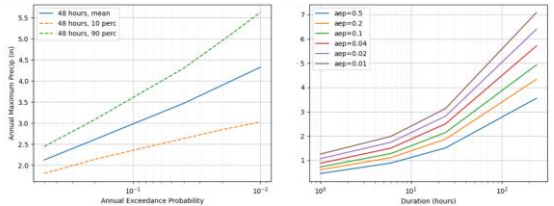
Pilot Study over Montana

Study area is Atlas 14 Volume 12 region

Volume 1 - Historical

- PF estimates/maps for 1-hr to 10-day durations and probabilities of 1/2 to 1/100
- Comparison with Atlas 14 estimates

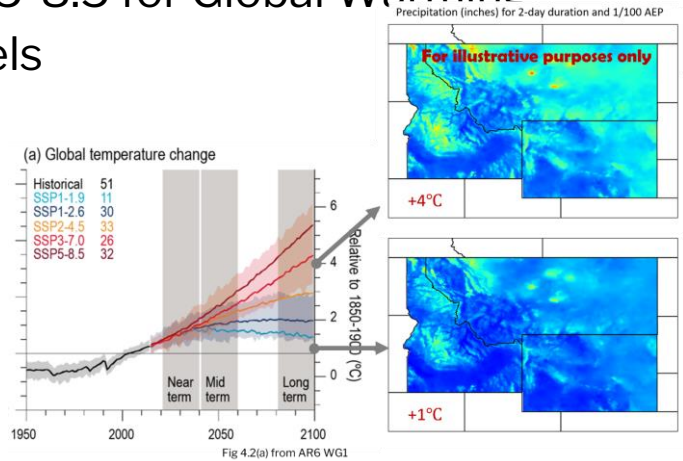


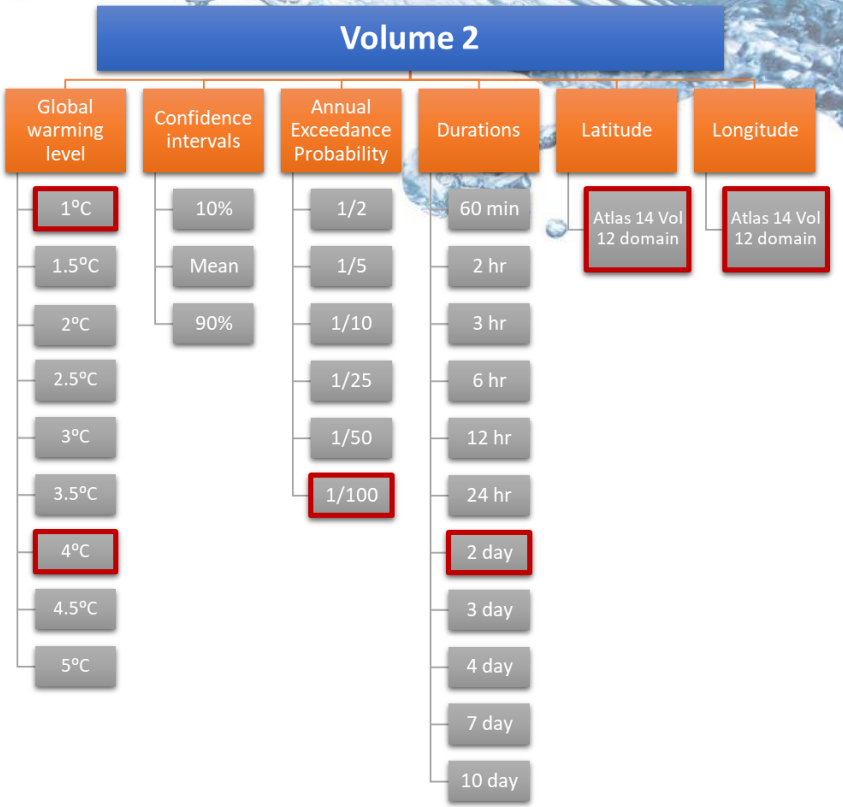


Pilot Study over Montana

Volume 2 - Future

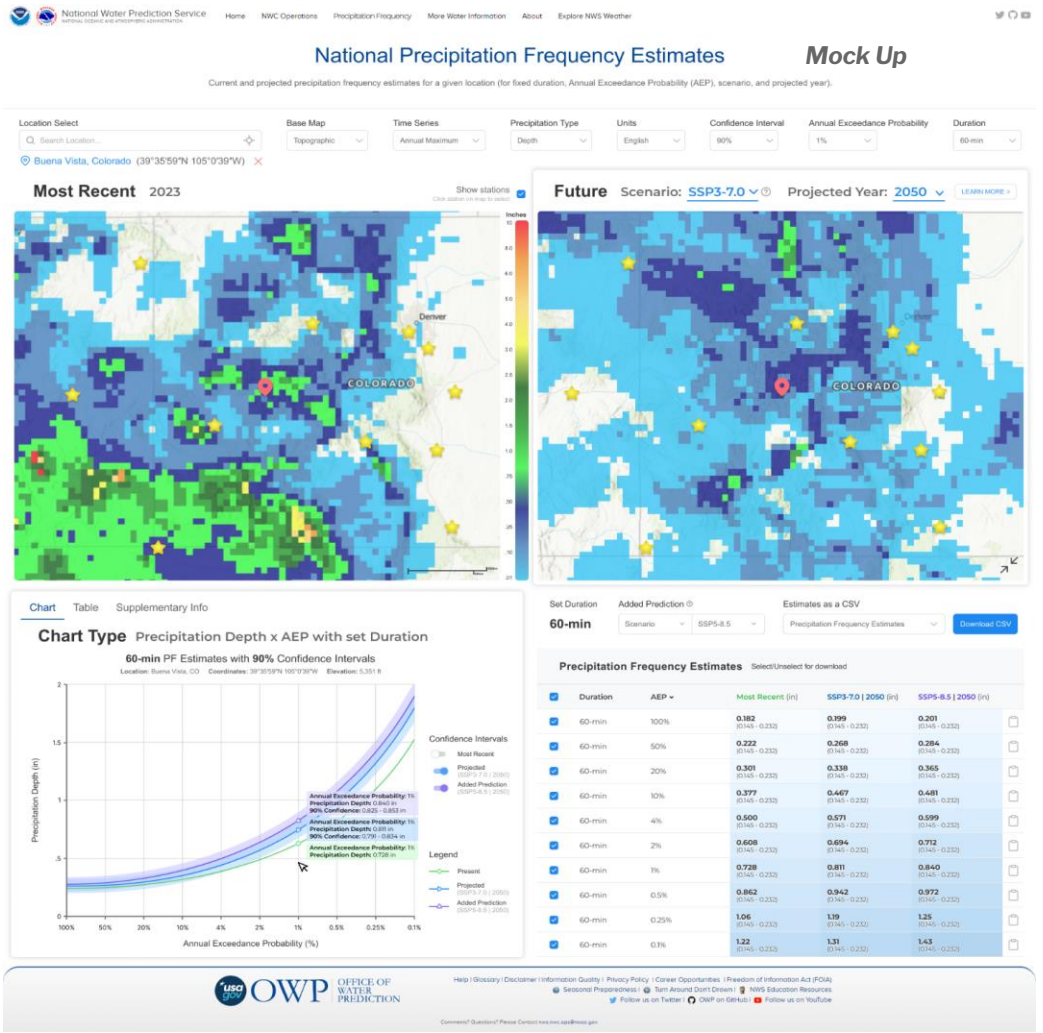
