The United States Geological Survey (USGS) Multi-Hazards Demonstration Project (MHDP) is preparing a new emergency-preparedness scenario, called ARStorm, to address massive U.S. West Coast storms analogous to those that devastated California in 1861–62. Storms of this magnitude are projected to become more frequent and intense as a result of climate change. The MHDP has brought together experts from the National Oceanic and Atmospheric Administration (NOAA), USGS, Scripps Institute of Oceanography, the State of California, Colorado Geological Survey, the University of Colorado, the National Center for Atmospheric Research, and other organizations to design the storm, but scientifically plausible, hypothetical storm that would provide emergency responders, resource managers, and the public a realistic assessment of what is historically possible.

The ARStorm project builds on the 1861–1862 historical events but uses modern modeling methods and data from large storms in 1969 and 1986. The ARStorm draws heat and moisture from the tropical Pacific, forming Atmospheric Rivers (ARs) that grow in size, gain speed, and, with a focus equal to hurricanes, dominate the U.S. West Coast for several weeks.

Using sophisticated weather models and expert analysis, precipitation, snowlines, wind, and pressure data the modellers will characterize the resulting floods, landslides, and coastal erosion and inundation. Data hazards will then be translated into the infrastructural, environmental, agricultural, social, and economic impacts. Consideration will be given to catastrophic disruptions to water supplies resulting from impacts on groundwater pumping, seawater intrusion, water supply, drainage, surface, and subsurface. Possible climate-change forces that could exacerbate the problems will also be evaluated.

In contrast to the recent U.S. East and Gulf Coast hurricanes, only recently have scientific and technological advances documented the frequency and growth of possible future West Coast storms. A task of ARStorm is to elevate the visibility of the very real threats to human life, property, and ecosystems posed by extreme storms on the U.S. West Coast. This enhanced visibility will help advance the preparedness of the emergency management community and the public to such storms.

ARStorm is scheduled to be completed by September 2010 and will be the basis of a statewide emergency response drill, Golden Guardian, led by the California Emergency Management Agency in 2011.

ARStorm — A West Coast Storm Scenario

EXTREME STORM SCENARIO: ARStorm

The ARStorm scenario hypothesizes severe storms that emanate huge amounts of moisture from the tropical Pacific and dump it on California over a several week period with firehose-like ferocity. The nontechnical term “Pineapple Express” is used to describe these storms.

Because there is no suitable scale for atmospheric rivers, the storm scenario is named “ARStorm” to represent an atmospheric river (AR) with a value of 1,000 on a scale of atmospheric rivers to be determined by atmospheric scientists. The scenario storm then will be an “AR, 1000,” and other U.S. West Coast storms will be scaled in comparison.

The rainfall, flooding, winds, and physical damage to infrastructure from an extreme storm would likely also result in adverse physical, chemical, and ecological impacts on the environment in northern and southern California, including the possible extinction of species.

The storm scenario will also allow recovery managers to better understand the types and nature of materials that would be in need of cleanup and disposal.

Emergency Response

Like the ShakeOut Earthquake Scenario, the ARStorm scenario is scheduled to serve as the basis for the State of California’s annual emergency response drill called Golden Guardian, possibly in 2012.

The effort will lead to real-time understanding and prediction of coastal flooding, inundation, erosion, wave heights, current strength, and cliff failure on the entire Southern California coast.

A coastal inundation model completed in 2009 will translate the meteorological output data (wind, pressure, and so forth) into secondary hazards like coastal erosion and inundation.

The output of the model will be used:
• In the ARStorm scenario to determine plausible consequences of the hypothetical storm
• Beyond southern California and incorporate real-time data inputs for use in a real-time warning system to be used by emergency managers, life line continuity operators, and resource managers

Policy

The Policy Section of ARStorm will focus on developing Winter Storm Scenario-based Policy Connections which include all four disaster management functions: preparedness, response, recovery, and mitigation. Special attention will be given to benefits from FEMA’s new program which emphasizes lifecycle flood risk reduction through strategic mapping, assessment, and planning.

Economics

The ShakeOut Earthquake Scenario exposed the vulnerabilities associated with a large-scale regional disaster on the economy of southern California and the U.S. economy. Likewise, the ARStorm scenario economics team has developed a model of the California economy to examine the economic costs from damages and outcomes associated with the ARStorm scenario.

Public Hazard Awareness Campaign

ShakeOut and the ARStorm Scenario for northern and southern California. The ARStorm scenario will be partially derived from that effort.

ARStorm iPhone app

The app began at the Art Center College of Design in 2008. The students’ task was to invent ways to turn disaster preparedness into a broad-based cultural value while also raising awareness and concern.

ARStorm: An Earthquake Scenario for California

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The ARStorm Project

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