**NTHMP Progress Report**

Alaska Division of Homeland Security and Emergency Management

Geophysical Institute, University of Alaska Fairbanks

January 1, 2012 to December 31, 2012

The Alaska State Tsunami Program is a state level risk reduction program that promotes tsunami planning, preparedness and hazard mitigation among Alaska’s coastal communities, in cooperation with NOAA’s National Weather Service and other federal, state and local agencies.

**Objective 1: Mapping and Modeling** - Continue tsunami inundation modeling and mapping and dissemination of all products to Alaska’s at-risk communities. **Activities related to the tsunami inundation mapping of Alaska communities in 2012:**

**1. Valdez** The city of Valdez suffered from both local landslide-generated waves and the tectonic tsunami, which originated in the Gulf of Alaska during the 1964 Great Alaska Earthquake. The city sustained great damage, and more than 30 people died due to tsunami-related causes. Because the local landslide-generated tsunami was responsible for most of the damage to the city during the earthquake, the potential occurrence of similar events must be evaluated to enable comprehensive inundation mapping efforts and development of tsunami evacuation maps.

We evaluate potential tsunami hazards for the city of Valdez and numerically model the extent of inundation due to tsunamis generated by earthquake and landslide sources. Totally more than 20 different scenarios are considered. Tsunami scenarios include a repeat of the tsunami triggered by the 1964 Great Alaska Earthquake, as well as several credible worst-case hypothetical tsunamis generated by a rupture along the Alaska-Aleutian megathrust in the Prince William Sound region, a Cascadia megathrust earthquake, and earthquakes from the Prince William Sound and Kodiak asperities of the 1964 rupture. Local underwater landslide events in Port Valdez are also considered as credible tsunamigenic scenarios. Results of numerical modeling are verified by successfully simulating the tectonic and landslide-generated tsunamis in Port Valdez observed during the 1964 earthquake. We have presented results of the inundation mapping to the City of Valdez during the community visit on 11/23/12. **The Valdez tsunami inundation modeling and mapping report is in peer-review, the Valdez City Council provided its comments in December 2012.**

**2. Chenega** The original village of Chenega, located in western Prince William Sound, was destroyed by ocean waves of uncertain origin, 23 inhabitants were lost to the sea during the 1964 tsunami. The waves appeared shortly after the shaking began and swept away most of the buildings while the shaking continued. We model the tectonic tsunami in Chenega Cove assuming different tsunami generation processes. Modeled results are compared with eyewitness reports and an observed runup. Results of the numerical experiments let us claim the importance of including both vertical and horizontal displacement into the 1964 tsunami generation process.

We numerically model the extent of inundation due to hypothetical tsunami at the current location of Chenega using both the vertical and horizontal displacements. Tsunami scenarios include a repeat of the tsunami triggered by the 1964 Great Alaska Earthquake as well as tsunamis generated by a hypothetically extended 1964 rupture, a hypothetical Cascadia megathrust earthquake, and a hypothetical earthquake in the Kodiak asperity of the 1964 rupture. **The tsunami inundation modeling and mapping report is submitted for the peer-review.**

**3. Sitka**We constructed the high-resolution DEM of Sitka for the purpose of tsunami inundation mapping of the community. The Alaska Division of Geological and Geophysical Surveys (ADGGS) published the DEM development report. We have validated the GI tsunami model for Sitka mapping by calculating wave amplitudes at Sitka due to the recent Haida Gwaii earthquake of October 28, 2012 and comparing them with the tide gauge record at Sitka. We have developed a set of hypothetical near- and far-field tsunami sources for Sitka inundation mapping. Tsunami scenarios include a repeat of the tsunami triggered by the 1964 Great Alaska earthquake, repeat of the tsunami triggered by the recent 2011 Tohoku and 2012 Haida Gwaii earthquakes, tsunami waves generated by a hypothetically extended 1964 rupture, a hypothetical Cascadia megathrust earthquake, a hypothetical earthquake in the Izu Bonin subduction zone, and a hypothetical earthquake in the Queen Charlotte-Fairweather fault zone. **The inundation mapping report is being finalized to get submitted to the ADGGS for peer reviews and publication.**

**4. Tatitlek, Cordova.** We developed several tectonic tsunami sources for communities of Tatitlek and Cordova. Tsunami scenarios include a repeat of the tsunami triggered by the 1964 Great Alaska Earthquake, several variations of the 1964 rupture, crustal tsunamigenic earthquakes in the Yakutat block, and a hypothetical Cascadia megathrust earthquake. Several additional hypothetical plausible worst-case tectonic sources that take into account a slip distribution different from the 1964 slip are now being developed. Some tsunami modeling results show a limited inundation of Cordova and Tatitlek. **The tsunami inundation modeling and mapping report for Tatitlek and Cordova is in preparation.**

5. **DEM verification.** We continued working on the quality control of digital elevation models (DEMs) for the tsunami inundation mapping project. In summer 2012, we conducted high resolution RTK GPS surveys in the communities of ***Elfin Cove*, *Cold Bay*,** and ***King Cove***. The collected GPS measurements are post-processed, using the measured tide, and are ready to be sent to NGDC NOAA, where they are incorporated with other elevation data to produce realistic DEMs. We reviewed and edited (based on the collected GPS measurements) tsunami DEMs developed by NGDC for the communities of ***Hoonah***, ***Gustavus*, *Elfin Cove***, and ***Unalaska/Dutch Harbor*.** The reviewed DEMs now support the tsunami inundation mapping needs for the state of Alaska.