- Future climate model data used to generate estimates until year 2100
  - Scenarios options: SSP2-4.5, SSP5-8.5 for Global Warming Levels





Web Delivery Mock Up

Montana Pilot Public Peer Review in 2024



In collaboration with OWP/Service Innovation and Partnership Division (SIPD) and Orion

subject to change

Data Repository

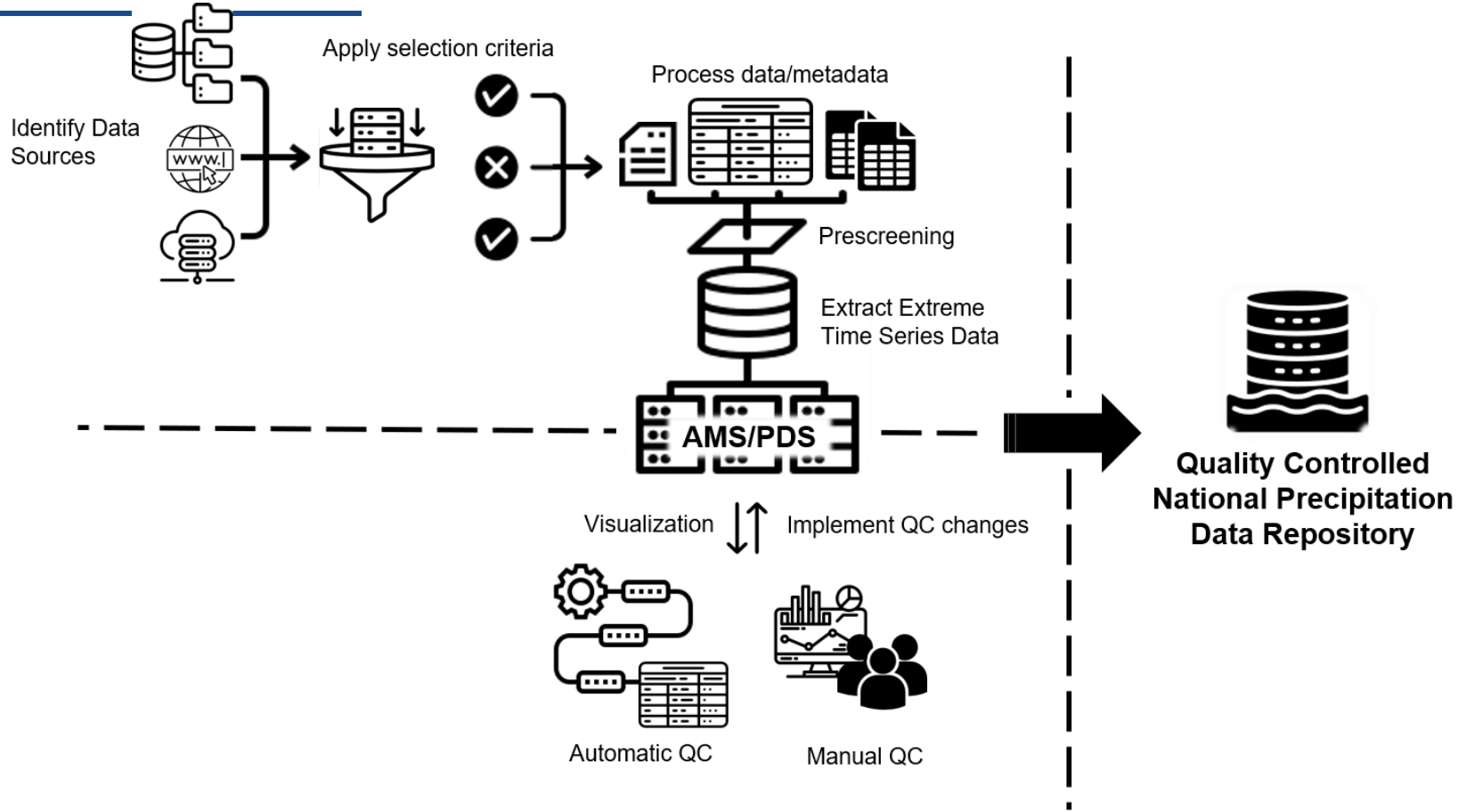
Collect and QC observed historical precipitation gauge data

