Analysis of NASA GPM Early 30-minute Run in Comparison to Walnut Gulch Experimental Watershed Rain Data

Adolfo Herrera

April 14 2018

Arizona Space Grant Symposium

Mentor: Eleonora Demaria

Background

- Adequately estimating precipitation is important for water supply, ecosystem health, flood preparedness, and agriculture sustainability

- Physical rain gauge networks are being decommissioned globally due to budget constraints

Comparison of Measurements

Satellite Estimate

- Measures in swaths
- Indirect estimate through cloud temperature
  - Increases error
- Resolution may vary but normally ~11km

Rain Gauge

- Point measurement
- Direct measurement that is very precise
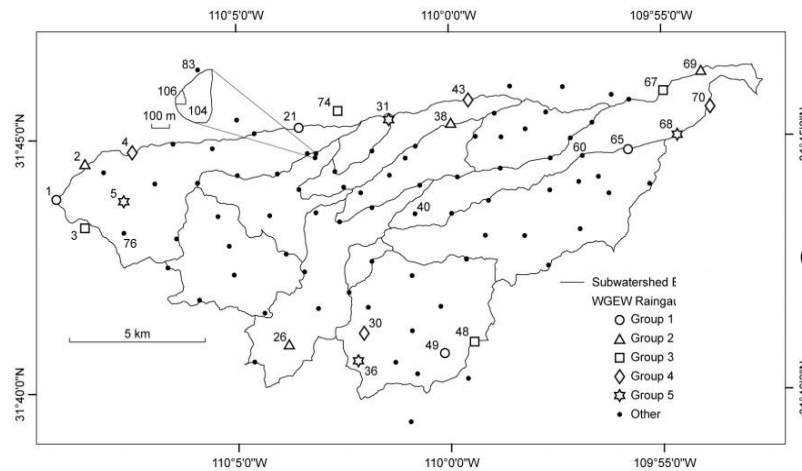- Require quality control on individual devices to ensure accuracy
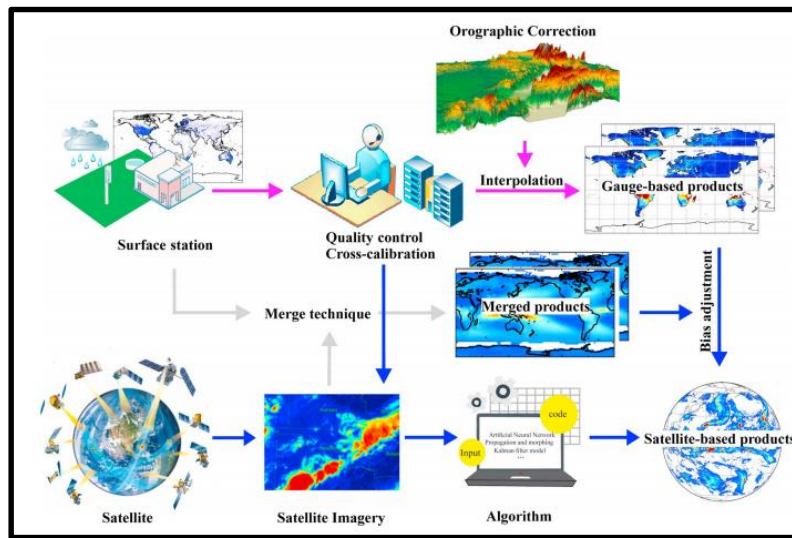
Source: Sun et al. A Review of Global Precipitation Data Sets

Goals/Data

- Determine if NASA GPM IMERG estimates capture the spatial-temporal properties of precipitation in a semi-arid environment

- Satellite data used:
  - IMERG Early 30-minute run (resolution of 0.1°x0.1°)

- Gauge data:
  - ~1 rain gauge/0.5km^2


Courtesy of Dave Goodrich

Source: destination360.com

Methodology

- The WGEW dataset is interpolated rain data throughout the watershed in 30 minute intervals

- Root mean square error (RMSE), relative bias, and correlation coefficient used to analyze differences in datasets.

