



An Advanced Quantitative Precipitation Information System for the Bay Area

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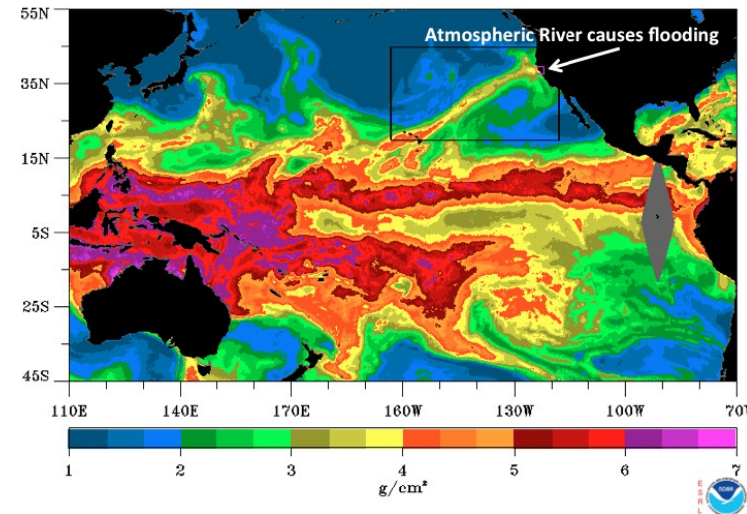
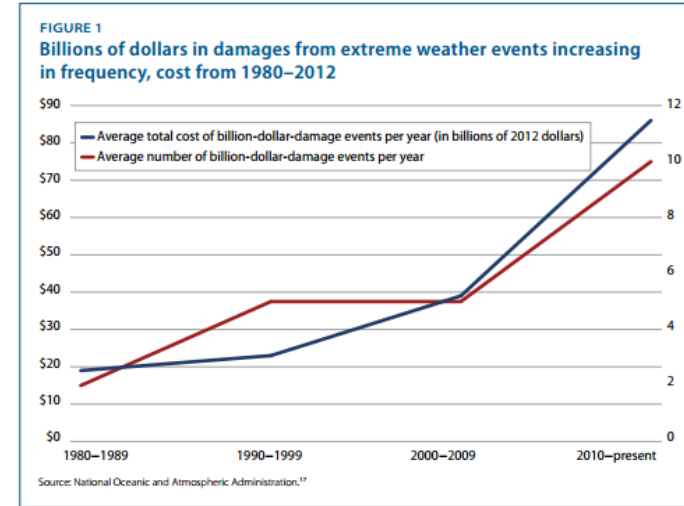


Background

- Grant awarded by DWR in 4th round of Prop 84
 - \$19M over 4 years
 - SCWA is local grant administrator
 - Involves NOAA, USGS, Scripps
- Complements Forecast Informed Reservoir Operations (FIRO) pilot study
 - Focus on Lake Mendocino

Project Need

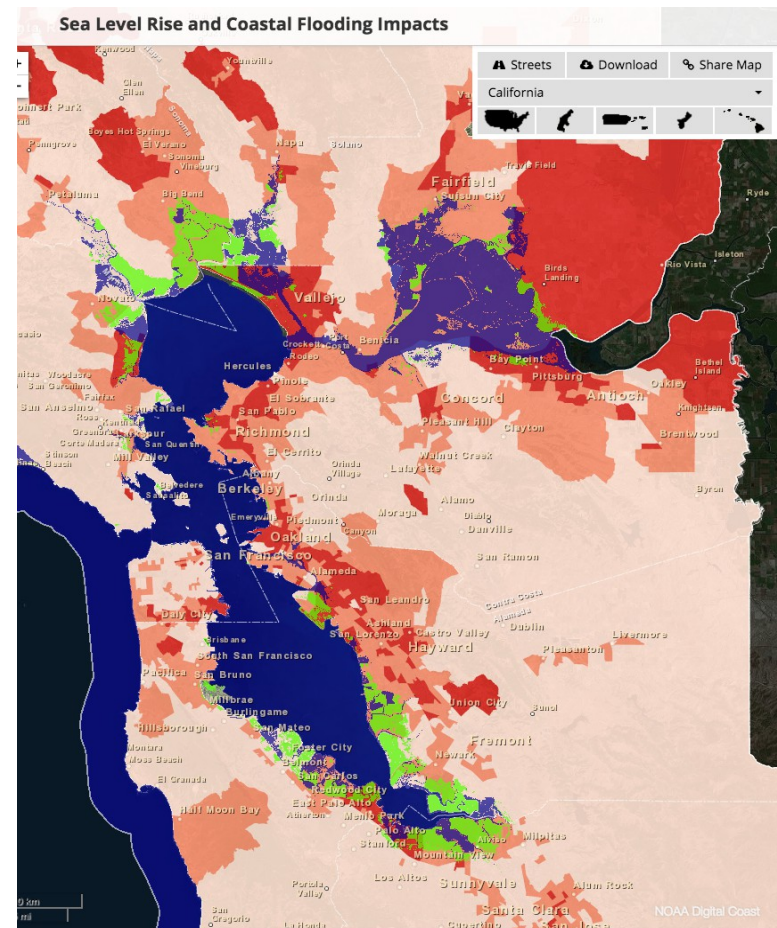
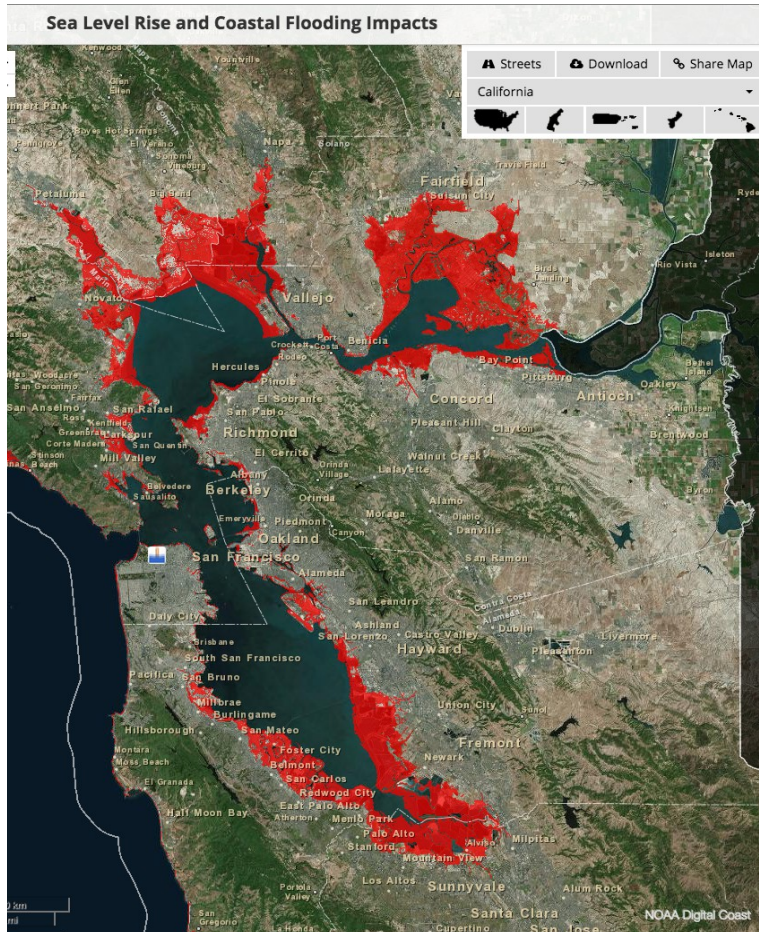
- Rainfall monitoring and forecasting for the Bay Area is inadequate for a variety of water management needs
 - Potential higher runoff in winter combined with sea level rise will lead to more coastal and inland flooding
- AQPI can be an effective climate adaptation strategy
 - Provide more accurate rainfall monitoring and forecasts with longer lead times
- More timely and site specific forecasts will provide a host of benefits
 - Reduced waste water overflows from urban areas, leading to improved water quality
 - Improved reservoir operations during wet and dry conditions
 - Improved situational awareness and preparation for emergency responders
 - Improved local and regional transportations systems – land, sea and air



