Precipitation Estimation in the US-Mexico Border Using Ground Based Radars

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Approach

- Estimating rain rates from ground-based radar reflectivity

- Output rainfall estimates into a gridded product

- Gridded rainfall used as a stand-alone product or as input to a distributed hydrologic model for estimation of soil moisture and evapo-transpiration
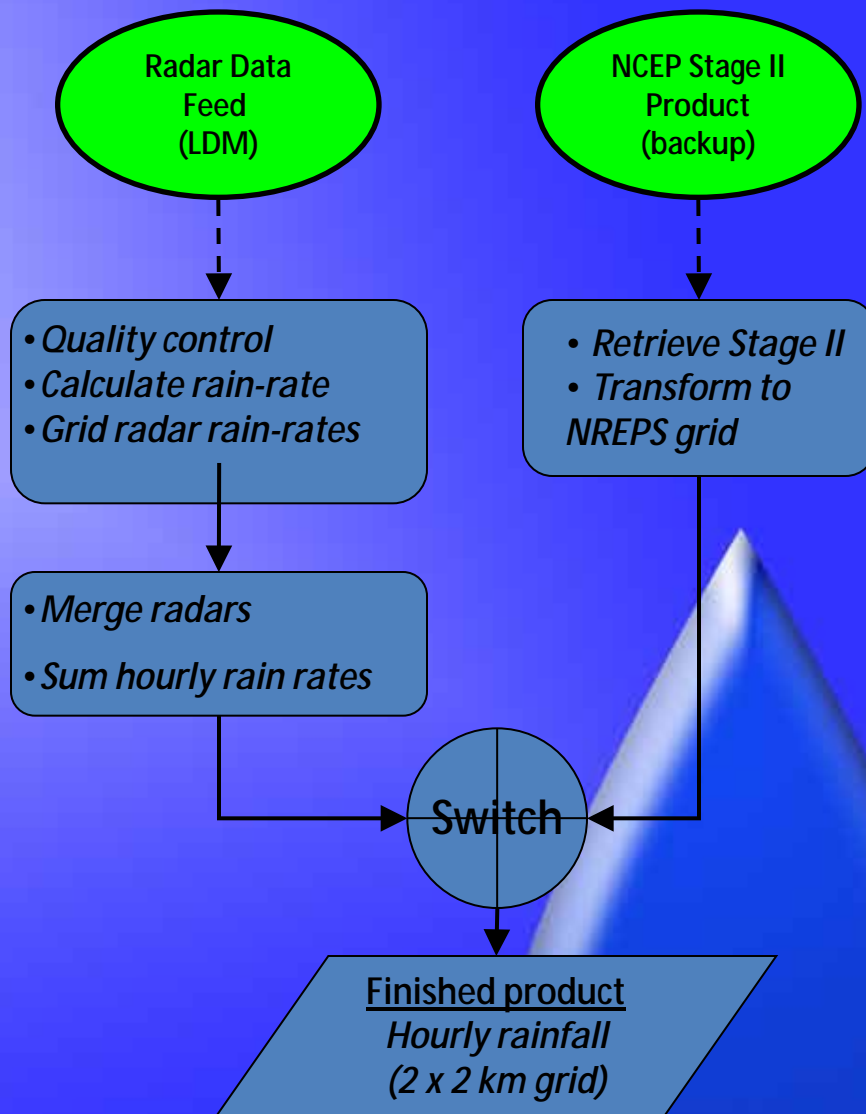
Software Package

- Developed by NASA MSFC and UAHuntsville
- NEXRAD Rainfall Estimation and Processing System (NREPS)

Data and Processing

- 5-minute volume scan from radars (WSR-88D) through LDM feed.

- Quality controlled

- Rainfall rates computed

- Grid and merge radar rainfall

- Hourly rainfall accumulations created on a 2 km grid.

