

Coastal Inundation Model Guidance for the Pacific Islands Region

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Coastal Inundation Guidance Workshop



WORKSHOP:

University of Hawaii at Manoa on August 1-2, 2011.

University of Hawaii Sea Grant College Program (UHSG)
NOAA Coastal Storms Program (CSP).

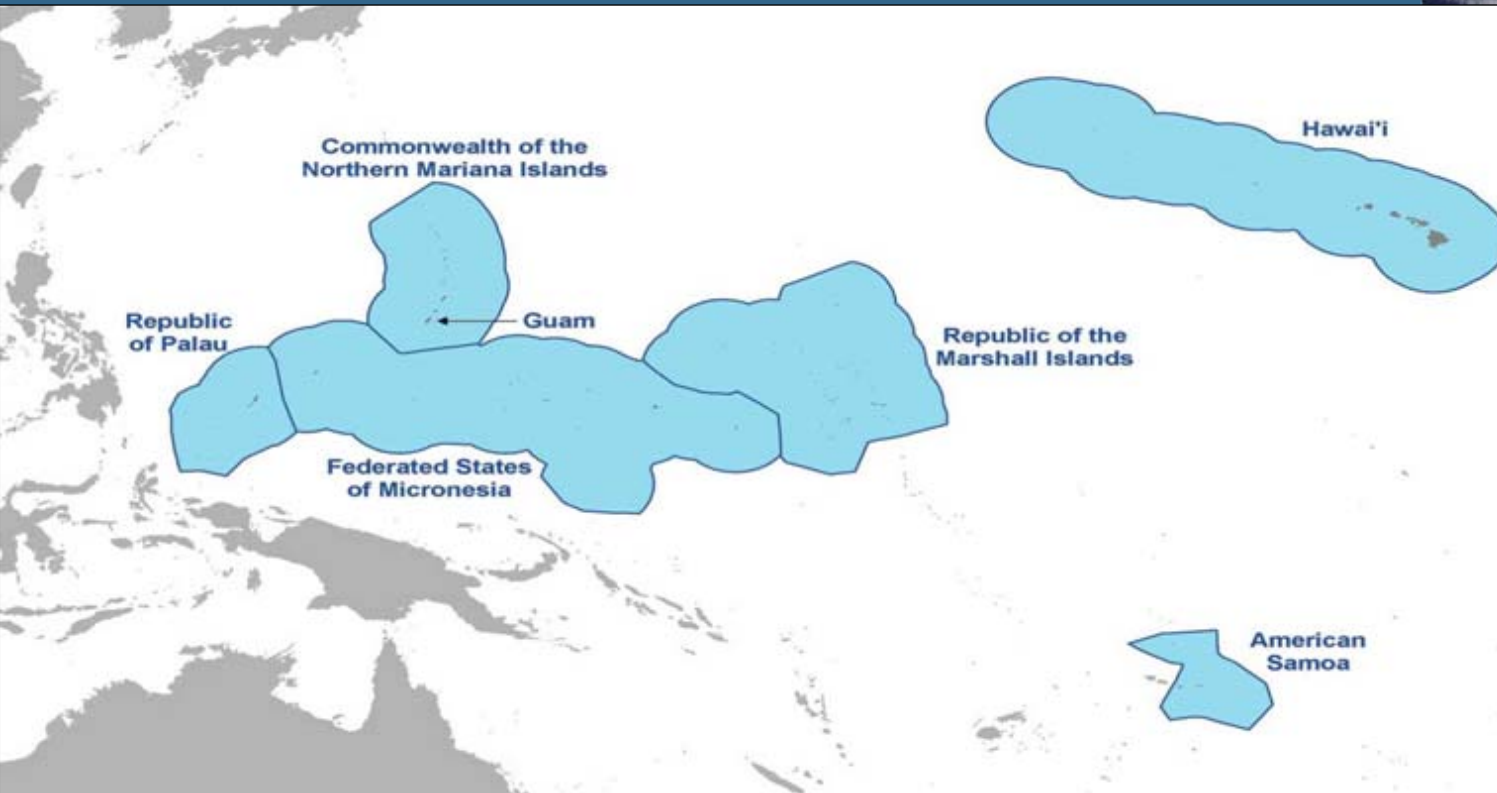
Issues Identified:

1. User group requirements,
2. Models and technologies currently available,
3. Investigating an operational inundation forecast guidance system.

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NOAA Pacific Islands Region and U.S. Affiliated Pacific Islands (USAPI)



- Hawaii
- American Samoa
- Guam
- Commonwealth of the Northern Mariana Islands (CNMI)
- Federated States of Micronesia (FSM)
- Republic of the Marshall Islands (RMI)
- Republic of Palau

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Key Workshop Discussion

Need for Forecast Guidance

- A key outcome: identification of the need for an operational coastal inundation forecast model for the region and the necessary capacity and support issues related to such a model.
- *There is currently no operational inundation forecast model available for the region.*
- Weather forecasters therefore have little model guidance from which to prepare inundation watches, warnings and forecasts – these are currently only rough estimates based on tropical storm category, which can be quite inaccurate due to other critical factors contributing to inundation height and timing.



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Key Workshop Discussion Issues

- *Large variability* within the region in terms of the probability and magnitude of inundation events, and of the forecast and response capacity.
- *All user groups require inundation modeling information* (guidance or forecasts) for both tropical and extra-tropical events.
- Need for all users in a vulnerable area (e.g., evacuation zone) to receive the same basic guidance, for reasons of consistency and reinforcement of the message.
- The development of *new tools* such as reverse 911 and alert texting to benefit all user groups.

