

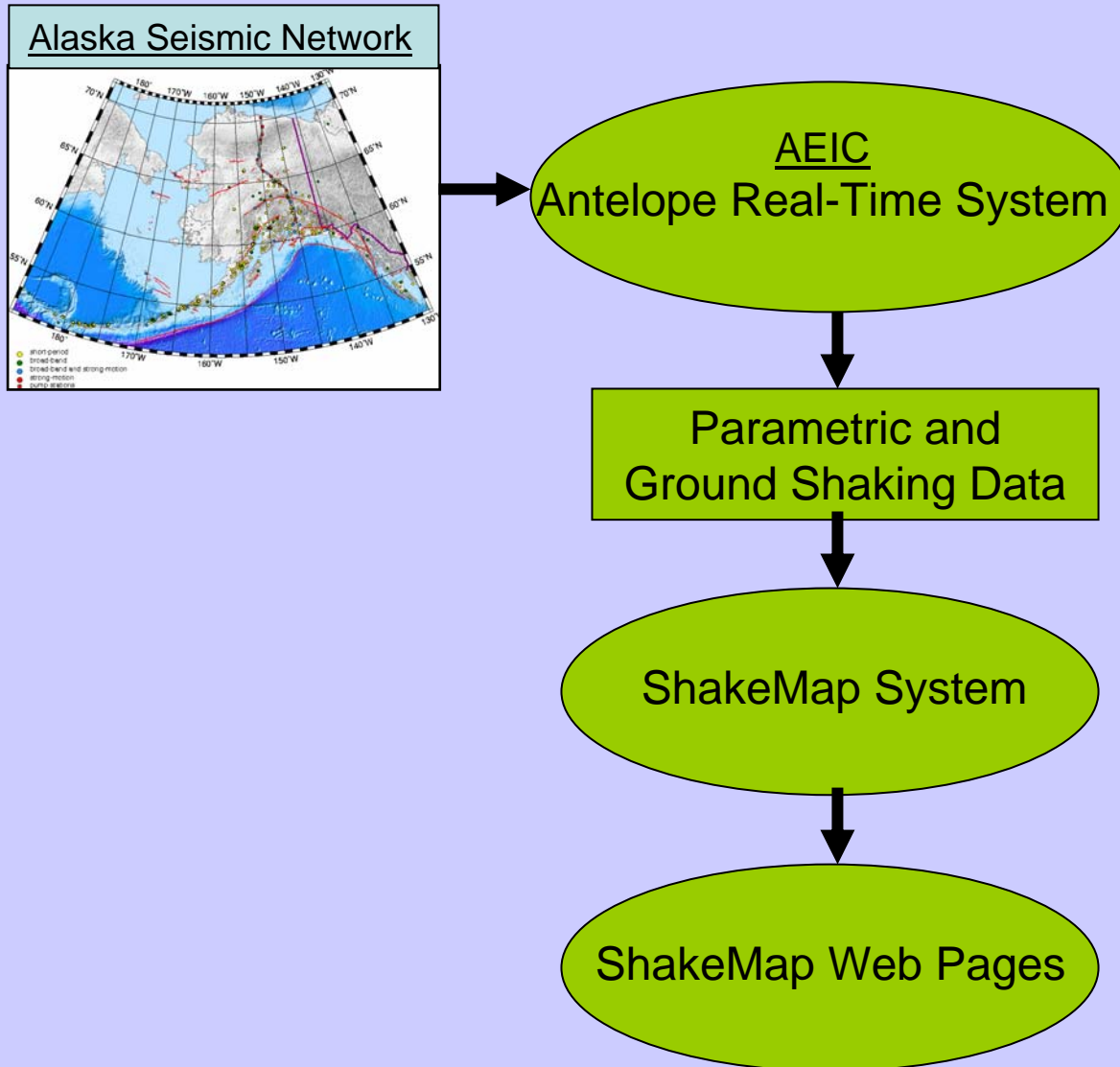
Implementation of the ShakeMap System in Alaska



ShakeMap

- The USGS ShakeMap system is a tool for the real-time generation of ground-shaking maps following significant earthquakes.
- ShakeMaps provide vital information within minutes after an earthquake to emergency response agencies, the media and the general public.
- ShakeMaps are produced on the basis of observed ground motion values (peak velocities, peak accelerations, and spectral accelerations) and complemented by calculated values using empirical attenuation relationships.