- Data discovery - 300+ datasets for CONUS and OCONUS
  - Need to identify priority datasets
- Collect, format and pre-screen precipitation observations
- Develop and implement QA/QC protocols
  - Metadata QC - ensure correct locations of stations
  - Annual maximum series (AMS) QC - verify, correct or remove high outliers
  - Station cleanup - removal of duplicates, merging to create longer records

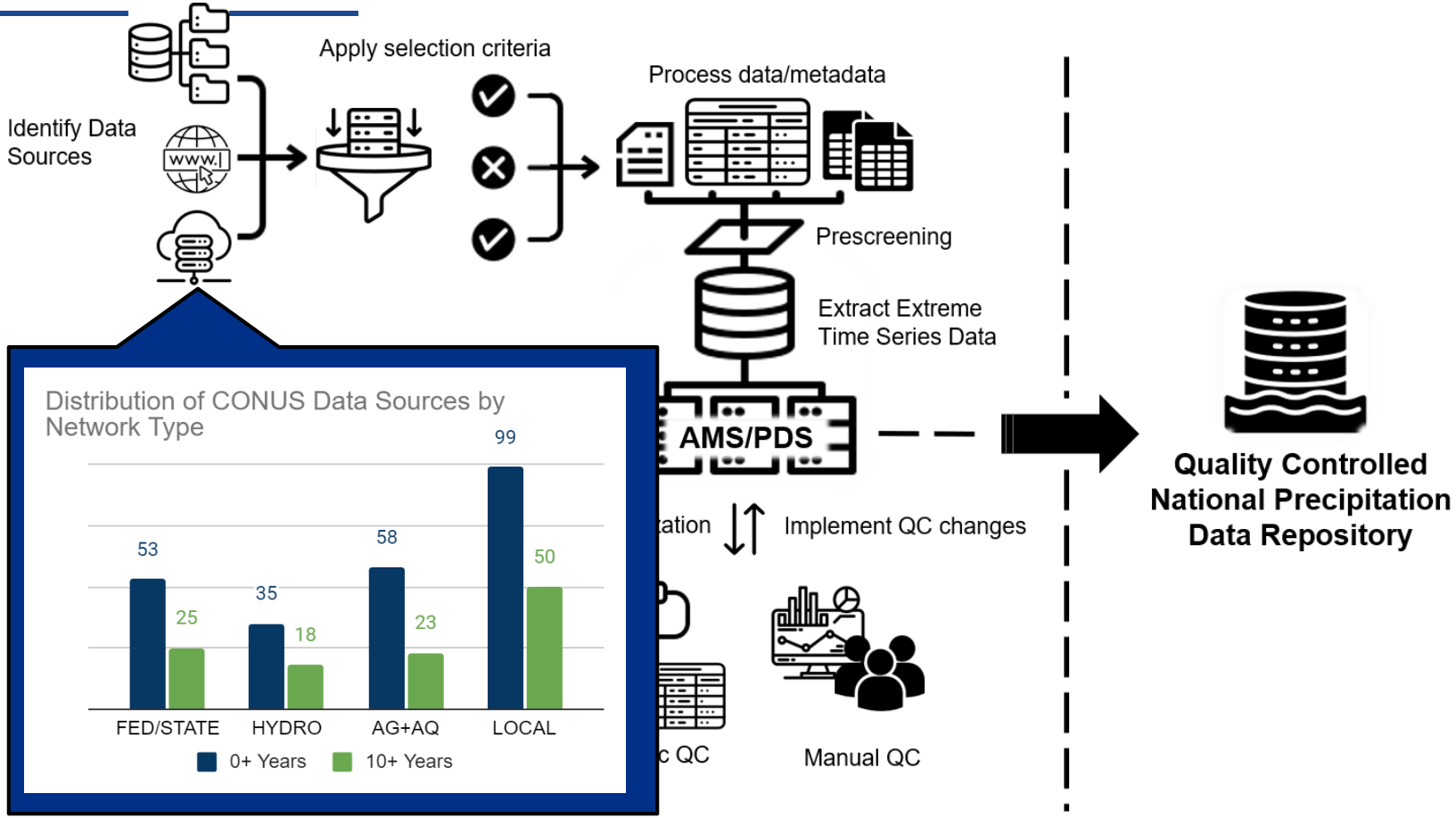
Maintain code repository for OWP

➔ Automated and reproducible to the extent possible

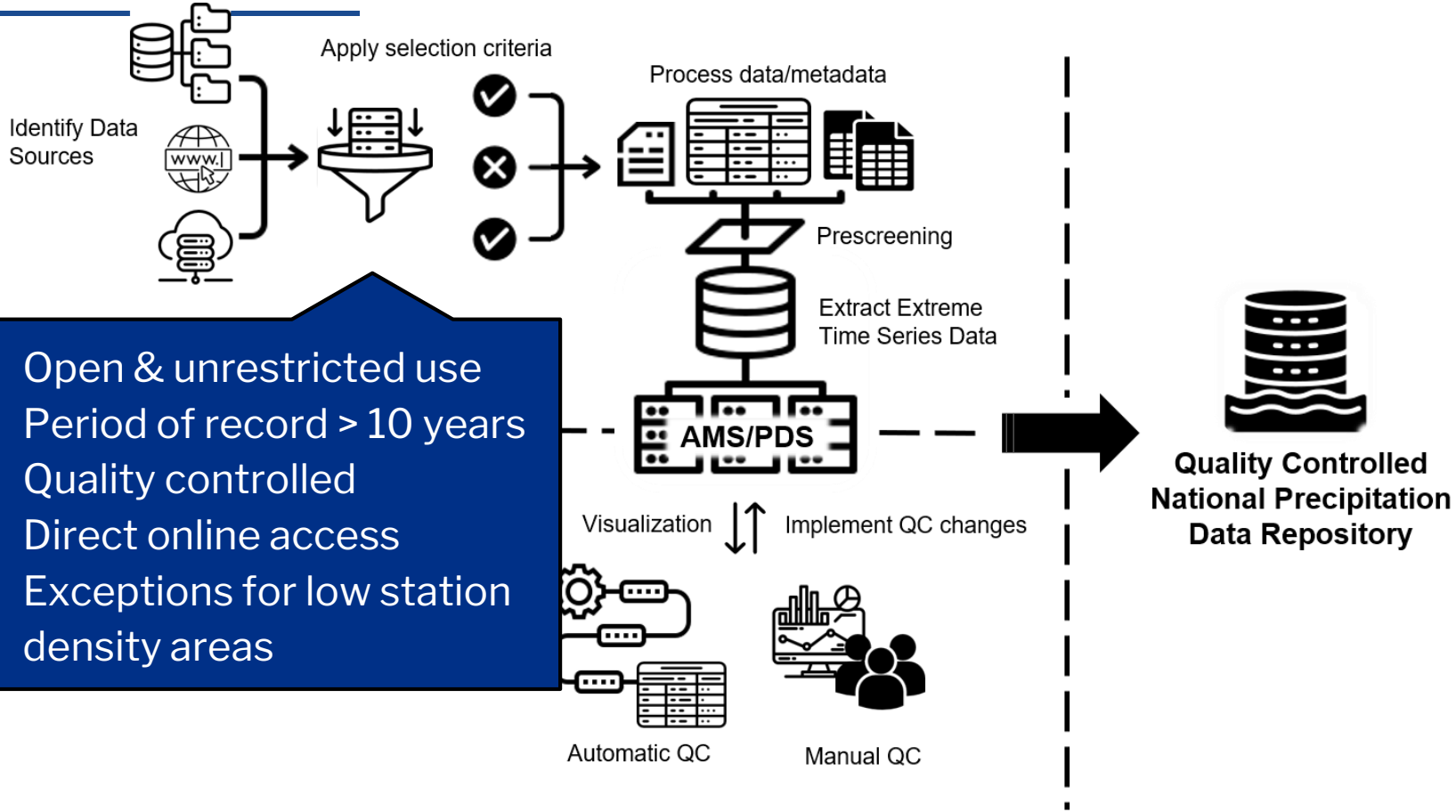
Quality Controlled National Precipitation Data Repository