Sea Level Rise and Coastal Flooding Impacts

Areas prone to shallow flooding

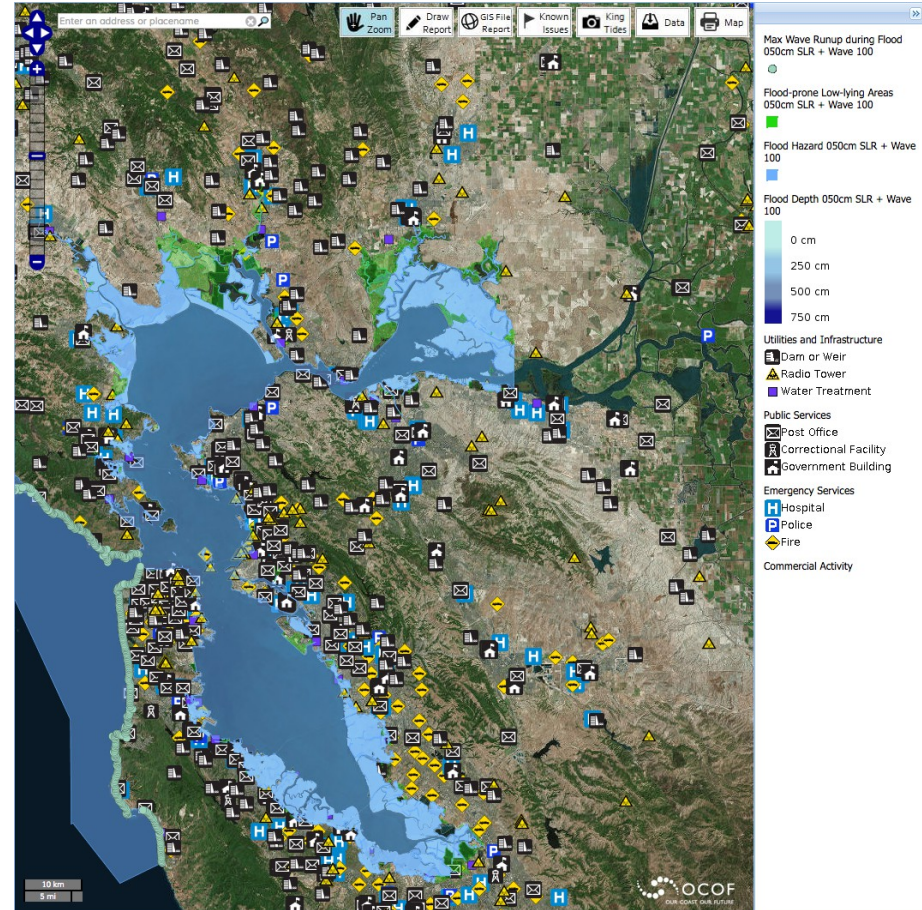
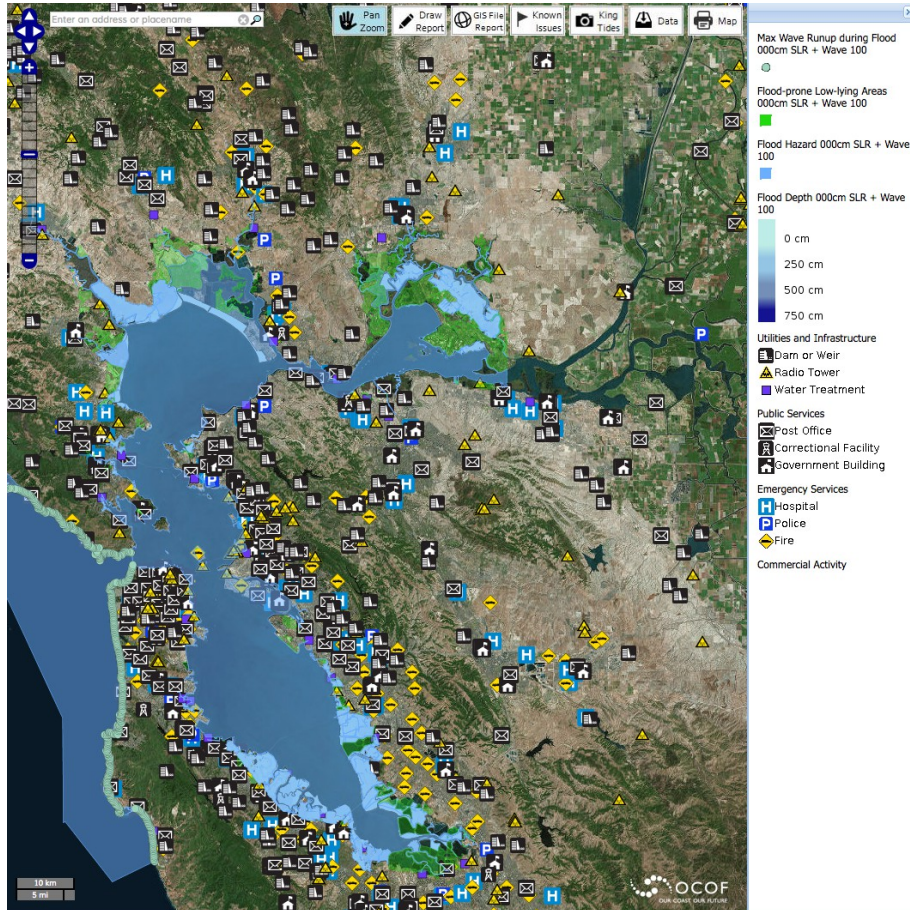
Socioeconomic vulnerability