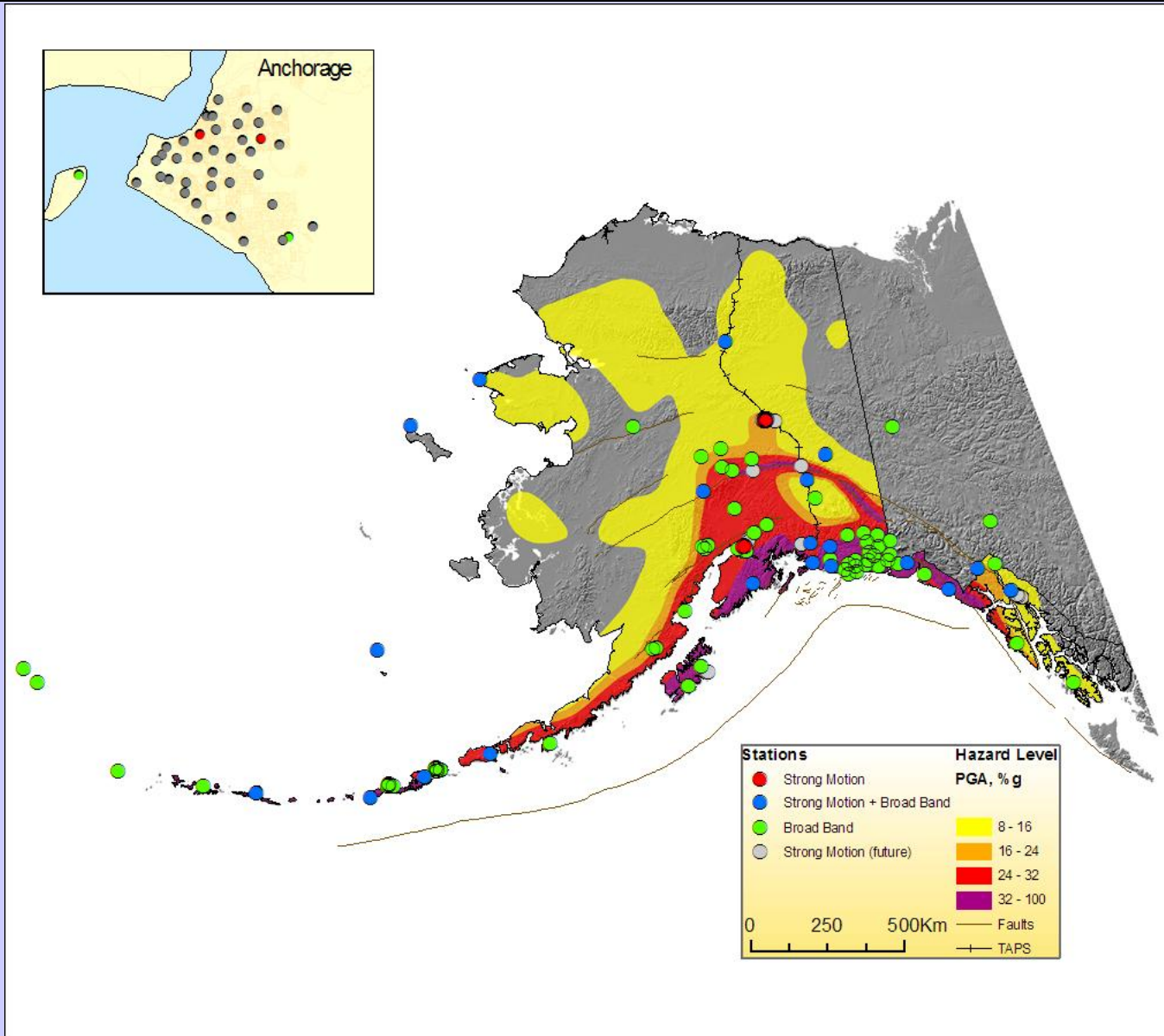
ShakeMap Workflow at AEIC



DATA

- Observations for ShakeMaps are collected from more than 80 broadband and 25 strong motion stations throughout the state.
- Ground motion grids are based on maximum peak ground accelerations and velocities of two horizontal components.
- Currently, ShakeMaps are produced for events with magnitudes greater than M3.5 with at least 10 associated arrival picks and calculated MMI greater than 2.0 at the epicenter.