- Prediction of detection (POD), false alarm rate (FAR), and critical success index (CSI) measures used to predict chance satellite correctly observes precipitation that the rain gauges observe

● Rain gauge
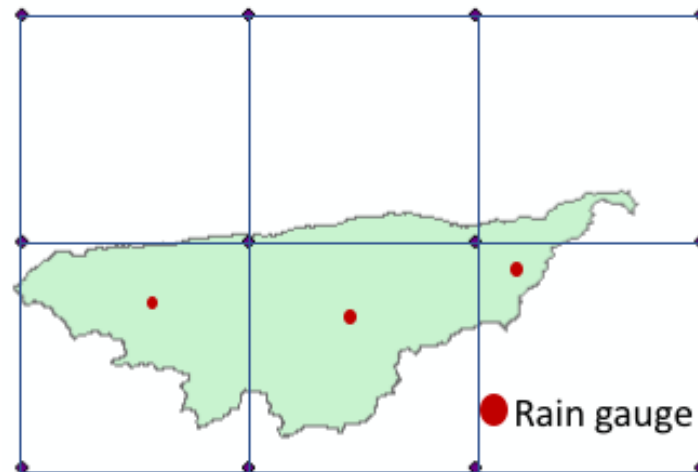
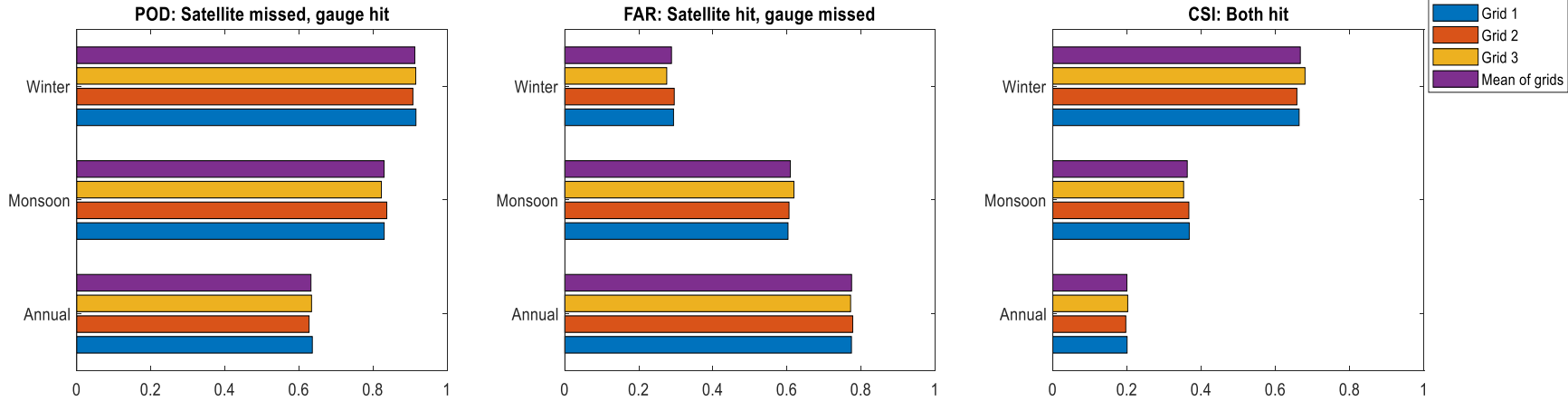# Scatterplots Show Sizable Spread in Points
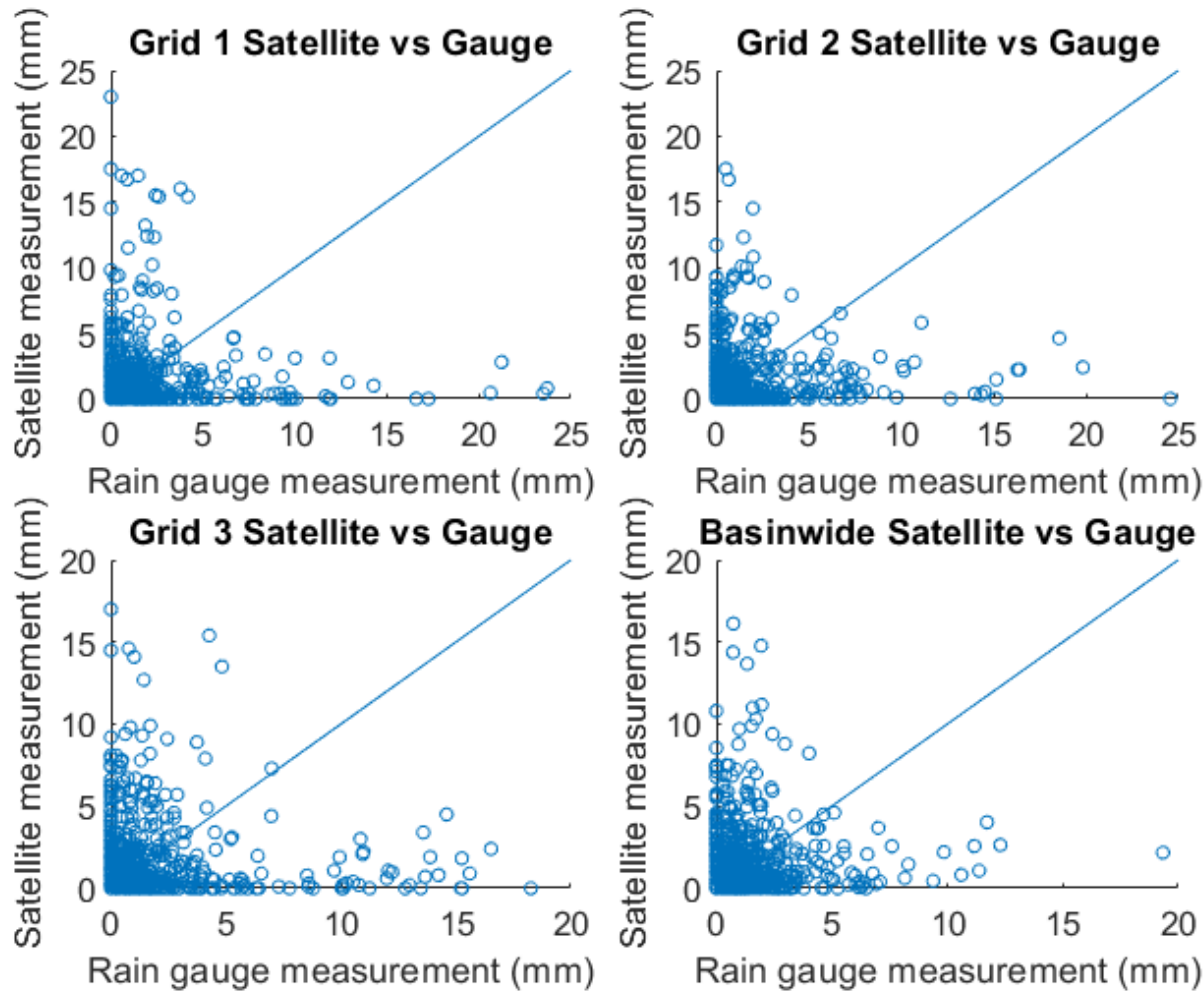
Satellite Estimates Have Trouble Capturing Highly Variable and Intense Monsoon Storms