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Modeling Issues

REEFS: Most models within NOAA's operational coastal inundation prediction system have been developed and tested for U.S. mainland coasts, which are typically mild-sloped, sandy beaches, without the fringing reef structures common to the Pacific Islands Region.

GEOGRAPHIC VARIABILITY: There is also a large variation in event frequency and intensity across the region. Tropical storms are rare over the Hawaiian Islands, but they are more prevalent in the Western Pacific over Guam, CNMI, FSM and the Republic of Palau. In fact, this latter region is one of the most active tropical cyclone areas in the world.



NOAA
Coastal Storms Program



Stakeholder Groups

- NWS Forecasters
- Research and design groups
(universities, USACE districts, and engineering firms)
- Emergency Managers
- General Public

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Stakeholder Needs

NWS Forecasters

- High level of technical background and training and a comprehensive technological infrastructure
- need for an adequate and robust computer and data infrastructure and institutional capacity to provide real-time services (locally or remotely).

Research and design groups (universities, USACE districts, and engineering firms)

- Projects focus on coastal planning, disaster management, land use, and coastal engineering.
- This group represents a largely sophisticated category of users who need high-resolution outputs for planning and research models but not necessarily in real time.

Emergency Managers

- tasked with ensuring public safety and defense (coordinating evacuation, issuing warnings, etc.) during various emergencies, including coastal flooding due to severe extra-tropical events, hurricanes and tsunamis.
- Forecast products must be timely, straight forward, and provide useful geographic information to decision makers
- There is also a need for surge-based evacuation zone that can guide evacuation planning and define vulnerable areas.

General Public

- typically the end-user of the forecast products and relies on the forecasts, warnings and advisories issued by forecasters, and on the directions given by EMs during evacuations

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Responsibility for official forecasts

- The Safety of Life At Sea conference (SOLAS) (IMO 1974) formally classified wind waves as weather, and subsequently wind wave forecasting has become a formal responsibility of the NWS.
- By extension, inundation forecasting, being an atmospheric- and wave-driven event, is the responsibility of weather services.
- **The workshop attendees therefore identified the NWS as the appropriate lead forecast/warning agency for coastal inundation in the Pacific Region for civil defense and EM purposes.**

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Pacific Islands Coastal Inundation Modeling

Primary Regional Inundation Modeling:

- ◆ USACE/ERDC
- ◆ NOAA/NWS/NCEP
- ◆ NOAA/NOS's Coast Survey Development Laboratory (CSDL)
- ◆ NOAA/NWS's Meteorological Development Laboratory (MDL)
- ◆ UH SOEST

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Pacific Islands Modeling Systems

Tropical Storms

- **SWIMS:** Hurricane Inundation Fast Forecast Tool (USACE)
- **SLOSH:** Sea, Lake and Overland Surges from Hurricanes (NOAA/NWS)

Extra-tropical

- **ETSS:** Extra-tropical Storm Surge (NOAA/NWS/OST/MDL)
- **ESTOFS:** Extra-tropical Surge and Tide Operational Forecast System (NOAA/NOS/OCS/CSDL)
- **NWPS:** Nearshore Wave Prediction System (NOAA/NWS/NCEP)

Inundation

- **UH-ORE:** Modeling of Flood Hazards in Tropical Coastal Environment (UH SOEST)

Modeling Classifications

- tropical vs. extra-tropical
- real-time vs. pre-run and
- deterministic vs. probabilistic

End User	Info Needs	Outputs	Model Result Fit
National Weather Service	Rapid, real-time model guidance	Public forecast and warnings	SWIMS, NWPS, possibly SLOSH
Academic	Accurate and stable high-resolution outputs-not time sensitive	Research and papers quantifying aspects of outputs and results	SWIMS, SLOSH, NWPS; Other circulation, wave and weather models run in academic environment
Emergency Managers	Extremely time-sensitive with clear guidance output (maps)	Warnings and evacuation protocols	Output from SWIMS, NWPS (inundation maps); HURREVAC, MMS
General Public	Accurate, clear information and evacuation guidance	None	News releases by various EMs.

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Next Steps: Guidance Task Groups

- 1. Tropical operations-** Task group to investigate the applicability of the SWIMS/PILOT program to operational forecast needs at the NWS Pacific Islands WFOs and CPHC. *Lead: NWS/PRH, NWS/CPHC, USACE*
- 2. Extra-tropical operations-** Task group to ensure that the NWPS system, including its future inundation modeling component, addresses Pacific Region needs and is distributed to the entire region. *Lead: NCEP/EMC, NWS/PRH, NWS/CPHC, NOS/CSDL*
- 3. Mapping activities-** Task group to determine the requirements of EMs and the public (end users) regarding inundation mapping products. *Lead: CPHC, PSC, DEM, SCD, USACE*
- 4. Testbed-** Task group to pursue the inclusion of Pacific Island tropical and extra-tropical inundation forecasting into the JHT and PacIOOS. *Lead: JHT, CPHC, NCEP*
- 5. Regional team for incorporating outlying islands-** Task group to determine the strategy and model feasibility regarding the Pacific Region's islands. *Lead: UHSG/CSP, PDC, NWS, USACE*

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Aloha and Mahalo!

<http://seagrants.oest.hawaii.edu/csp>



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