Sea Level Rise and Coastal Flooding Impacts

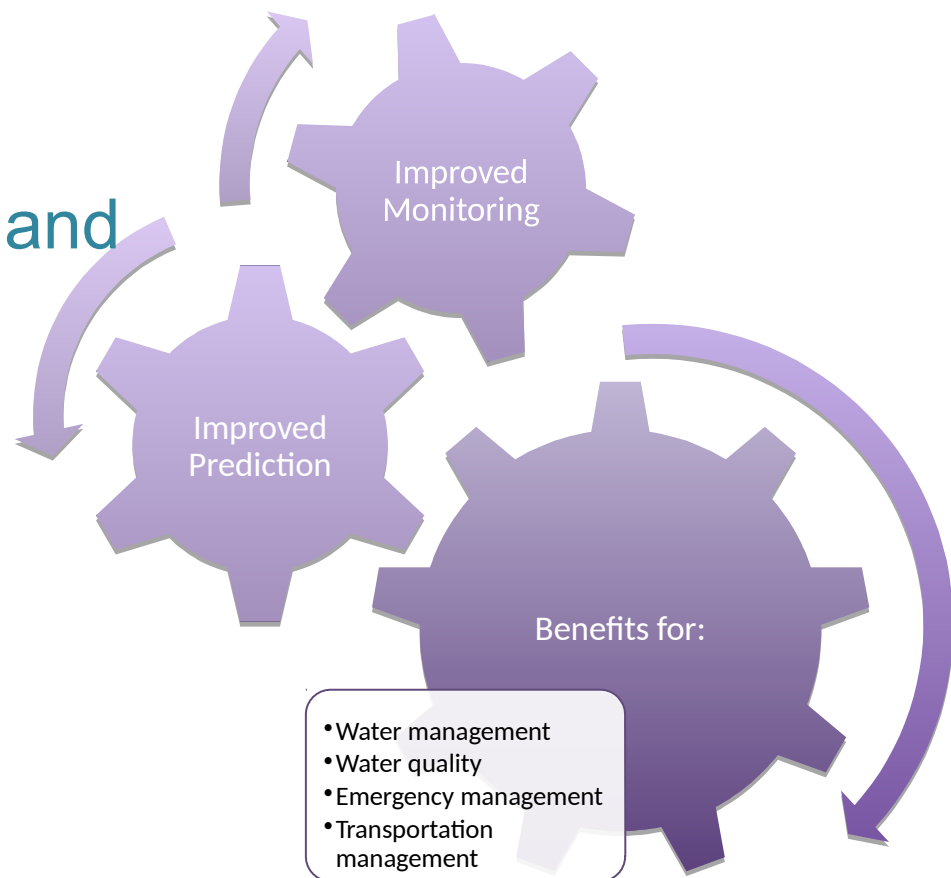
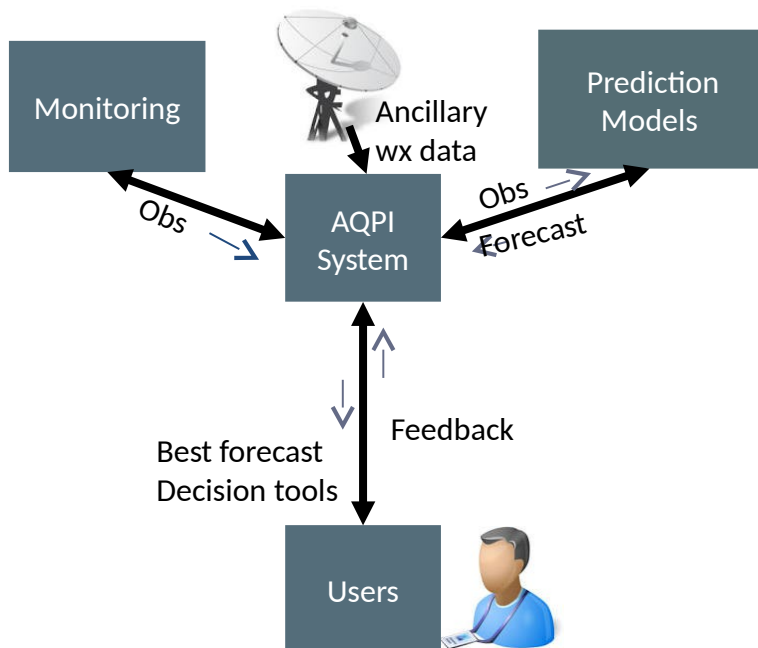
100 Yr Return Period Storm – No SLR