Quality Controlled National Precipitation Data Repository

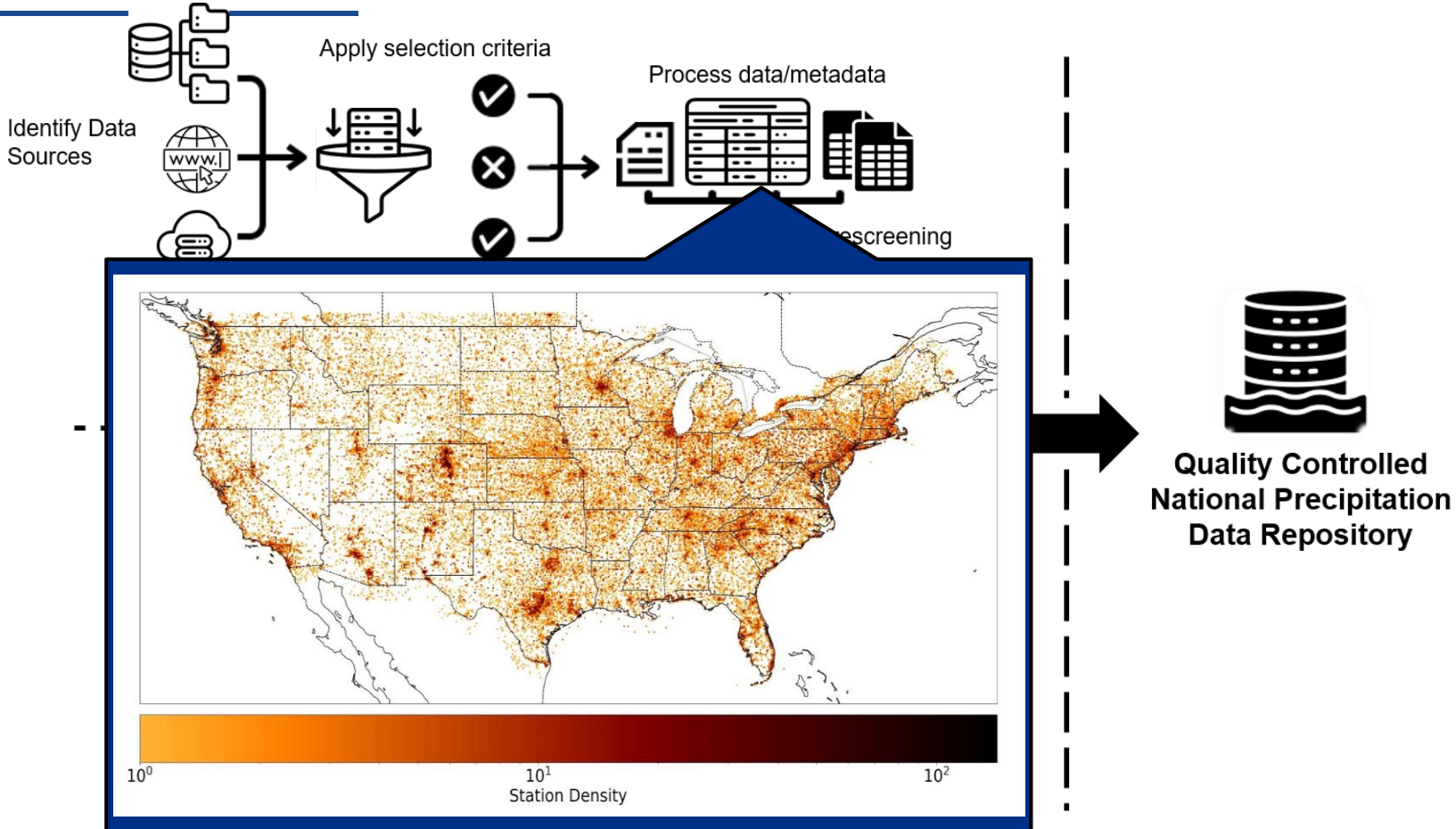


Quality Controlled National Precipitation Data Repository



- Open & unrestricted use
- Period of record > 10 years
- Quality controlled
- Direct online access
- Exceptions for low station density areas

