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

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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/0.5km²

Source: destination360.com

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
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

Point by point

 Basin-wide
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
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