100 Yr Return Period Storm – 50 cm SLR

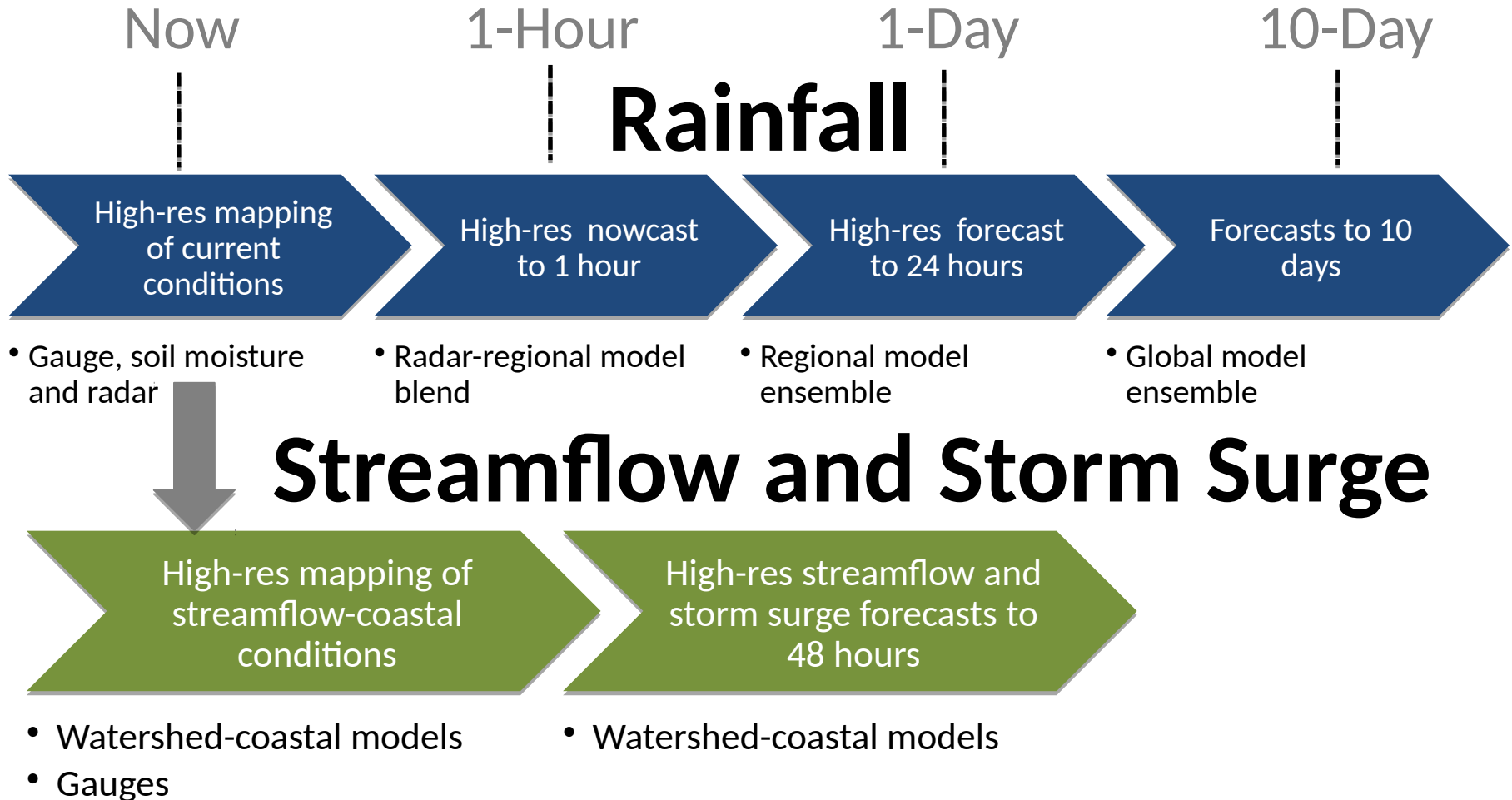


What is an AQPI System?

