

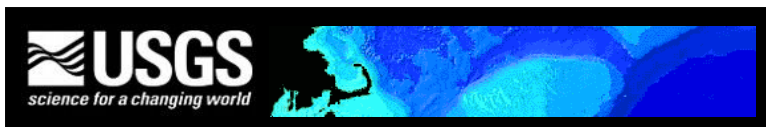


Advanced Tsunami Hazard Assessment Techniques in U.S. and International Nuclear Regulatory Activities

Annie Kammerer, US NRC

Antonio Godoy, IAEA

AGU National Meeting 2009





Motivation for Tsunami Activities

- Indian Ocean Tsunami
- US Nuclear Renaissance
- Large number of nuclear “newcomer” nations among IAEA Member States



US Regulatory History

- Regulatory Guide 1.59 (1977)
 - Identifies tsunami hazard, but no details
- NOAA PMEL and PNNL reports support updated Standard Review Plan (3/2007)
- Office of Research initiates research program to develop sources and techniques



US Regulatory History

- NRC, USGS, and NOAA initiate research work in source characterization and modeling (2006-2007)
- USGS (with A&M) starts leading assistance to NRC with 2 license reviews (2008)
 - South Texas Project (Gulf)
 - Calvert Cliffs (Atlantic)



US Regulatory History

- NRC initiates development for new regulatory guide on tsunami (2009)
 - Current allow hierarchical approach
 - Incorporation of climate change
 - Need guidance on modeling tool characteristics
 - Need guidance on PTHA

Hydrologic Hazard Analysis

- * Safety Analysis Report
 - 1. Introduction
 - 2. Site Characteristics
 - 2.1 Geography
 - 2.2 Site Vicinity
 - 2.3 Meteorology
 - 2.4 Hydrology
 - 2.5 Seismology
 - 3. Plant Systems
 - ⋮
 - ⋮
 - 19. Emergency Plan
- * Environmental Report

1	Descriptive Hydrology
2	Historic Flood
3	PMP/PMF
4	Dam Failure
5	Surge & Seiche
6	Tsunami Hazards
7	Ice Effects
8	Cooling System
9	Flood Protection
10	Channel Division
11	Low Water
12	Ground Water
13	Effluent Transport
14	Emergency Operation

- REG. RULE
- 10 CFR
- RGs
- SRP
- NUREGs
- Reports



US NRC Research Program

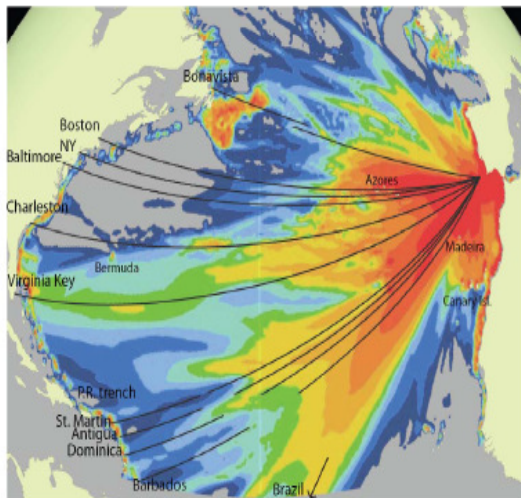
- **Phase 1:** Identification and preliminary analysis of existing data for source characterization and approach
- **Phase 2:** Additional analysis of sources, data collection and global modeling
- **Phase 3:** Probabilistic hazard analyses and modeling technical basis documents
- **Phase 4:** Regulatory Guide on Tsunami

Source Characterization

Evaluation of Tsunami Sources with the Potential to Impact the U.S. Atlantic and Gulf Coasts

An Updated Report to the Nuclear Regulatory Commission

By Atlantic and Gulf of Mexico Tsunami Hazard Assessment Group




USGS
science for a changing world

- Publically available USGS report in use by industry and NRC
- Updated 2008
- ML082960196



International Activities

- Update of IAEA Safety Guide 417, “Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations”
 - Expands tsunami discussion
 - Includes treatment of climate change
- Series of international workshops held
 - India 2005, Italy 2006, India 2010



International Activities

- Extra-Budgetary Project to develop international capabilities for tsunami hazard assessment (2008-2010)
 - NRC, NOAA and USGS participation
- New IAEA International Seismic Safety Center formed (7/2009) and now leads tsunami work