Radar Data Feed (LDM)

NCEP Stage II Product (backup)

- *Quality control*
- *Calculate rain-rate*
- *Grid radar rain-rates*

- *Retrieve Stage II*
- *Transform to NREPS grid*

- *Merge radars*

- *Sum hourly rain rates*

Switch

Finished product
*Hourly rainfall
(2 x 2 km grid)*

Current Projects

- Tennessee Valley Authority
  - Distributed real-time rainfall measurements to reduce dependence on rain gauges.
  - Radar-based rainfall products (e.g., 6-hr sub-basin mean rainfall).
- NASA Applied Science Program's ARRA Project: Water Supply and Management in the San Joaquin River watershed in California
  - Collaborative effort with JPL, ARC, and MSFC.
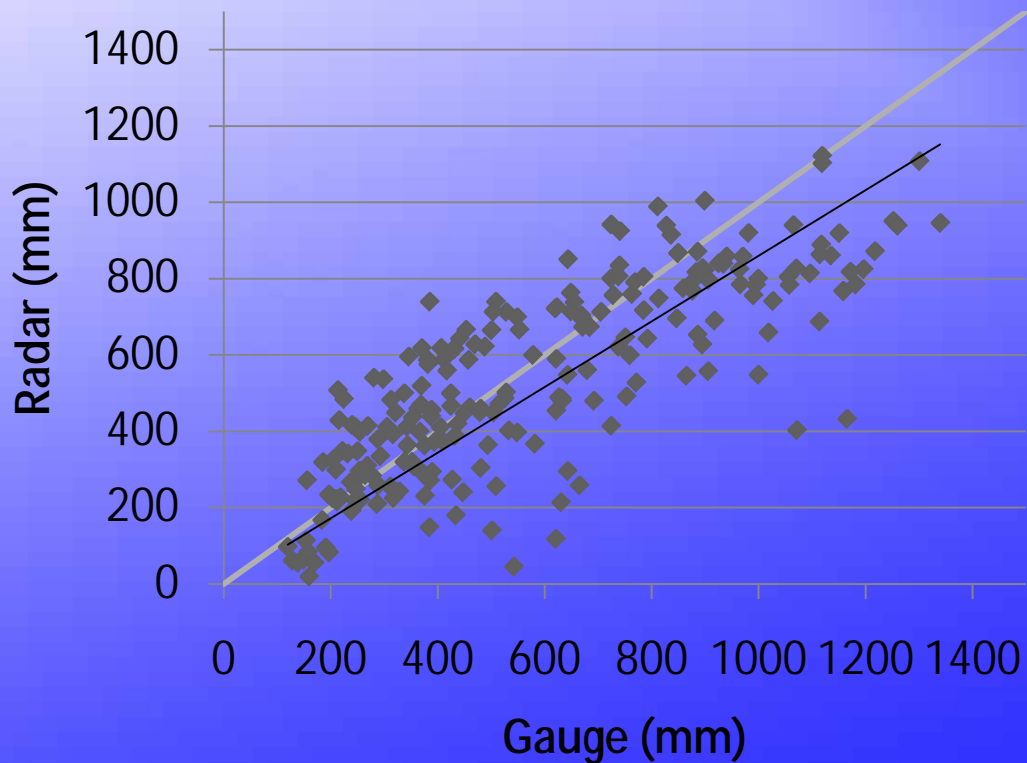 - Rainfall grids used as input to hydrologic models.