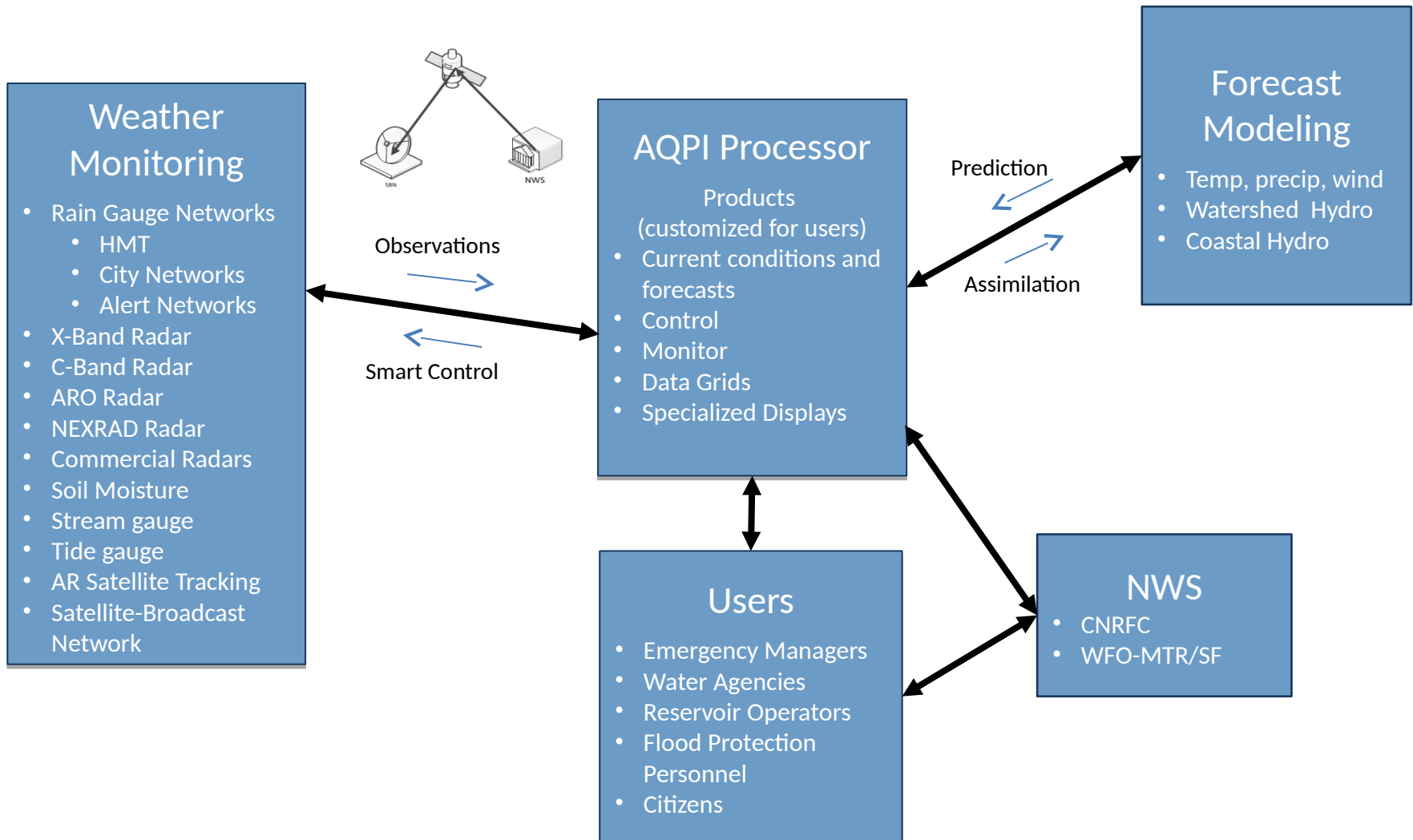
- An integrated set of observations and models to improve monitoring and prediction of precipitation, surface runoff, and coastal bay flooding



AQPI: better monitoring of current and future weather and water conditions



AQPI System



DWR Flood Risk Assessment



Every California Community is at Risk for Flooding

In just the last 20 years, all 58 counties have experienced at least one flood event, resulting in loss of life and billions of dollars in damage.

Flooding can affect California at different times and in different ways based on the complexities and diversity of the land, hydrology and climate - from stormwater flooding in urban areas to alluvial fan flooding at the base of hillside; from fast moving flash floods in Southern California to slow rise deep floods in the Central Valley.

The impacts of a major flood would be devastating to California and to the nation. In addition to tragic loss of life, flooding can have a serious impact on the economy and environmental resources.

When California floods...

- Vital services and critical infrastructure becomes isolated or closed, including transportation and energy facilities, public buildings, hospitals, police and fire stations, and schools.
- Jobs are lost or put at risk when businesses are disrupted or closed.
- Vast areas of agricultural lands become unproductive, impacting national and international food supplies.
- Water supplies and water quality are impacted, including a portion of the water supply for 60 percent of Californians.
- Sensitive species and ecosystems are impacted. At least 100 sensitive species are exposed to flood hazards within each California hydrologic region.

The diagram shows a map of California with lines pointing to various flood types: Tsunami Flooding, Slow Rise Flooding, Flash Flooding, Stormwater Flooding, Alluvial Fan Flooding, Debris Flow Flooding, Coastal Flooding, and Engineered Structure Failure Flooding. Each type is accompanied by a small representative image.