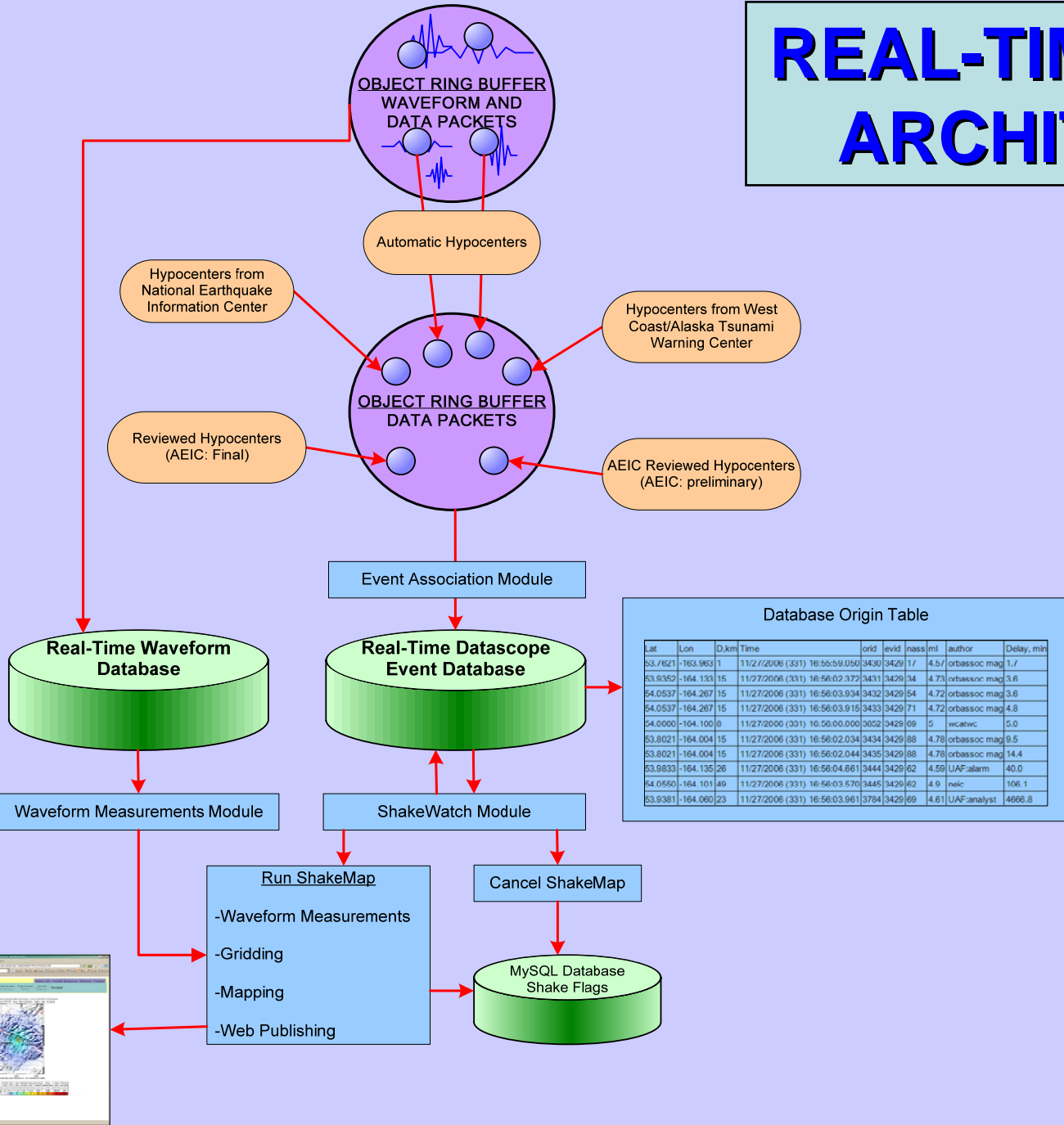
Map of Seismic Stations



ShakeMap Methodology

- The ShakeMap triggering and production is based on the Antelope system used for real-time seismic operations at AEIC.
- The ShakeMap generation sequence is triggered once a new event above certain magnitude appears in the real-time event database.
- The first ShakeMap is automatically generated within 1-2 minutes after that, and then several updates may be automatically issued if new data becomes available from different sources.
- Analyst-reviewed ShakeMaps are generated for alarm events after the revision of the automatic solutions, usually within 25 to 45 min of the origin time.
- A cancellation script is activated if an updated hypocenter is no longer eligible for ShakeMap.
- A final version of ShakeMap is manually produced for larger events, if necessary, in order to utilize any additional information, including extended source geometry.

REAL-TIME SYSTEM ARCHITECTURE



Summary Database

quakes View91

File Edit View Options Graphics Help

ok x 61.5459

0	lat	lon	dep th	time	orid	evid	nass	ml	auth	(lddate-1189554393)/60
	61.5542	-151.6057	99.9702	9/11/2007 (254) 23:46:33.73751	15973	15973	14	4.29	oa_bk dbg ml	1.01047900120417
	61.5254	-151.4053	100.0000	9/11/2007 (254) 23:46:33.52503	15974	15973	40	4.43	oa_bk dbg ml	1.95739766756694
	61.5290	-151.3735	99.9684	9/11/2007 (254) 23:46:33.63483	15975	15973	51	4.41	oa_bk dbg ml	3.25753666559855
	61.5320	-151.3845	99.8875	9/11/2007 (254) 23:46:33.64093	15976	15973	64	4.47	oa_bk dbg ml	4.92394083340963
	61.5407	-151.4678	95.9729	9/11/2007 (254) 23:46:33.81315	15977	15973	76	4.58	oa_bk dbg ml	6.37812083164851
	61.5000	-151.7000	98.1673	9/11/2007 (254) 23:47:00.00000	15978	15973	73	4.50	wcatwc	6.5165823340416
	61.5389	-151.5667	100.5588	9/11/2007 (254) 23:46:34.21196	15981	15973	48	4.39	UAF:alarm	28.1033468325933
	61.5900	-151.8400	84.7000	9/11/2007 (254) 23:46:32.80000	15995	15973	48	4.40	neic	191.776054998239
	61.5364	-151.4755	95.2554	9/11/2007 (254) 23:46:34.53216	16217	15973	94	4.36	UAF:kozyreva	2568.28660099904

9

Dismiss

AEIC ShakeMap Homepage

[Home](#) [Map Archive](#)

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ShakeMap Home Page

Choose "Most Recent Event" to see maps for the most recent earthquake, select one of the maps from the list of "Recent Significant Events" or click on the "Map Archive" tab at the top of the page to view past events.

Most Recent Event

Location	Date	Time	Magnitude
59.5 miles WNW of Anchorage <i>(ID 15973)</i>	Sep 11 2007	15:46:34 AKDT	4.4

Maps of Recent Significant Events

Location	Date	Time	Magnitude
146.8 miles WSW of Adak <i>(ID 9760)</i>	Aug 1 2007	19:24:40 AKDT	5.4
151.7 miles WSW of Adak <i>(ID 9081)</i>	Aug 1 2007	19:21:41 AKDT	6.6
35.3 miles SE of Adak <i>(ID 6014)</i>	Jul 13 2007	13:54:44 AKDT	6.0



Please use the [comment form](#) for questions, comments, or suggestions about the ShakeMaps.