Current Projects

- Additional end-user tool:
  - NREPS visualizer: Java-based desktop GUI
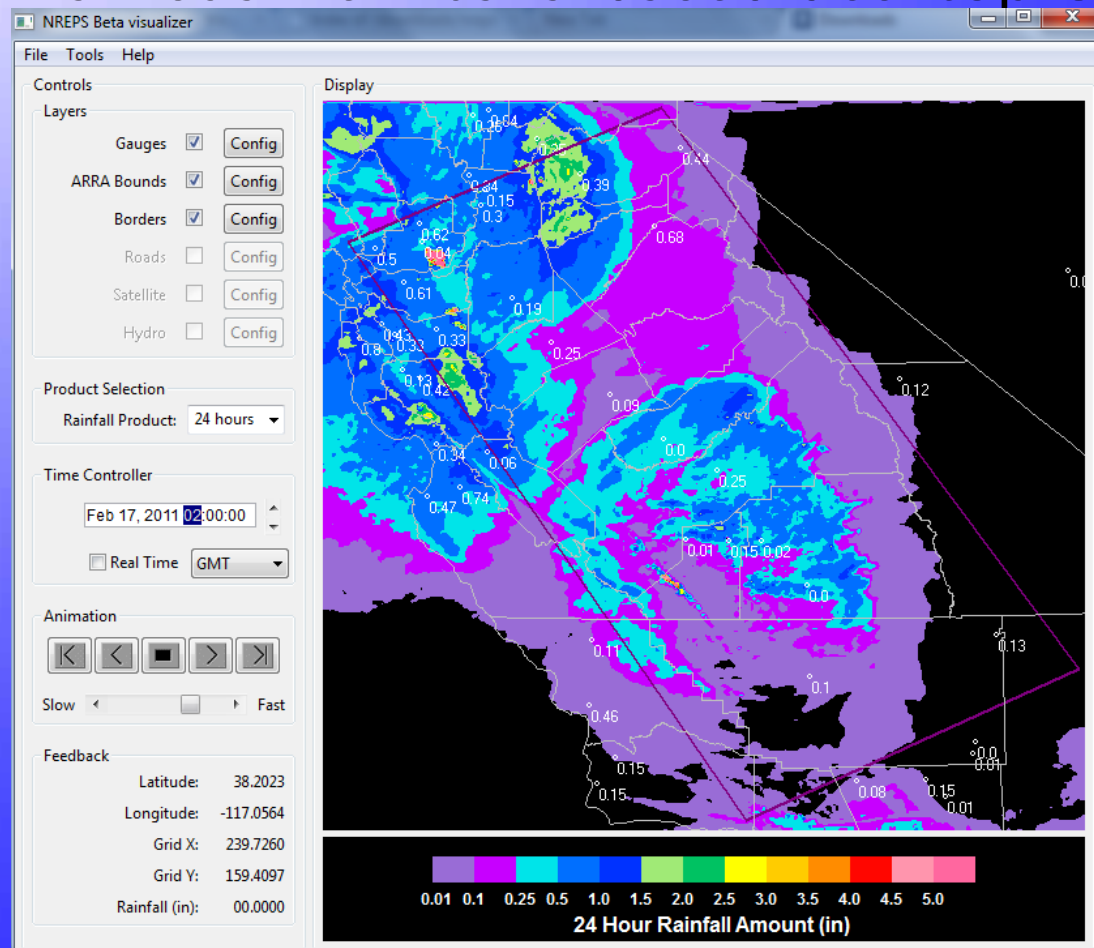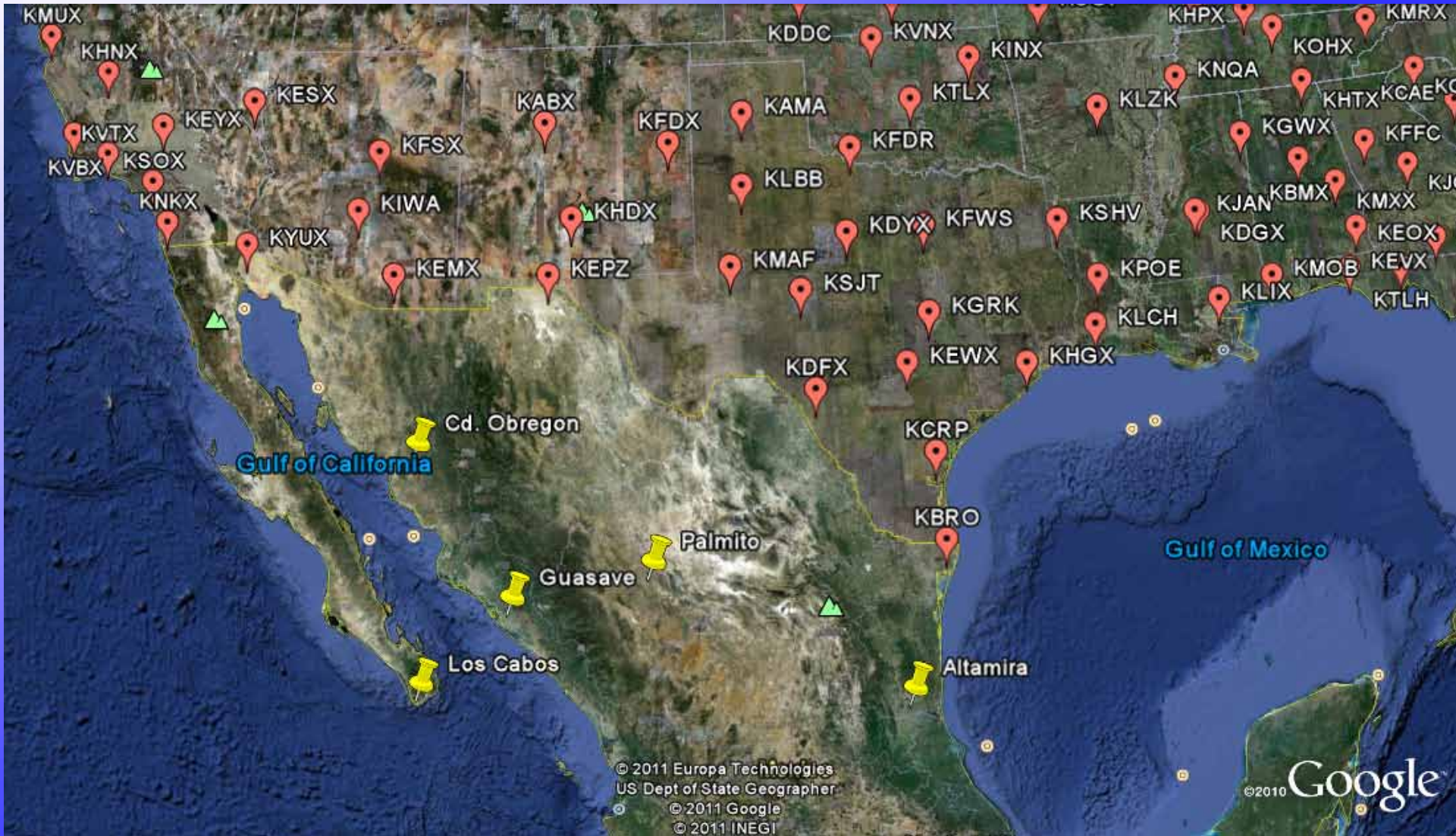
Current Projects