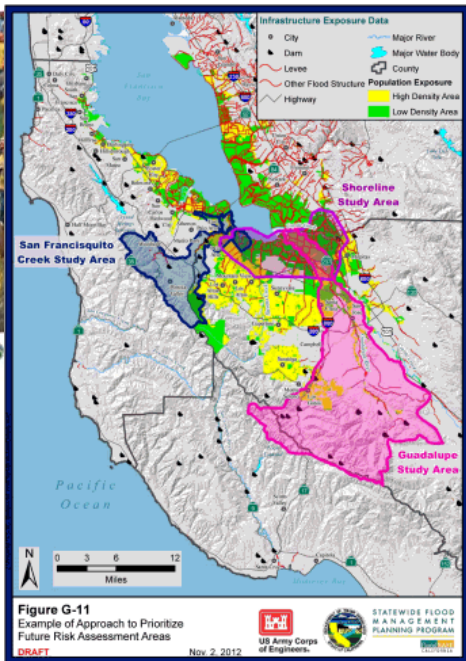


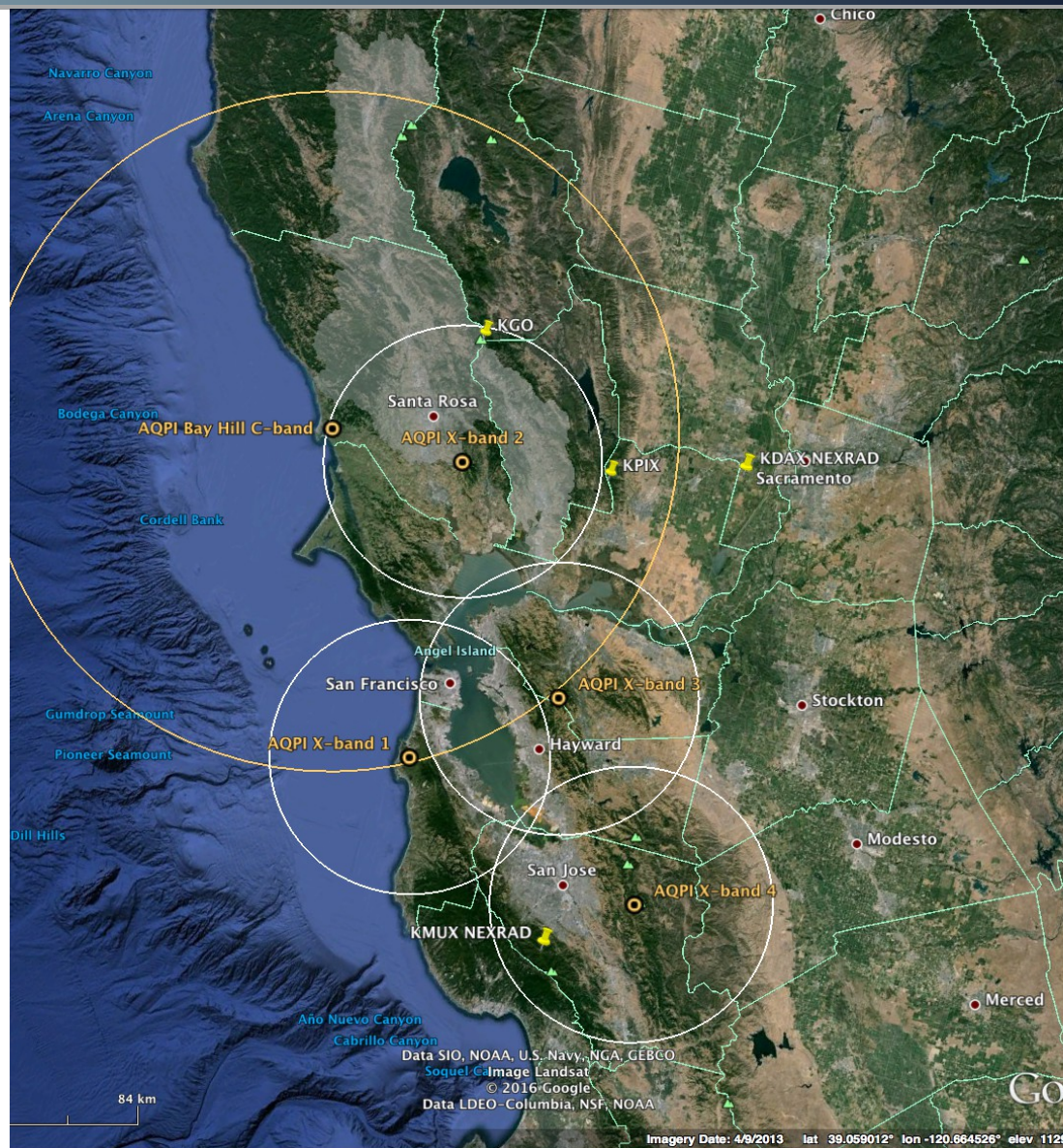
Figure G-11
Example of Approach to Prioritize Future Risk Assessment Areas
DRAFT Nov. 2, 2012
US Army Corps of Engineers STATEWIDE FLOOD MANAGEMENT PLANNING PROGRAM

Figure G-11. Example of Approach to Prioritize Future Risk Assessments

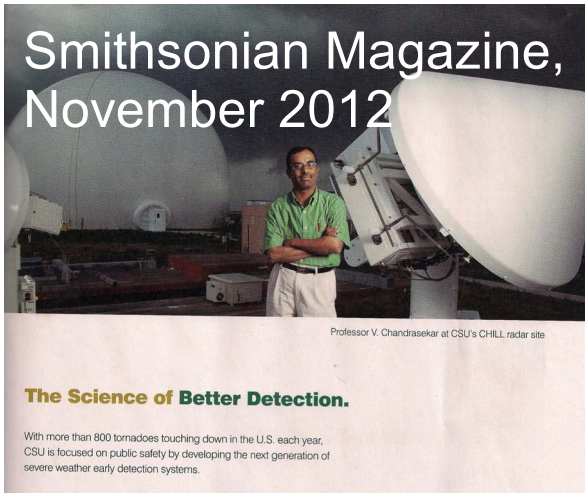
Leverage flood risk studies in Bay Area for prioritizing observing system locations

Potential Radar Deployments (not finalized)