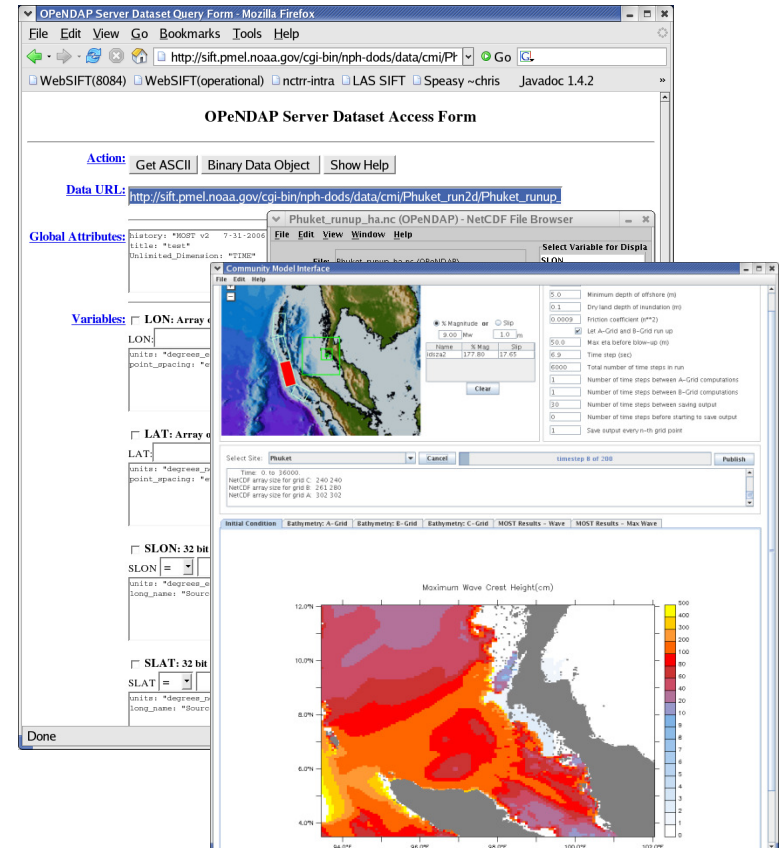


IAEA EBP

- Goal to improve international practice in tsunami hazard assessment
- Sponsored by Japan (JNES) and US
 - Participants from Korea, India, Pakistan, Turkey, Egypt, Indonesia, Japan & US (NRC, NOAA & USGS)
- NOAA provided training on ComMIT system
 - ComMIT is an internet-enabled interface to the community tsunami model developed by the NOAA Center for Tsunami Research (NCTR)

US NRC ComMIT Training

- NOAA ComMIT training at NRC
- Open to IAEA participants as IAEA ISSC activity
- Interfaces with tsunami warning



The screenshot displays the OPeNDAP Server Dataset Query Form in a Mozilla Firefox browser window. The form includes sections for Action (Get ASCII, Binary Data Object, Show Help), Data URL (http://sift.pmel.noaa.gov/cgi-bin/nph-dods/data/cmi/Phuket_run2d/Phuket_runup), and Global Attributes (History: *MOOP v2, Title: *East*, Unlimited_Dimension: *TSTEP*). Below these are sections for Variables (LON: Array, LAT: Array, SLON: 32 bit, SLAT: 32 bit) with input fields and units. A 'Done' button is at the bottom left.

Overlaid on the form is the 'Community Model Interface' window, which features a map of the Pacific Ocean with a red box indicating the simulation area. To the right of the map are various model parameters such as Minimum depth of offshore grid, Dry land depth of inundation grid, Friction coefficient (M²), Let A-Grid and B-Grid run up, Max time before coverage (hr), Time step (sec), Total number of time steps in run, Number of time steps between A-Grid computations, Number of time steps between B-Grid computations, Number of time steps between saving output, Number of time steps before starting to save output, and Save output every n-th grid point. A 'Publish' button is visible at the bottom right of this window.

At the bottom of the interface is a plot titled 'Maximum Wave Crest Height(cm)' showing a color-coded map of the wave crest height over the simulation area. The plot includes a color scale on the right ranging from 0 to 500 cm.



IAEA and NRC Tsunami Response

- NOAA, NRC and IAEA collaborative work to implement existing warning tools into incident response
- Development of critical use software for analysis of impact (similar to ShakeCAST)
- Integration with ComMIT software in the US and Internationally



THANK YOU