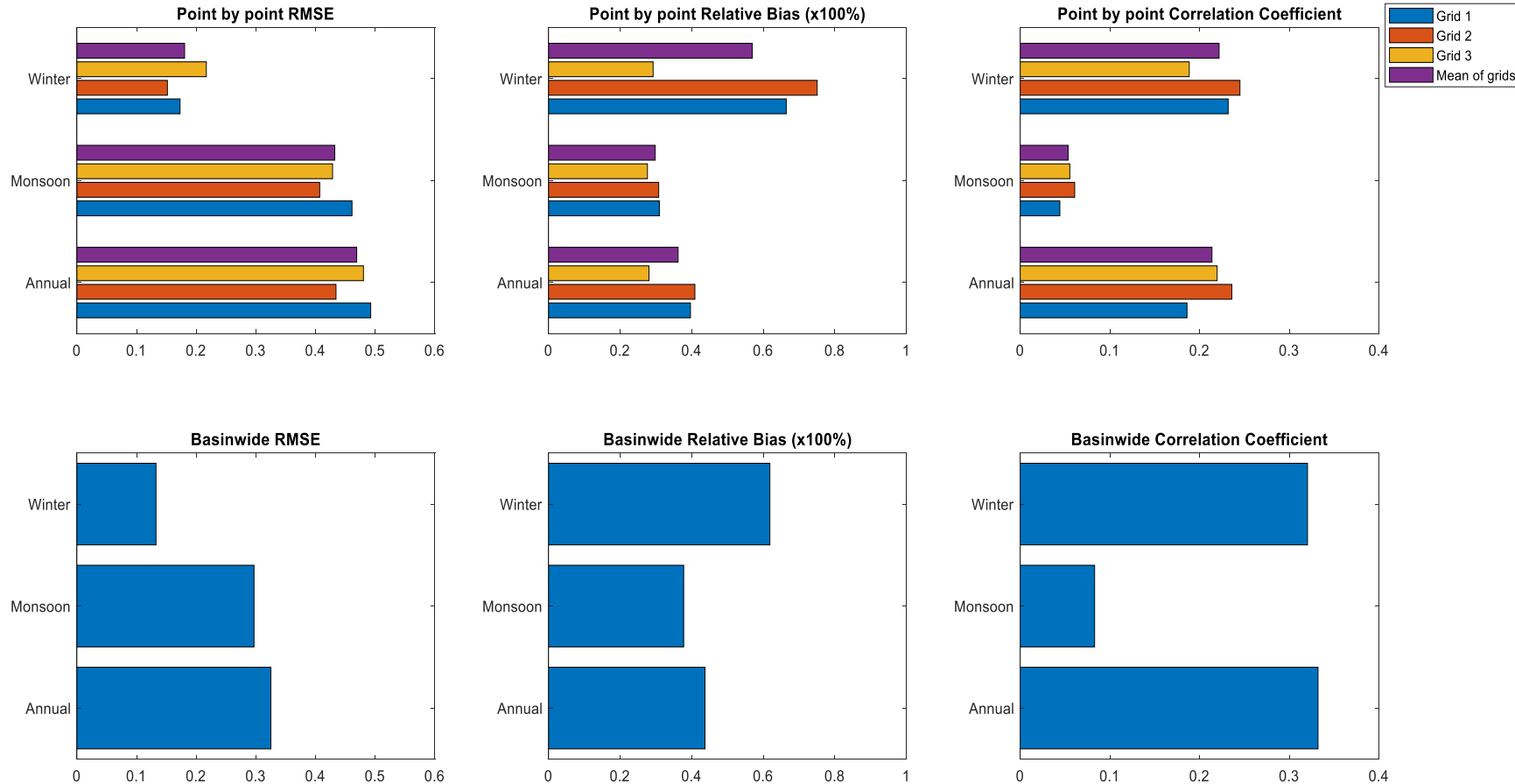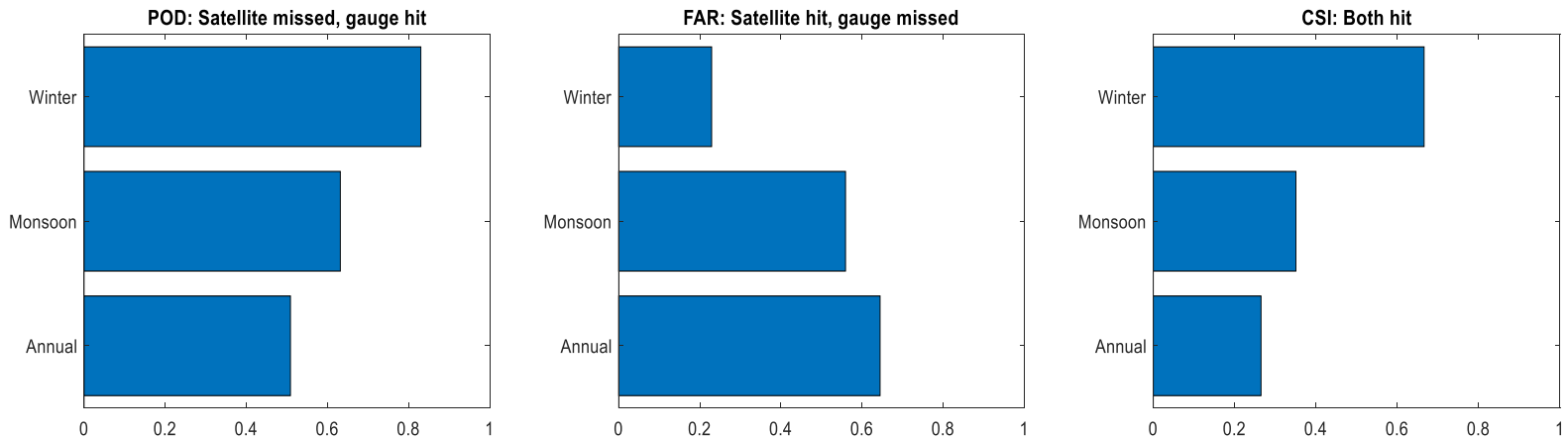
GPM Estimates Struggle to Capture Monsoon Precipitation Events

Conclusions

- Results could be improved with time lag
- The Early-run is not the only product. Late and Final runs are intended to be more accurate, but not necessarily real time
- There is much more error in the monsoon season; this may be due to the unique characteristics of monsoon precipitation in this region
- While many of the metrics from previously slides appear poor, this technology is trending in the correct direction

Acknowledgments

- Thank you to Eleonora Demaria for guiding me on this project

- Thank you to Carl Unkrich for providing the rain gauge data

- Thank you to the USDA-ARS and NASA for helping fund this project

Thank you