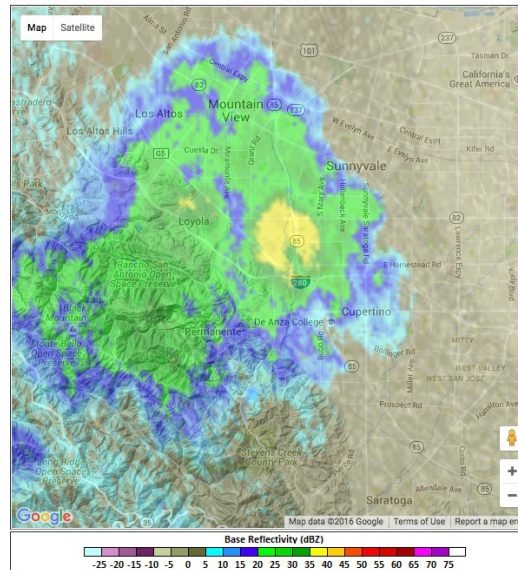
- Radars
 - X-band
 - C-band
- Surface stations
 - Rain gauges
 - Surface meteorology
 - Soil moisture
 - Stream gauges



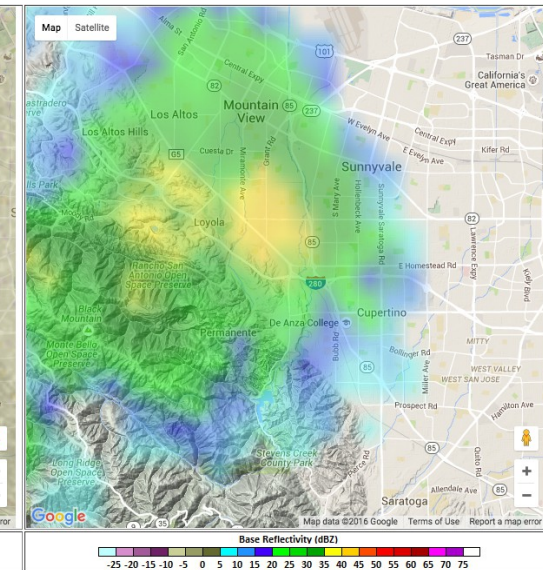
- Small radar systems (X-band) have been deployed in other urban regions
 - Dallas-Fort Worth
 - Tokyo
 - Paris
- High time and space resolution
- Accurate rainfall estimates
- Improved situational awareness
 - Emergency management
 - Transportation



Santa Clara X-band



NEXRAD



AQPI Benefits Summary

- Overall

- Total Wx Benefits (\$240M/yr; \$34/person)
- Incremental AQPI Benefits (\$79M/yr; \$11/person)

- By Category

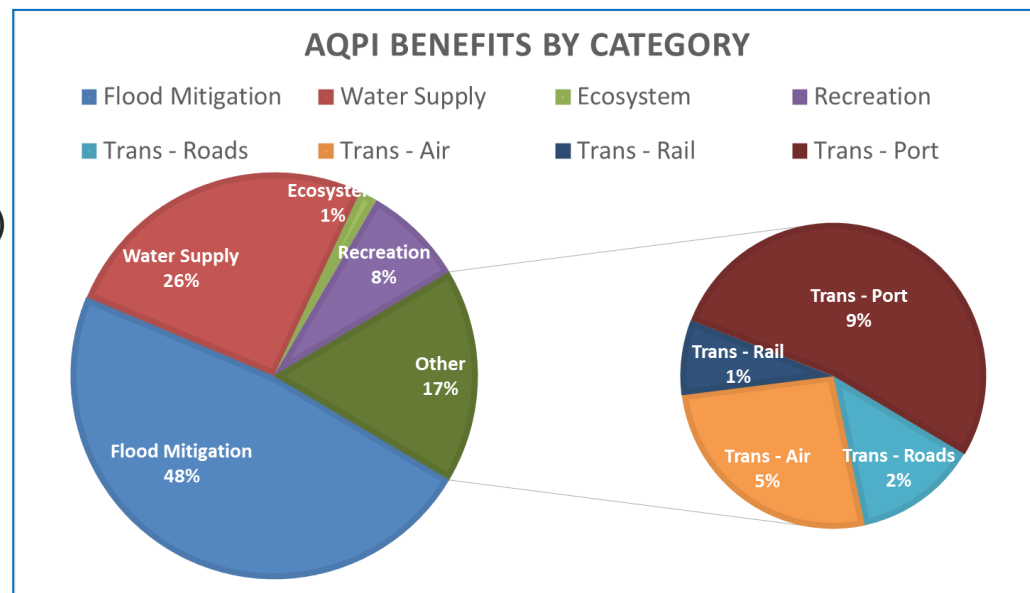
- Flood Mitigation (48%)
- Water Supply (26%)
- Ecosystem Services (9%)
- Transportation (17% (Ports 9%))