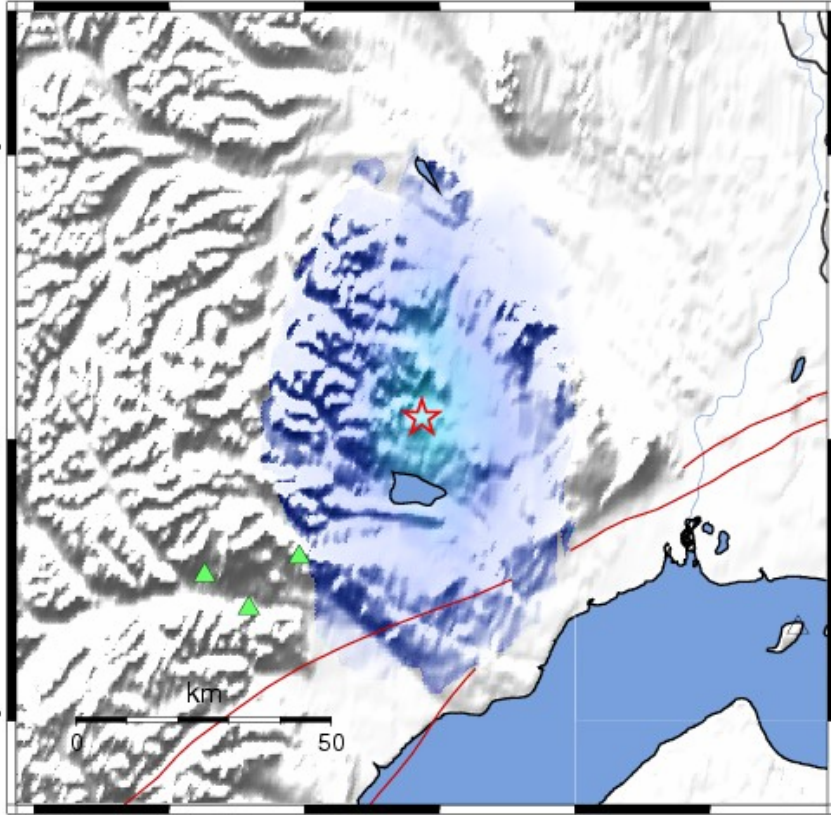
Page maintained by the ShakeMap Working Group.

Page last generated Fri Sep 14 15:28:04 2007.

NEAR REAL-TIME SHAKEMAPS

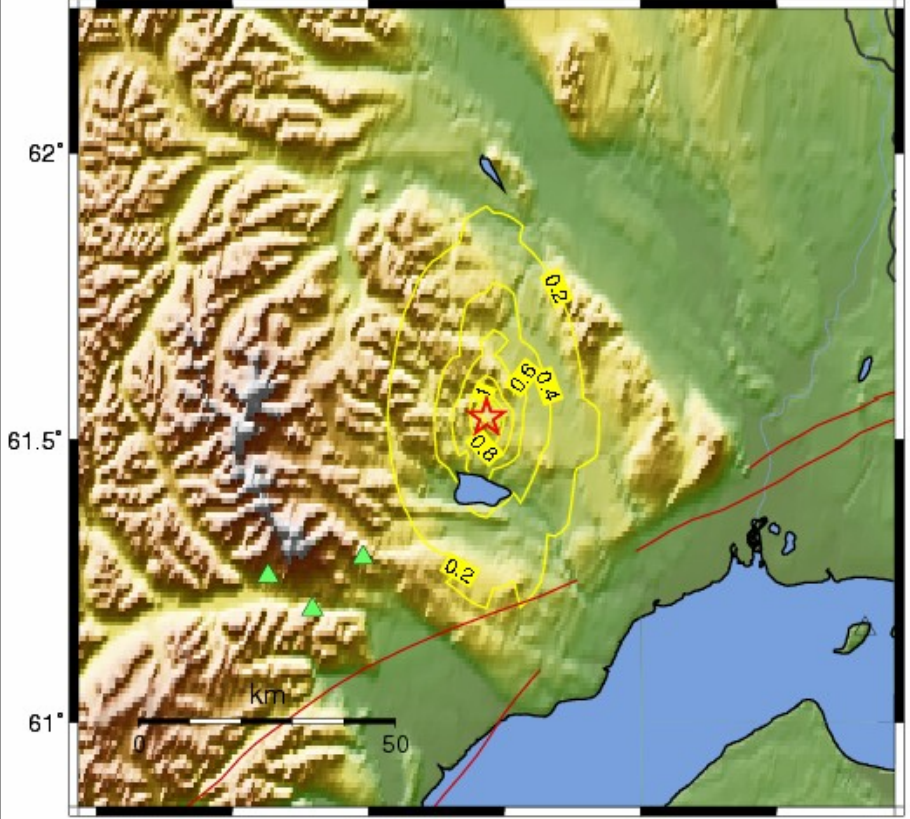
AEIC ShakeMap : 59.5 miles WNW of Anchorage

