



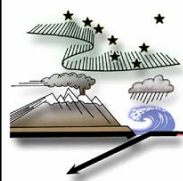
# **Alaska Earthquake Information Center**

**Earthquake Monitoring Activities and  
Recent Seismicity Report**

Alaska Seismic Hazard Safety Commission

Jamie Roush

September 18, 2007



**AEIC** *Alaska Earthquake  
Information Center*  
Geophysical Institute, UAF





# Overview

- **Monthly Seismicity Report**
- **Defining the Seismic Threat**
- **Earthquake Monitoring Network**
- **AEIC Education and Outreach Activities**
- **Seismology Lab Tour...**

# Alaska Seismicity

June 1 – August 31, 2007

- **5862** events located between June 1 and August 31

- June: 1508    July: 1854    August: 2500

- 11 events in the range of magnitude 5.0 to 6.0

- 52 events in the range of magnitude 4.0 to 5.0

- 17 events were felt. No reports of damage.










- Largest event:

**Magnitude 6.6** – August 2nd, 7:21 PM AKST,  
Andreanof Islands, 58 miles SE of Amchitka. Not felt. No  
damage reported.

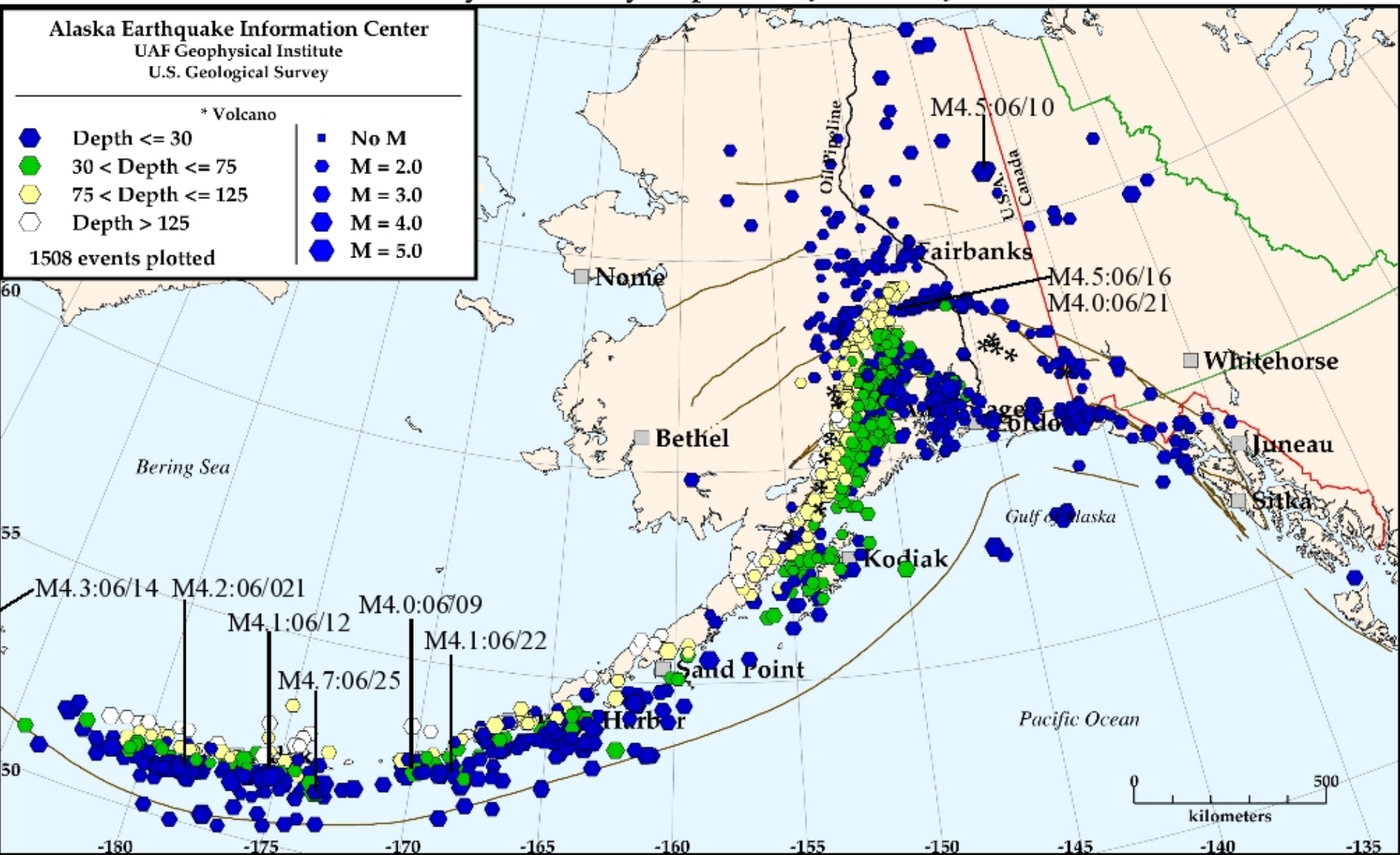
# AEIC Monthly Seismicity Report for June 01 - June 30, 2007

