Objectives of the Workshop

• Development of the virtual coastal community.
  – Hypothetical and ideal scenario
  – Use the developed scenario as a platform for our individual research efforts
  – Use the developed scenario as a benchmark for our individual research efforts
  – Strengthen collaborative ties among broadly distributed research disciplines

• Strategies to initiate integrated scenario simulations
  Seismic faulting --> Tsunami generation --> Propagation
  --> Runup and coastal effects --> Evacuation
Development of the virtual coastal community

- Bathymetry
- Topography
- Built Environment
- Land-Use Information
- Geotechnical Data
- Vegetation
- Demographics
- Societal Data

✓ Data & Information Source for the Simulations
✓ Dissemination & Repository of the Simulation Results
as a Benchmark Problem

- Experimental and numerical investigations for landslide generated tsunamis (Cal Tech, USC, NWU, Cornell, URI -- NSF)
- The Third International Workshop on Long-Wave Runup Models: Catalina Island 2004 (Cornell, USC & OSU -- NSF)
Applications of Research Results

- Experimental and numerical investigations of tsunami structure interactions (UW, SMU, OSU, Cornell -- NSF)
- Seismic/Tsunami Construction, Phase-1: A Pilot Study (OSU, UH -- NTHMP)
- Index Buildings -- the CUREE-Caltech Woodframe Project (FEMA)
Applications of Research Results

- Experimental and analytical investigations for tsunami soil interactions – scour (OSU, U of Tokyo, NILIM -- NSF &NILIM)
- 3-D tsunamis (OSU, PSU, UW -- NSF)
- Simulation models for warning transmission and evacuation (Gunma, OSU & UNT -- NSF (pending))
Objectives of the Workshop

• Development of the virtual coastal community.

• Strategies to initiate integrated scenario simulations
  – Scenario used as Integrated Simulation Exercise
Possible Integration Schema

1. Seismic Signals & Tsunami Generation

2. Propagation

3. Ground Shake Effects

4. Warning

5. Runup effects

6. Evacuation

7. Assessment, Recovery & Long-Term Effects
1. Seismic Signals & Tsunami Generation

- Tectonic problems – sea floor deformation due to faulting.
- Geologic problems – effects of gas-hydrates on submarine slides, etc.
- Hydrodynamics – initial tsunami generation
- Slump geometry & motion – subaerial and subaqueous landslides
- Gravity current – landslide runout
- Scenario Earthquake -- USGS: Advanced National Seismic System
  http://www.anss.org/
- Linkage to Neptune project:  http://www.neptune.washington.edu/
- Linkage to Earth Scope:
  http://dax.geo.arizona.edu/earthscope/about/index.html
2. Propagation

- Transoceanic propagation -- hyper-real-time simulations
- Bathymetry – effects of deep-water sills and mounds, friction effects
- Interaction with continental slope/shelf
- Local 3-D propagation problems
- Island problems
- Sallow-water model and Boussinesq model
- Community Computational Portals – A Model for Evaluating the Impact of Natural Hazards (OSU, UAK, UH -- NOAA & NSF (pending)).
- PDC/MHPCC Tsunami Modeling: http://www.pmel.noaa.gov/tsunami/pdctm.html
3. Ground Shake Effects

- Structures - buildings, storage tanks, marine piles; piers; offshore terminals; breakwaters
- Geotechnical Issues - quay-wall stability; liquefaction
- Infrastructures - power lines; roads; bridges; tunnels; water supplies
- Fires
- SPUR, a Distributed Simulation Framework for Seismic Performance for Urban Regions (UCB, CMU & MSU)
- PEER -- OpenSees (Open System for Earthquake Engineering Simulation)  http://opensees.berkeley.edu/
- The SCEC Community Modeling Environment: An Information Infrastructure for System-Level Earthquake Research  http://www.scec.org/cme/
4. Warning

- Seismic signals
- Deep-water sensors – NOAA’s DART Program: http://www.pmel.noaa.gov/tsunami/Dart
- Nearshore sensors – tide gages etc.
- Information transmission
- Decision making
- Future monitoring with Neptune Project: http://www.neptune.washington.edu/
- NSF MRE project, EarthScope: http://dax.geo.arizona.edu/earthscope/about/index.html
5. Runup Effects

- Bathymetry – critical spatial dimensions for focusing, defocusing, etc.
- Shallow-water model; Boussinesq model; RAN model; BEM; turbulence model
- Shoaling and breaking
- Motion of the runup tip
- Interaction with objects (man-made coastal structures and natural objects, trees etc.)
- Pickup problem
- Wave forces on coastal structures
- Water-borne missile problem (impact forces)
- Scour and sediment transport
- Wave induced liquefaction
6. Evacuation

- Evacuees’ Response
- Information transmission to the general public
- Decision making
- Psychological factors
- Immediate rescue strategy
- Command simulation
- Hospital/Fire/Police/Utilities activities
- Drill and education
7. Assessment, Recovery & Long-Term Effects

- Casualty assessment
- Economical impact assessment
- Environmental impact assessment
- Disaster relief strategies
- Clean-up effort
- Recovery plan
Opportunity

• NEES Grand Challenge (NSF)

• National Tsunami Hazard Mitigation Program (NOAA, USGS, FEMA, 5 Pacific States)

• NSF’s Cyberinfrastructure: http://www.eng.nsf.gov/general/Workshop/cyberinfrastructure/index.htm

• Proactive municipalities and cities in preparing evacuation plans and educational materials (e.g., Oahu, Hawaii; Eureka, California; Newport, Oregon; Lincoln City, Oregon; Greys Harbor, Washington)

• Hurricane/Tornado simulation efforts
Workshop Agenda

8:40 – 9:10: Workshop Objectives (Yeh)
9:10 – 9:30: A Preliminary Scenario Simulation (Katada)
9:30 – 9:50: SPUR program (Mish)
9:50 – 10:05: Coffee/Tea Break
10:05 – 10:25: How the Concept of Scenario Simulation Fits into NSF's New Cyberinfrastructure Emphasis? (Pancake)
10:25 – 10:45: Linkage to the National Program (Gonzalez)
10:45 – 11:00: NEES Grand Challenge (Yim)
11:00 – 11:50: Discussion (Liu)
11:50 – 12:00: Review & Preview (Yeh)
12:00 – 1:00: Lunch
1:00 -- 1:05: Announcement & Preview (Yeh)
1:05 – 1:40: Essential Scenario Elements & Linkage to On-Going or Forthcoming Relevant Projects. (Petroff)
1:40 – 2:45: Discussion of Strategies to Initiate the Simulation Programs (Yeh)
2:45 – 3:00: Coffee/Tea Break
3:00 – 4:30: Revisit Grand Challenge, Cyberinfrastructure, National Program (Liu)
4:30 – 5:00: Summary & Conclusion (Yeh & Pancake)
Objectives

• Development of the community scenario(s).
  – Access to the scenario data and information
  – Dissemination & Repository of the scenario simulation (research) results
  – Form a working group for the development

• Strategies to initiate integrated scenario simulations