Tue Sep 11, 2007 03:46:34 PM YDT M 4.4 N61.54 W151.57 Depth: 100.6km ID:15973



AEIC Peak Accel. Map (in %) : 59.5 miles WNW of Anchorage

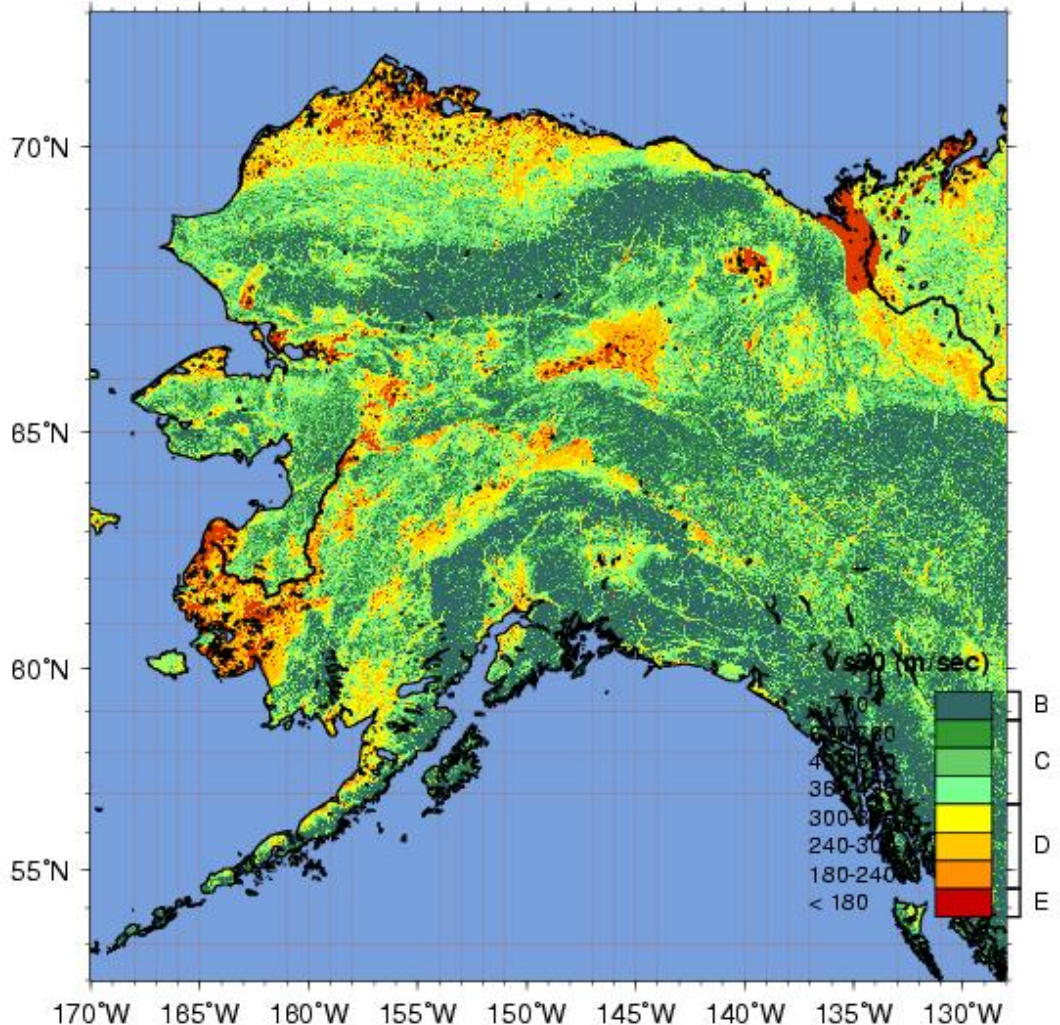
Tue Sep 11, 2007 03:46:34 PM YDT M 4.4 N61.54 W151.57 Depth: 100.6km ID:15973



