San Francisco Bay Advanced Quantitative Precipitation Information (AQPI) System

Carl Morrison, Morrison & Associates, Inc., cmorrison@morrisonassociates.com

The Bay Area Advanced Quantitative Precipitation Information (AQPI) System employees a moderate-range C-band radar unit and four advanced short-range radar units strategically located in the Bay Area to augment existing C-band (NEXRAD) radar units, rain gauges, moisture probes and other technology to deliver to flood protection managers, reservoir operators, wastewater treatment plant operators, emergency responders, transportation officials and others very precise information on where, when and with what intensity precipitation will fall. Lead time will be between 2 and 12 hours.

NOAA, SFPUC and Sonoma CWA will contribute millions of dollars as matching funds for the $19 million expected to be funded by DWR with a 2015 Round Prop 84 grant.

In particular the AQPI system will give precipitation information about atmospheric rivers, the source of 50% of the Bay Area's precipitation. This is increasingly important as climate change is causing atmospheric rivers to be more intense and unpredictable.

Keywords: Atmospheric rivers, radar, flood protection, reservoir operations, emergency response, wastewater

Poster Topic: Climate Change

Hot off the Press! San Francisco Bay Responds to Record High Temperatures

Charles Martin, USGS, camartin@usgs.gov
Erica Nejad, USGS, enejad@usgs.gov
Tara S. Schraga, USGS, tschraga@usgs.gov
James E. Cloern, USGS, jecloern@usgs.gov

Headline from 2014: "U.S. scientists have announced that the year so far has been the warmest on record, setting expectations for a long, hot, dry year ahead" (ClimateCentral.org). News reports across California called 2014 the hottest year on record for the State as record high air temperatures were set across southern California while warmer winters made headlines in Northern California. Thus far, 2015 has shown no sign of cooling. Statewide air temperatures for January through March 2015 topped the 2014 record by 1.8°F, and air temperature at San Francisco International Airport recorded extreme values for winter months in both 2014 and 2015. We analyzed water temperature measurements made by USGS from 1968-2015 to determine how the estuary has responded to these record-high winter air temperatures. We compared seasonal trends in the six major sub-embayments of the Bay-Delta system: Lower South Bay, South Bay, Central Bay, San Pablo Bay, Suisun Bay, and the lower Sacramento River. Initial results of monthly average water temperature from 1968-2015 show periods of record high temperatures estuarywide in 2014 and 2015, correlating with record high air temperatures. Warming of the Bay has important ecological implications, water temperature is an important habitat attribute, and is a strong regulator of metabolism and life cycles of biota from bacteria to fish. We will extend our analyses to determine how much of the water temperature variability is explained by air temperature, and to measure seasonal and spatial patterns of estuarine response to the recent high-temperature anomalies.

Keywords: climate change, water temperature, record high temperatures, Bay-Delta

Poster Topic: Climate Change

Integrating Fluvial and Oceanic Drivers in Operational Flooding Forecasts for San Francisco Bay

Liv Herdman, USGS, lherdman@usgs.gov
Li Erikson, USGS, lerikson@usgs.gov
Patrick Barnard, USGS, pbarnard@usgs.gov
Andrea O'Neill, USGS, aoneill@usgs.gov
Rob Cifelli, NOAA, rob.cifelli@noaa.gov
Lynn Johnson, NOAA, lynn.e.johnson@noaa.gov

The U.S. Geological Survey (USGS) and National Weather Service (NWS) are developing a state-of-the-art flooding forecast model for the San Francisco Bay area that will predict watershed and ocean-based flooding up to 72 hours in advance of an approaching storm. The model framework for flood forecasts is based on the USGS-developed Coastal Storm Modeling System (CoSMoS) that was applied to San Francisco Bay under the Our Coast Our Future project. For this application, we utilize Delft3D-FM, a hydrodynamic model based on a flexible mesh grid, to calculate water levels that account for tidal forcing, seasonal water level anomalies, surge and in-Bay generated wind waves from the wind and pressure fields of a NWS forecast model, and tributary discharges from the Research Distributed Hydrologic Model (RDHM), developed by the NWS Office of Hydrologic Development. The flooding extent is determined by overlaying the resulting water levels onto a recently completed 2-m digital elevation model of the study area which best resolves the extensive levee and tidal marsh systems in the region. Here we present initial pilot results of a hindcast for a winter storm in January 2010, with a focus on the Coyote Creek and Guadalupe River watersheds. We also demonstrate the feasibility of predicting flooding on an operational time scale that incorporates both atmospheric and hydrologic forcings.

Keywords: Flood Forecasting; Sea Level Rise; Coastal Storm Modeling

Poster Topic: Climate Change