- ARRA performance summary

$y = 0.8597x$
$R^2 = 0.5622$

Radar Coverage

Challenges

- Radar coverage
  - Lack of coverage by US radars
  - Incorporating Mexican radars
    - Domain coverage
    - Smaller wavelength, attenuation
    - Variable low-level elevation angle(s)
    - Calibration schedule
    - Raw data access

- Improving radar data quality
  - Beam blockage by terrain
  - Correction for reflectivity from melting processes, ground clutter, birds, insects, etc.
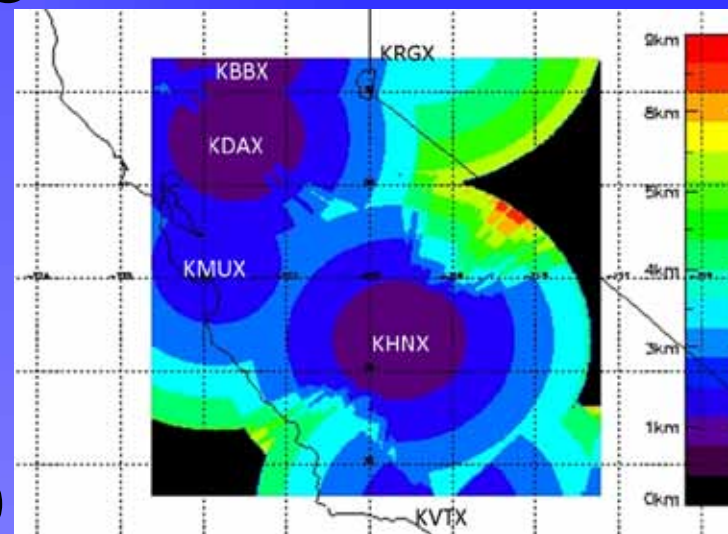
Opportunities

- NREPS can be easily adapted to other locations with a ground-based radar network.

- Using satellite rainfall estimates for inter-comparison in gauge-scarce regions.

- Using satellite data (NASA TRMM Precipitation Radar) for radar reflectivity calibration.

- Future goal of satellite data integration for rainfall estimates.