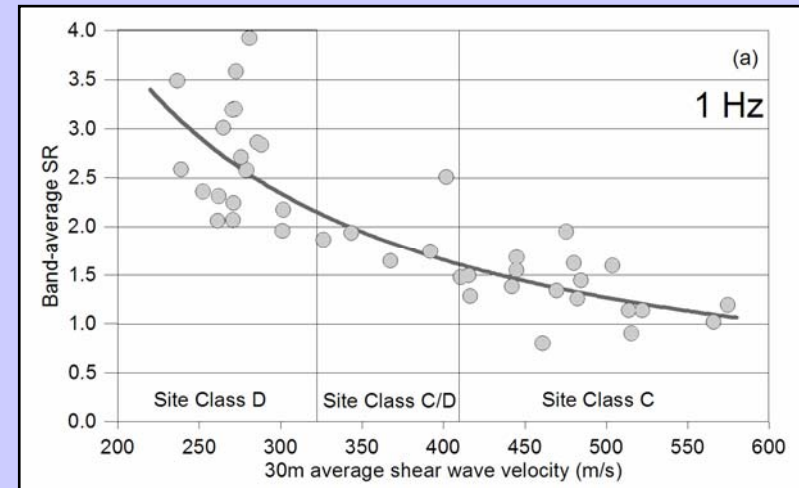
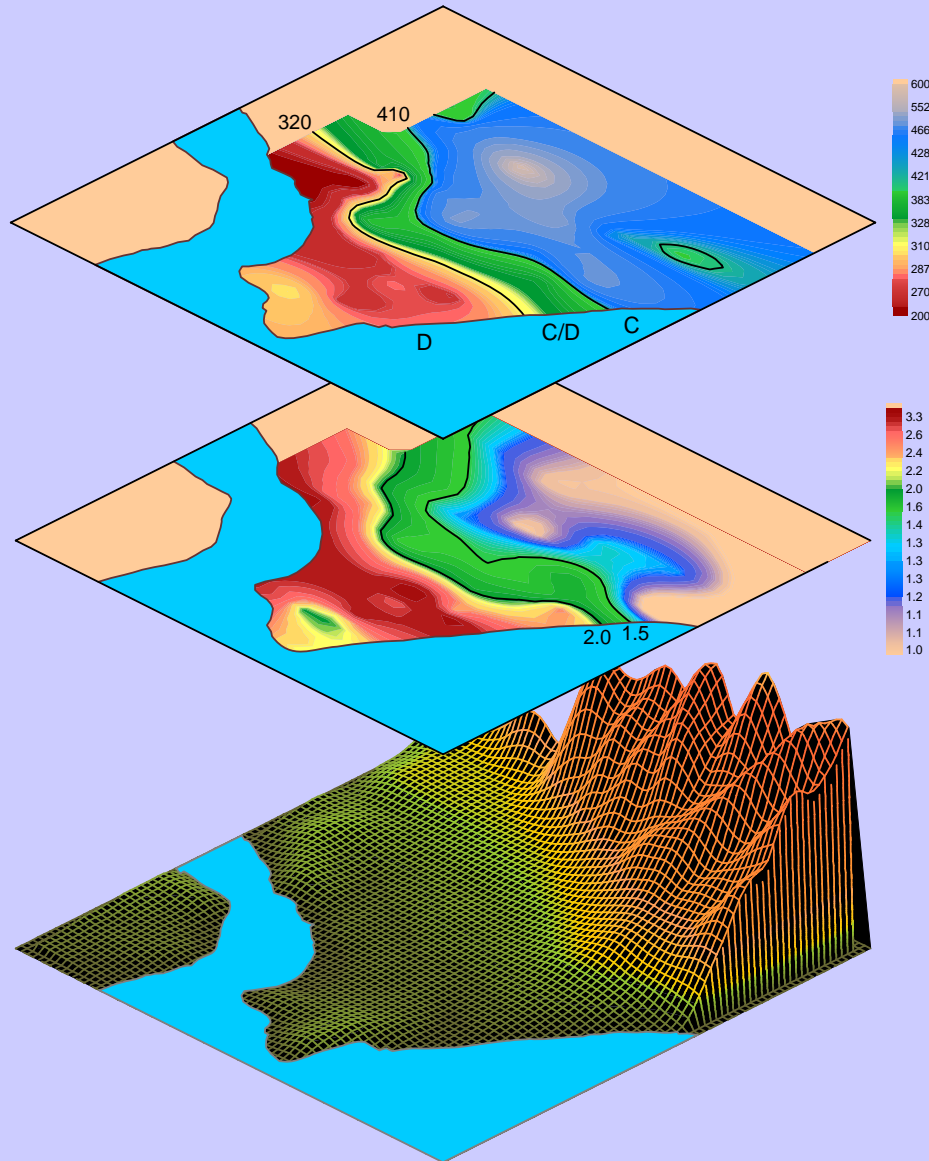
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-37	37-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Vs30 Grid

- The site corrections are based on the average shear-wave velocity values for the uppermost 30 meters (V_{s30}).
- V_{s30} values are derived from the slope of the topography.



Correlation of Vs30 and Site Response in Anchorage



Geology Map

Generalized Geologic Map of Alaska

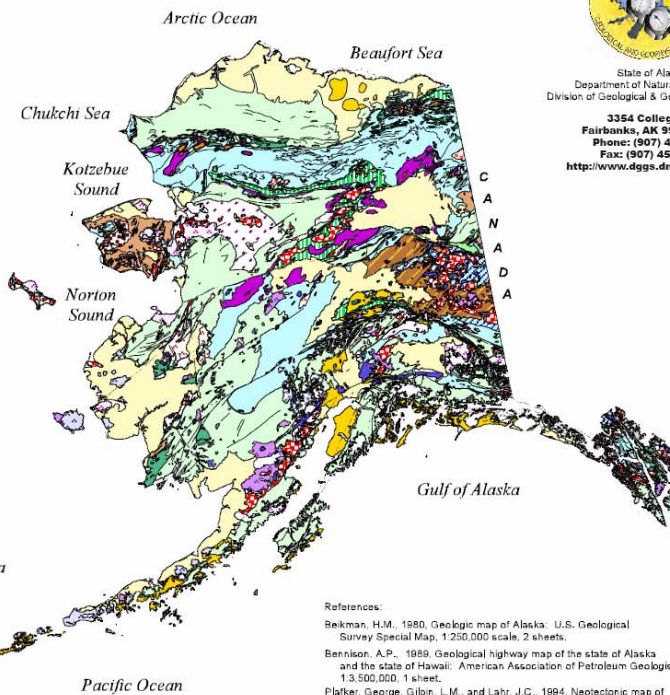
By M.B. Werdon, D.J. Szumigala, and G. Davidson