Quality Controlled National Precipitation Data Repository



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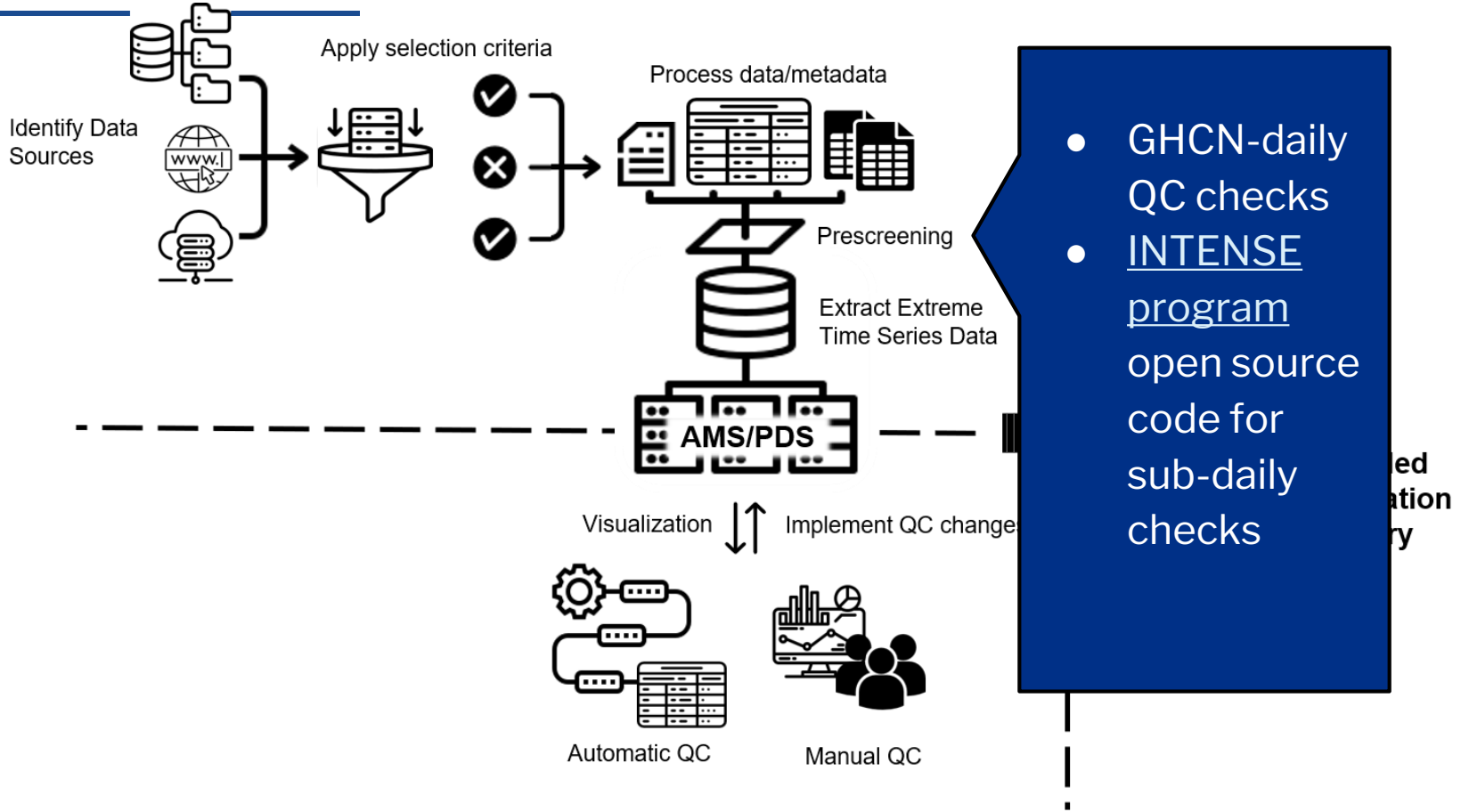
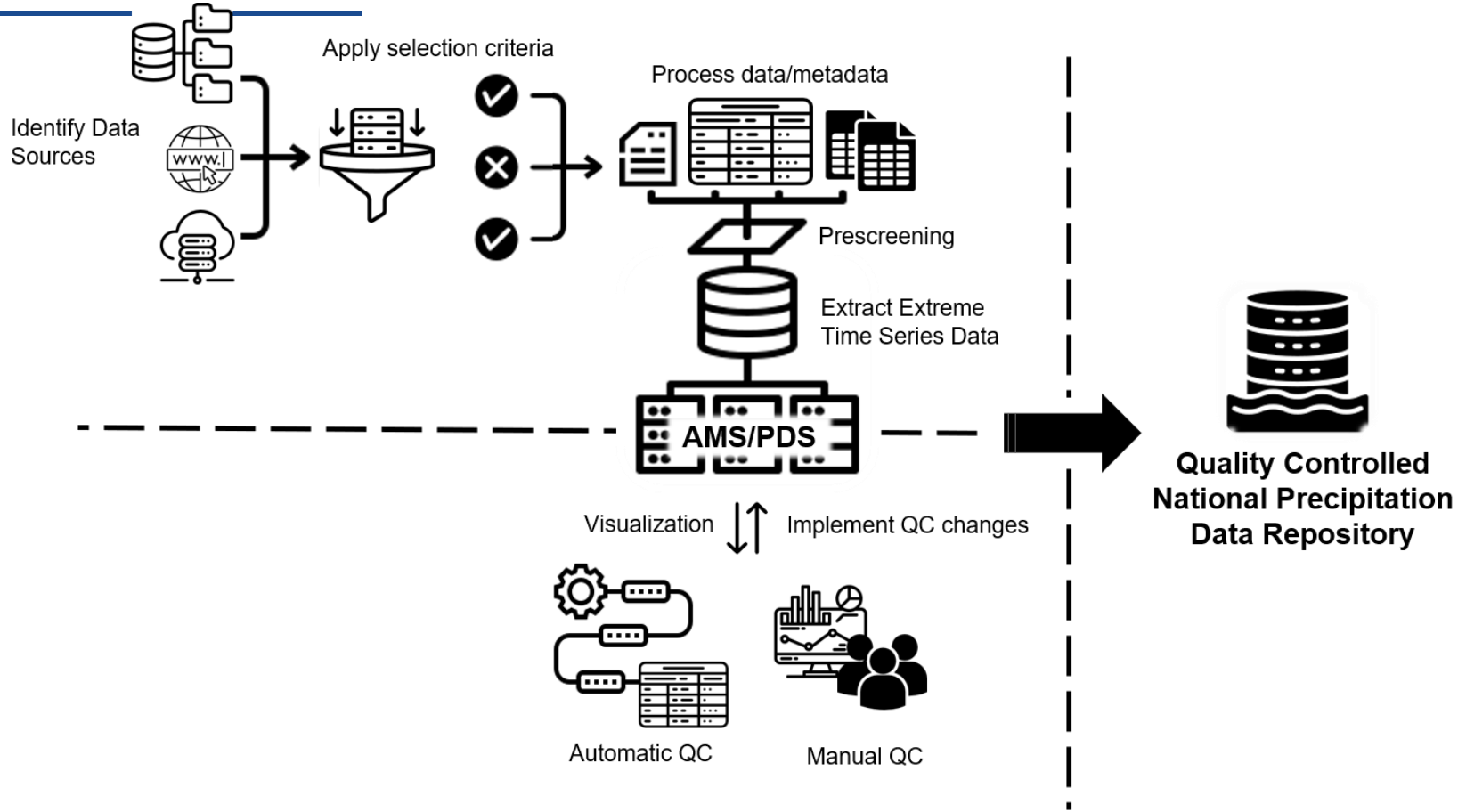
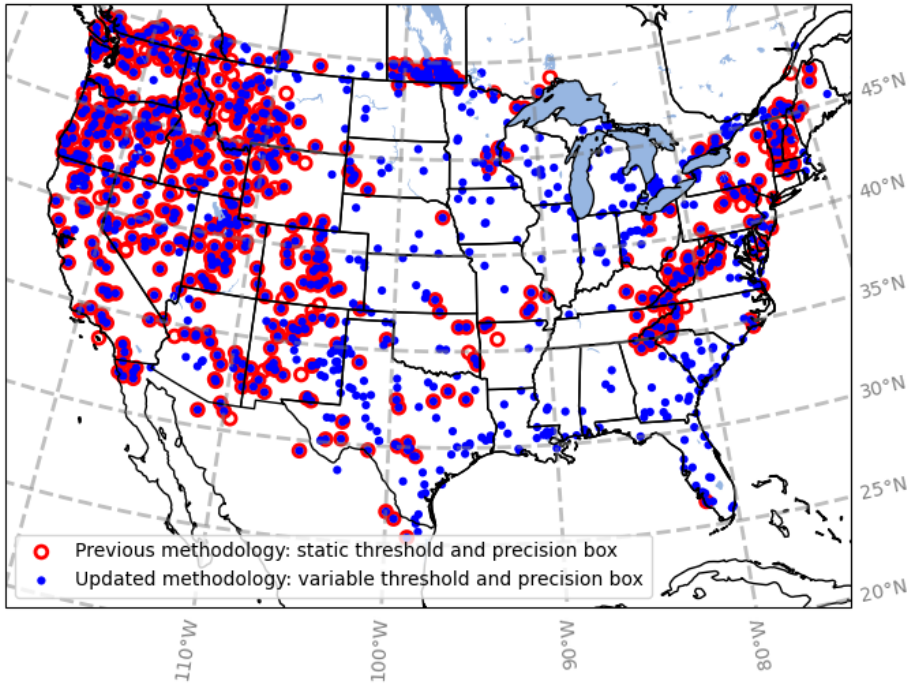