- Present Value

- PV(6%, 10yr)
- Benefits - \$460M
- Costs - \$90M

- Benefit/Cost Estimates

- Best Estimate – 5:1
- Optimistic Estimate – 13:1
- Pessimistic Estimate - 2:1



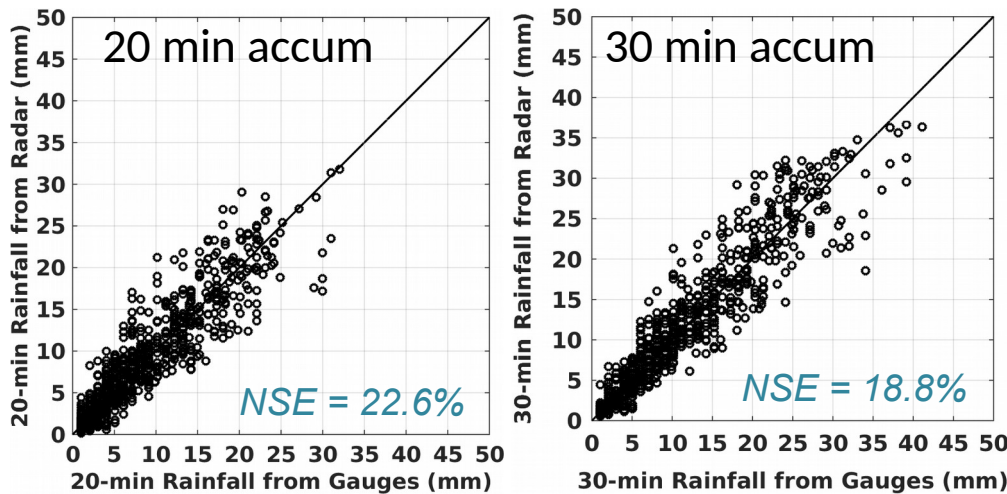
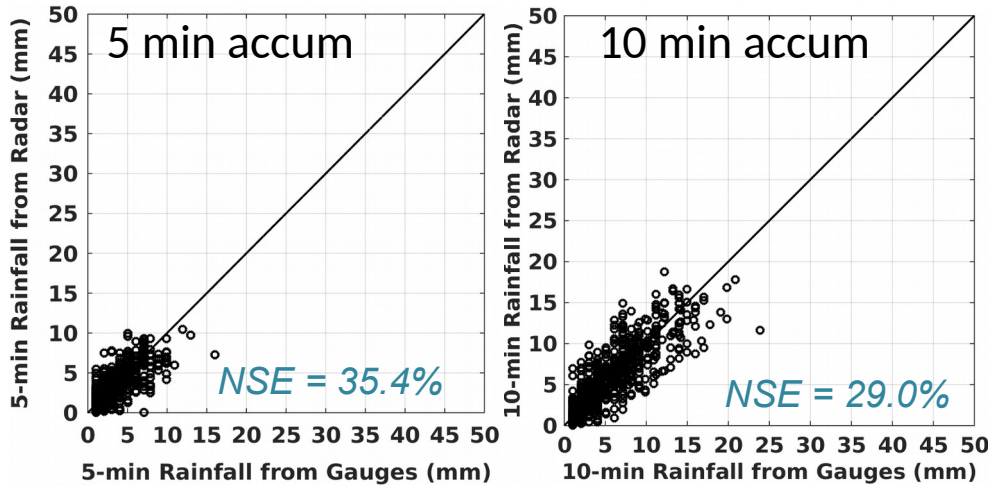
From Johnson et al. 2015: "Benefits Of An Advanced Quantitative Precipitation Information System: San Francisco Bay Area Case Study"

Summary

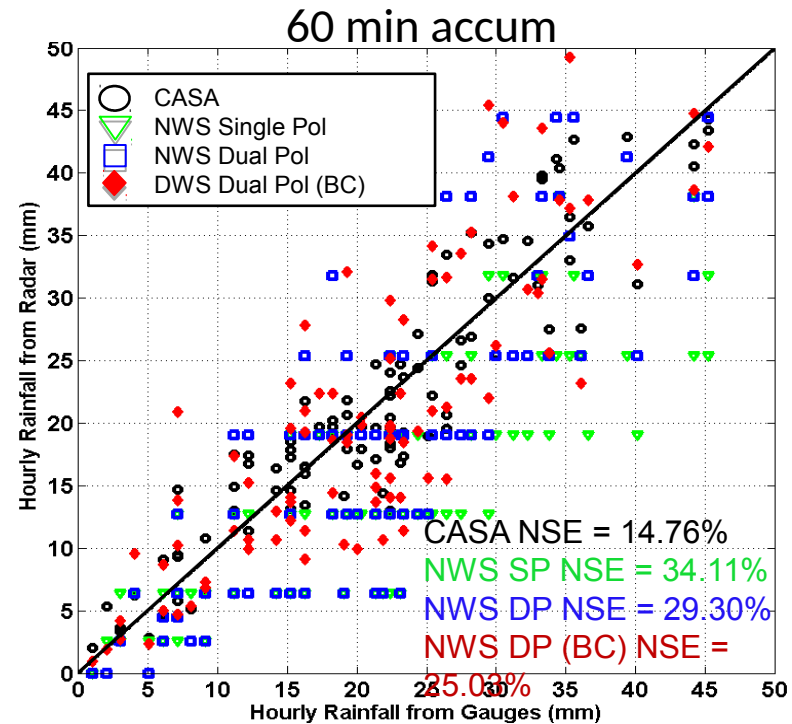
- Improved monitoring and prediction of precipitation and flooding can enhance public safety
- The BA-AQPI System can aid water managers in securing water supplies while mitigating flood risk and minimizing water quality impacts to the Bay from storm runoff and combined sewer discharges
- The BA-AQPI System will implement a combination of radar systems and high resolution models to improve tracking of incoming storms and provide high resolution coverage over populated and flood prone urban areas of the SF Bay region
- The BA-AQPI System will can be expected to provide benefits exceeding costs of at least 4:1

Backup Slides

Performance of CASA/DFW QPE System



A combination of events in different seasons



NWS Data Source: [http://](http://www.ncdc.noaa.gov/hexradinv)

www.ncdc.noaa.gov/hexradinv

CASA/DFW QPE: localized flash flood on June 24, 2014:

- Domain:
~10km X 10km
- Time:
20:59-22:10UTC
- Spatial resolution:
250m X 250m
- Temporal resolution:
1 min
- Peak rainfall rate
~200 mm/hr