2000



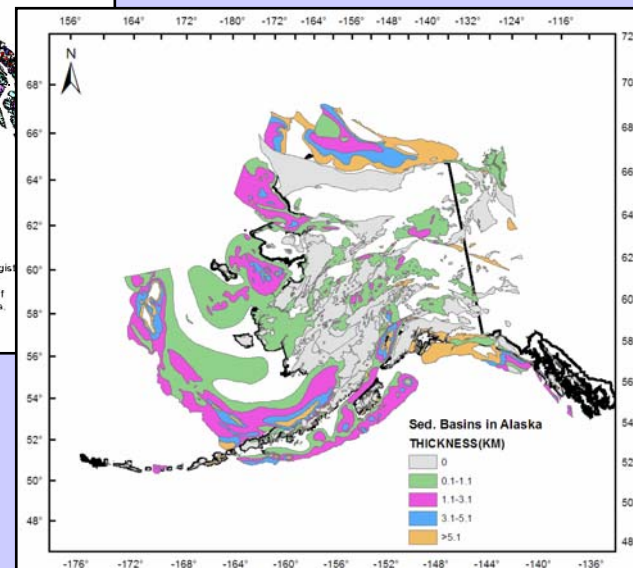
State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys

3354 College Rd.
Fairbanks, AK 99709-3707
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<http://www.dggs.dnr.state.ak.us>



References:
Beikman, H.M., 1980. Geologic map of Alaska: U.S. Geological Survey Special Map, 1:250,000 scale, 2 sheets.
Bennison, A.P., 1989. Geological highway map of the state of Alaska and the state of Hawaii: American Association of Petroleum Geologists 1:3,500,000, 1 sheet.
Plafker, George, Glibin, L.M., and Lahr, J.C., 1984. Neotectonic map of Alaska: in Plafker, G., and Berg, H.C., eds., The Geology of Alaska, Geology of North America, v. G-1: Geological Society of America, plate 12, scale 1:2,500,000.

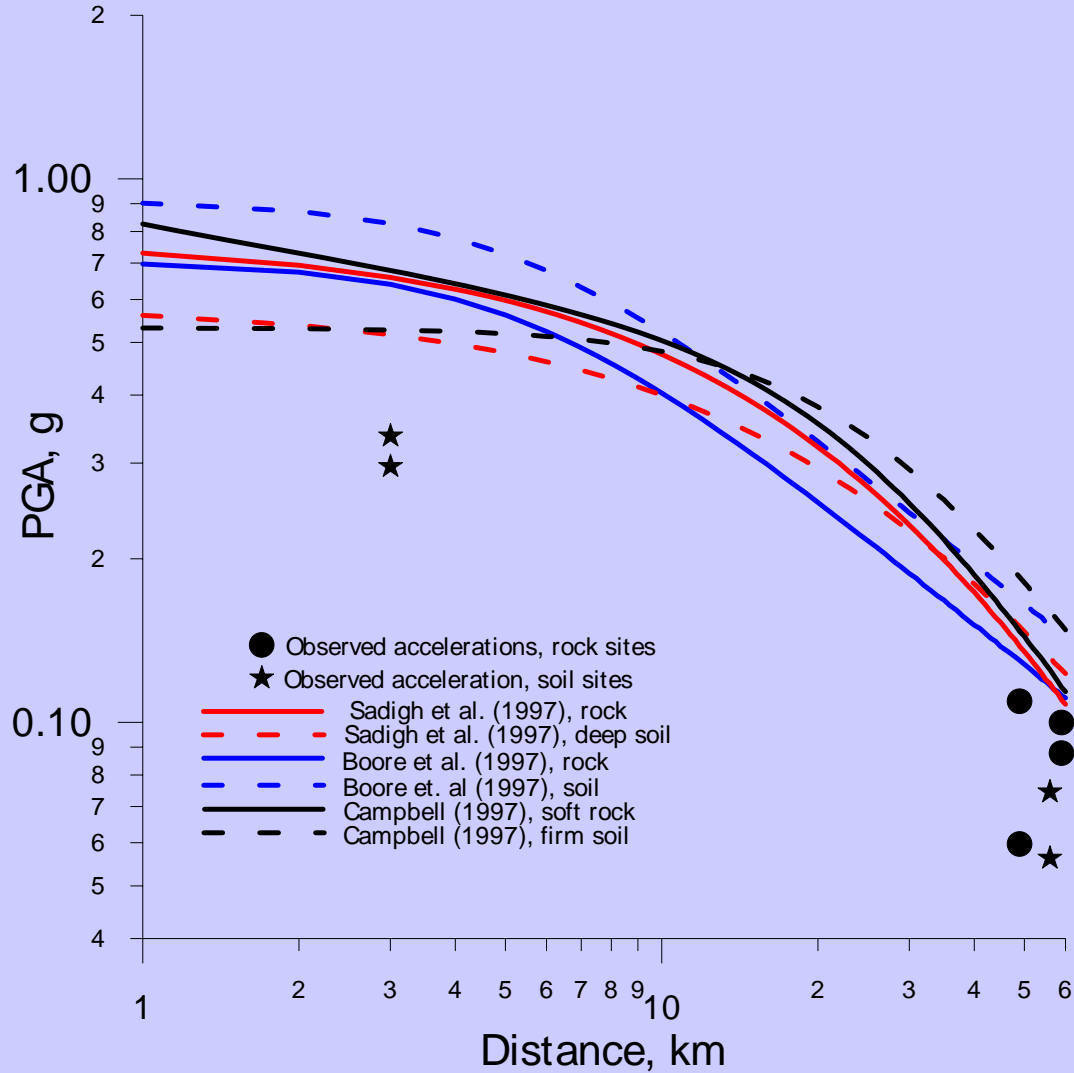
- Geologic Units**
- Ice/Water
 - Quaternary sedimentary
 - Quaternary volcanic
 - Quaternary/Tertiary volcanic
 - Tertiary sedimentary
 - Tertiary volcanic
 - Tertiary plutonic
 - Tertiary/Mesozoic sedimentary
 - Tertiary/Mesozoic volcanic
 - Tertiary/Mesozoic plutonic
 - Mesozoic sedimentary
 - Mesozoic volcanic
 - Mesozoic plutonic
 - Mesozoic/Paleozoic sedimentary
 - Mesozoic/Paleozoic volcanic
 - Mesozoic/Paleozoic plutonic
 - Mesozoic/Paleozoic ultramafic
 - Paleozoic metamorphic
 - Paleozoic sedimentary
 - Paleozoic igneous
 - Paleozoic/Precambrian metamorphic
 - Paleozoic/Precambrian sedimentary
 - Paleozoic/Precambrian igneous
 - Precambrian sedimentary
 - Unmapped
 - Faults