Quality Controlled National Precipitation Data Repository



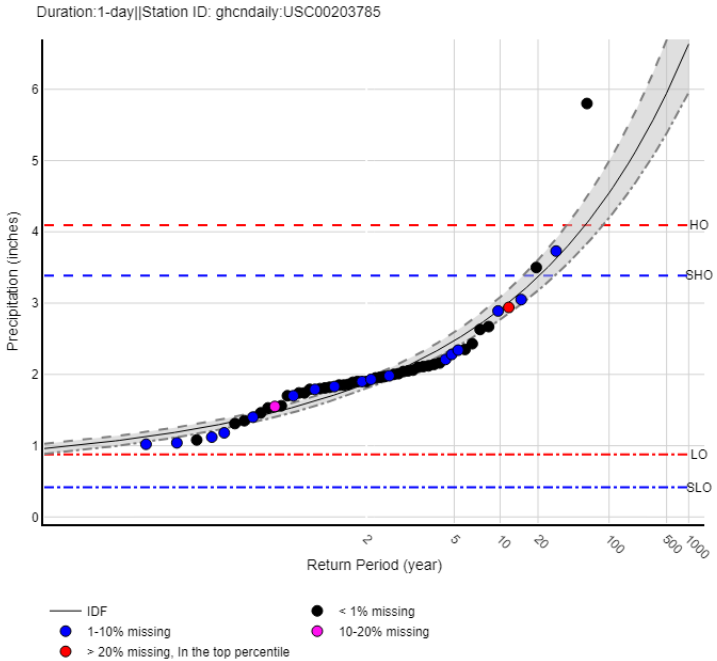
Data Repository - Station Metadata QC

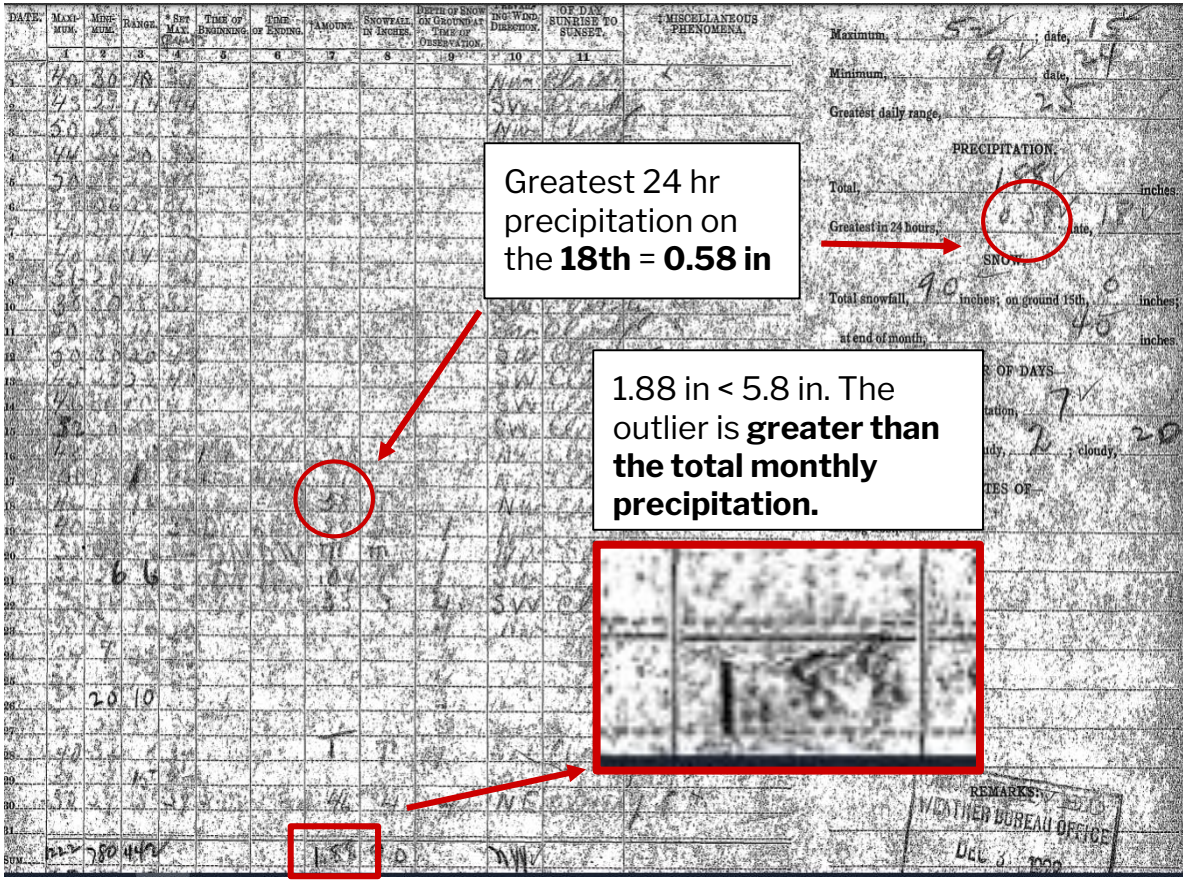
- Automated flagging of potentially erroneous metadata
  - Compare metadata elevation to DEM
    - Expanded applicability of elevation checks to include flat terrain regions
  - Gross checks for correct state/county