**Other activities:**

1. We participated in the USGS SAFFR (Science Application for Risk Reduction) project, which goal is to develop a tsunami scenario to describe the impact of a tsunami generated by a credible hypothetical M9 earthquake in the area of Alaska Peninsula. We have calculated vertical coseismic deformations for the earthquake source model and completed all required model runs using the set of telescopic grids around Port of Los Angeles. We have provided the SAFFR working group with the computational results (time series at critical locations, maximum tsunami amplitudes) and wrote a section for their report. We have included the SAFFR scenario into the ATOM (Alaska Tsunami Online Mapping) interface to estimate the impact of this tsunami on the Alaska communities in the near-field (Akutan, King Cove, Unalaska, Sand Point), and along the south-eastern coast (Sitka, Elfin Cove, Gustavus, Hoonah).
2. In January 2012, we visited an east coast tsunami modeling group at the University of Rhode Island. The purpose of the trip was to share expertise and efforts in the tsunami modeling efforts. As a result, the URI shared their time-stepping Boussinesq model (FUNWAVE) and a new non-hydrostatic model (NHWAVE) based on a Godunov-type scheme. Preliminary modeling of the tsunami using FUNWAVE in ***Dutch Harbor/Unalaska*** with a spatial resolution of 4-5m reveals some hazardous currents forming in narrow passages and near the tip of the narrow peninsulas. We plan to use NHWAVE model to simulate landslide-generated tsunamis in Alaska fjords in the future.
3. To help mitigate hazards that earthquakes and tsunamis pose to Alaska coastal communities, we developed and employ the ATOM (Alaska Tsunami On-line Mapping) interface - a Google Map internet-based interface to the tsunami modeling tools at the Arctic Region Supercomputing Center (ARSC). In the scope of establishing the partnership between California Geological Survey (CGS) and University of Alaska Fairbanks (UAF), we will maintain the ATOM interface and provide an access for researchers at the CGS to develop and execute specific tsunami scenarios at the ATOM interface. The Alaska Tsunami Mapping Team (ATMT) will also provide means and expertise to explain the computational results and facilitate comparison of the numerical calculations to previous tsunami observations.

**Objective 2: Mitigation and Education -** Promote local, regional and state level tsunami mitigation and preparedness. Participate in community outreach visits; support the design and printing of tsunami public education materials; provide NOAA Weather Radios to remote communities. 2012 activities include the following:

**Feb 2012**

* Tsunami Evacuation planning – Cordova

**Mar 2012**

* March 25-31, 2012 was proclaimed as Tsunami Preparedness Week by Governor.
* The State conducted a Statewide Live Code tsunami warning test. The partners for the test included State EM, NOAA, NWS, and the AK Broadcasters Assn. Press releases and PSA's were widely distributed to all media prior to the live code test. Information regarding the live test and tsunami information was broadcast on the Statewide Alaska Weather show nightly one week prior to the test. An online post-test survey was conducted to evaluate the test. The State EOC contacted communities to verify names/numbers and notification of the test.
* Tsunami evacuation drills in select schools took place during the live code test.
* Tsunami information flyers were sent to schools.
* Throughout the week, tsunami preparedness information was broadcast during the evening local news.
* Tsunami Brochures, fliers, children's booklets, coasters, etc. were widely distributed.
* DHSEM participated in the WC/ATWC Open House and presented the “Quake Cabin”.

**April 2012**

* Two presentations were given at an Emergency Medical Services symposium in Ketchikan.
* Tsunami Evacuation planning/mapping meeting with the Ketchikan Fire Chief.
* Presentations to US Forest Service (70-80 people) in Klawock and Prince of Wales CAP (20 people).

**May 2012**

* Tsunami Evacuation planning/mapping meeting with the Craig City Planner.
* Presentations to Prince of Wales LEPC, Craig Fire Department and EMS, Southeast Alaska Region Health Consortium, Alaska State Trooper Post (Klawock), Craig City Council.
* School presentations in Craig, Naukati Bay and Thorne Bay.

**July 2012**

* Earthquake and Tsunami presentations at RISC meeting.
* Begin monthly meetings with Alaska Experience Theater and Anchorage Museum to plan for the 50th anniversary of the 1964 Great Alaska Earthquake.

**September 2012**

* School presentations in Metlakatla, Cold Bay and King Cove.
* Public presentations in Cold Bay, King Cove and the Cold Bay WFO.
* Brochures and evacuation maps developed for Cold Bay and King Cove.

**October 2012**

* Evacuation map developed for Cordova.
* A two-day Tsunami Operations Workshop was held in Cordova. Nineteen people from nine communities participated in the workshop.

**November 2012**

* NDPTC AWR 217 Training Course for two DHSEM staff.

**December 2012**

* Printing of a new children’s book “Tsunami Story”.

**Objective 3: TsunamiReady -** Work with the NTHMP and NWS Offices in Alaska in promoting the TsunamiReady Program. Identify tsunami communities eligible for TsunamiReady Program; install or upgrade warning sirens; provide NOAA Weather Radios to remote communities; install tsunami evacuation and hazard zone signs.

* TsunamiReady Recognition ceremonies for Cold Bay and King Cove.
* Evacuation signage installed in Cold Bay and King Cove.
* Warning Siren installed in Port Lions.
* Warning siren shipped to Saint George (installation scheduled for spring 2013).
* Additional evacuation signs delivered to Cordova.
* Weather Radios provided to several communities.

Submitted by: Ervin Petty, Tsunami Program Manager

 Alaska Division of Homeland Security & Emergency Management

 PO Box 5750

 Fort Richardson, AK 99505-5750

 907-428-7015

 ervin.petty@alaska.gov

 Dr. Elena Suleimani, Tsunami Modeler

 University of Alaska Fairbanks/Geophysical Institute

 PO Box 757320

 Fairbanks, AK 99775-7320

 907-474-7997

 elena@gi.alaska.edu