Attenuation Relationships

- Boore et al. (1997) model is used for the crustal events with $M > 5.3$.
- Youngs et al. (1997) model is used for subduction-zone events.
- ShakeMap Small Regression model for shallow events with $M \leq 5.3$.

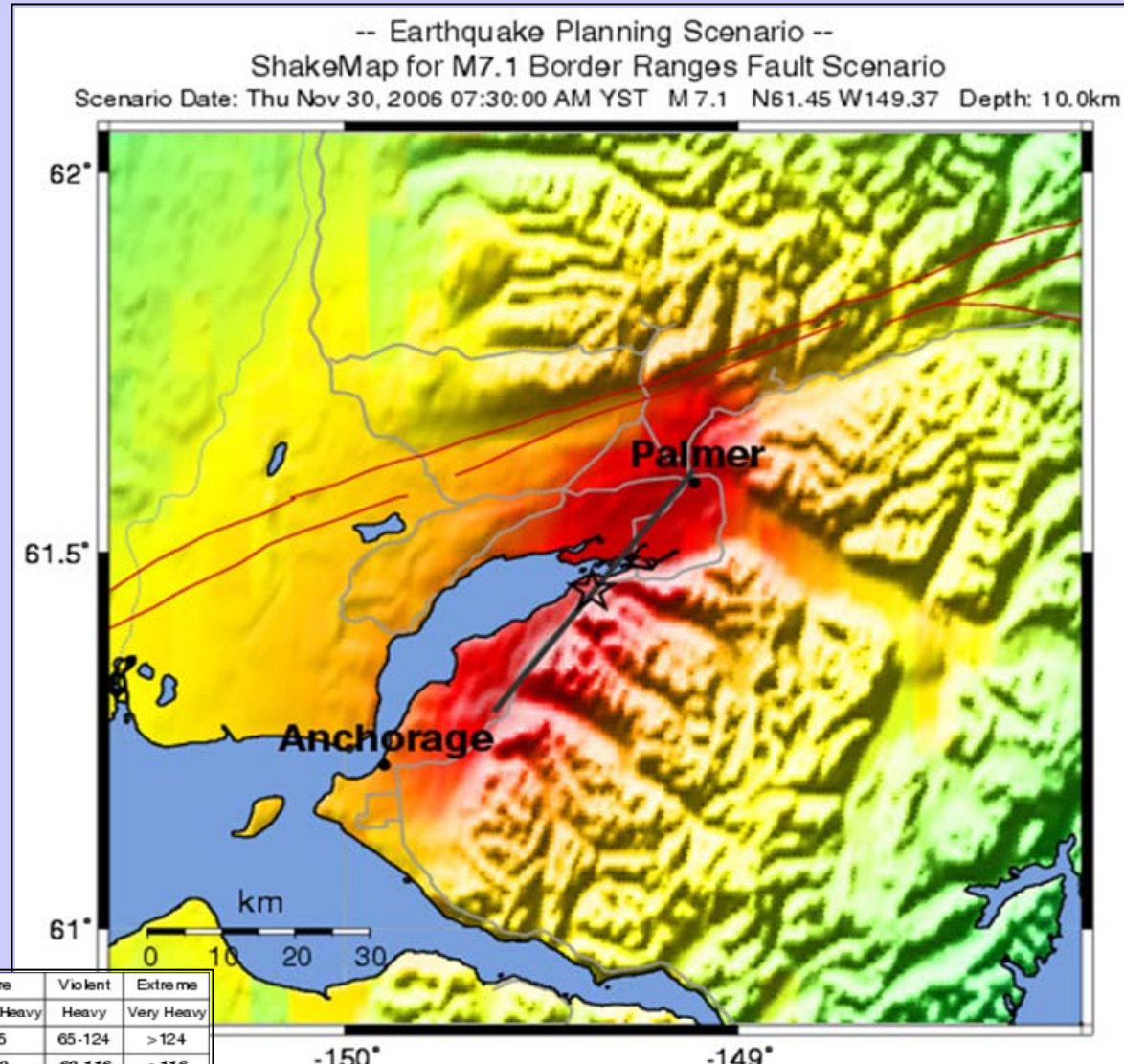
Observed and Predicted PGA During the Denali M7.9 Earthquake



SCENARIO SHAKEMAP

M7.1 earthquake on the Border Ranges Fault near Anchorage

- Scenario ShakeMaps represents the expected ground motions from hypothetical earthquakes.
- Earthquake scenarios play an important role in planning and coordinating emergency response and conducting training exercises based on realistic situations.



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POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
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INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Thank You!