Data Repository - AMS QC Example

GHCN-Daily Station: Higgins Lake, MI
AMS High Outlier: 5.8 in
Date of Outlier: 11-18-1928



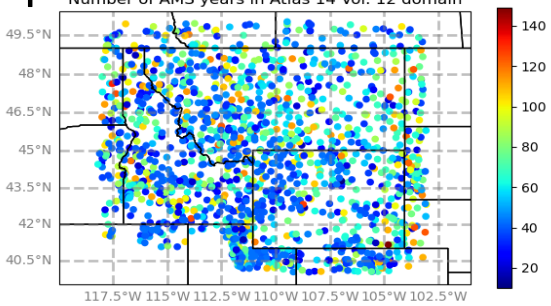


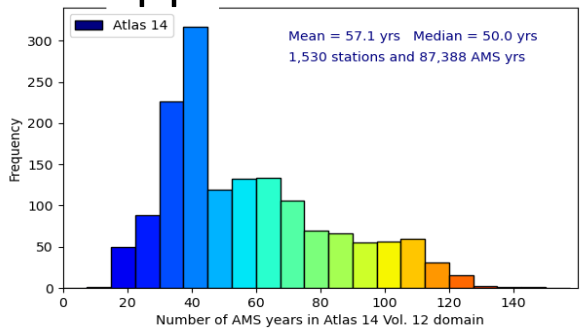
Nonstationary Framework Methodology

- Development of improved methodology
  - Regionalization
  - Model performance measures
  - Confidence intervals
- Ensure adaptability for different climate regions

Nonstationary Framework Methodology - Enhancements

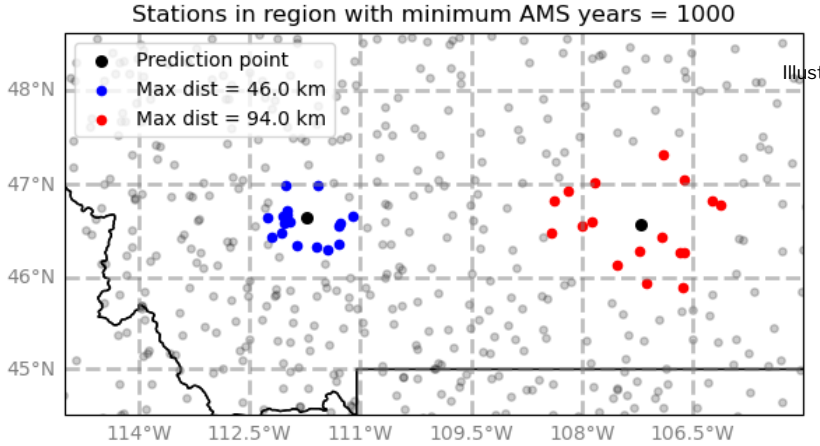
- Impacts of station data
  - Resampled storm events within region
  - Inclusion of stations with differing record periods and length
  - Station weighting based on distance and/or other characteristics
- Identification of optimum covariates across CONUS/OCONUS
  - Spatial covariates (MAM, PRISM MAP, elevation, etc.)
  - Temporal covariates (time, CO2, radiative forcing, global temperature, etc.)
- Model performance measures and applications



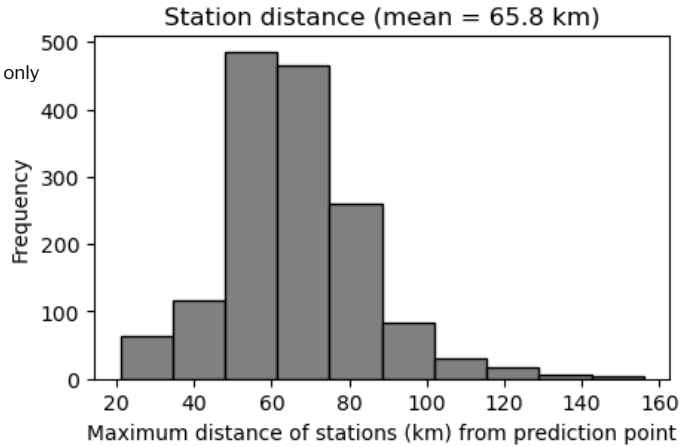


Nonstationary Framework Methodology - Enhancements

- Automating regional delineation
  - Adaptable search radius
  - Geographic attributes
  - Meteorologic attributes
  - Homogeneity/statistical testing



Illustrative Purposes only



Future Climate Estimates

- Climate Model Datasets-Considerations
  - Availability and limitations of model data (e.g., daily/subdaily; statistically/dynamically downscaled)
  - Best practices approach - analysis of multiple model datasets
- Vol 2 research will develop quantile adjustment factors to be applied to Vol 1 values

In Summary

- Public involvement - Peer Reviews
  - Pilot Study in 2024
  - CONUS in 2025
- On-going Research and Development
  - Quality Controlled Data Repository
  - Improved Nonstationary Framework Methodology
  - Automated and reproducible to the extent possible

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Thank You!

Debbie Martin

Debbie.Martin@noaa.gov

https://water.noaa.gov