Alaska Earthquake Information Center  
 UAF Geophysical Institute  
 U.S. Geological Survey

\* Volcano

- |   |   |
|---|---|
|  Depth <= 30       |  No M    |
|  30 < Depth <= 75  |  M = 2.0 |
|  75 < Depth <= 125 |  M = 3.0 |
|  Depth > 125       |  M = 4.0 |
|   |  M = 5.0 |

1508 events plotted














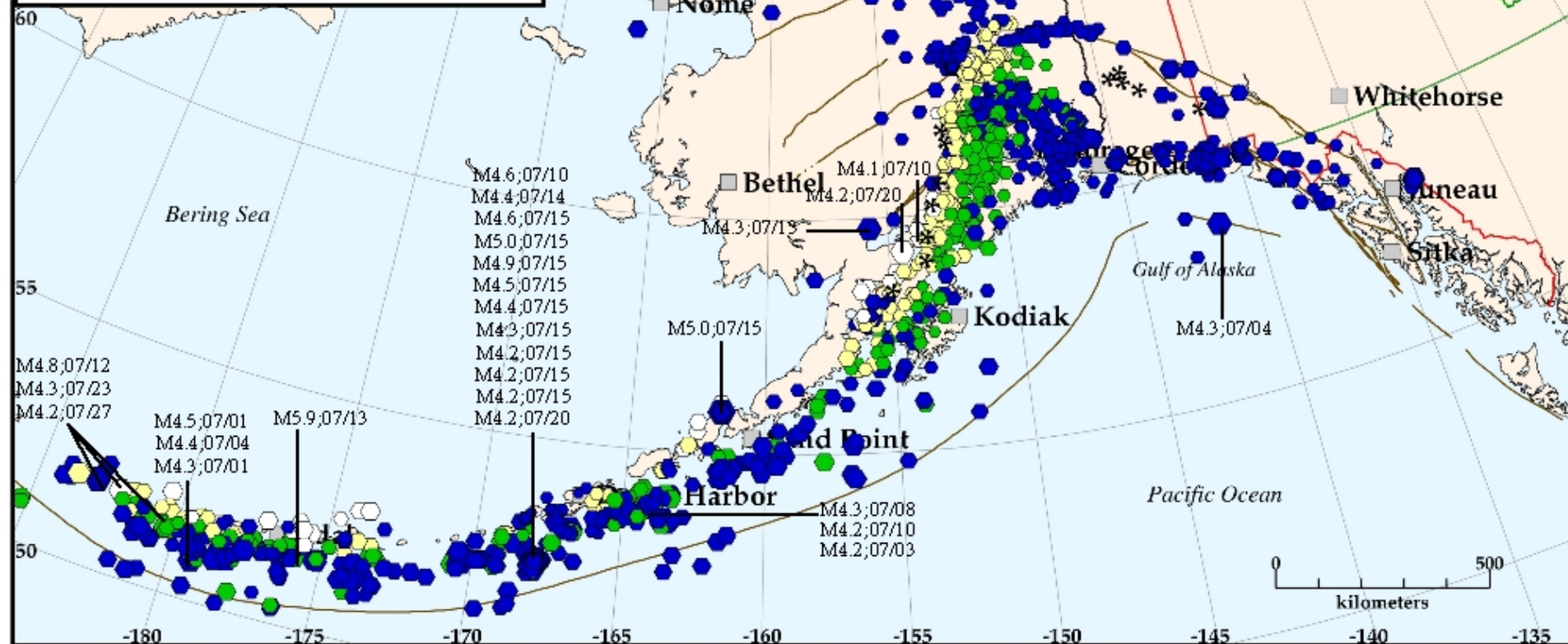
# AEIC Monthly Seismicity Report for July 01 - July 31, 2007

Alaska Earthquake Information Center  
 UAF Geophysical Institute  
 U.S. Geological Survey

\* Volcano

- |  |   |
|--|---|
|  Depth $\leq 30$              |  No M    |
|  $30 < \text{Depth} \leq 75$  |  M = 2.0 |
|  $75 < \text{Depth} \leq 125$ |  M = 3.0 |
|  Depth $> 125$                |  M = 4.0 |
|  |  M = 5.0 |










1854 events plotted



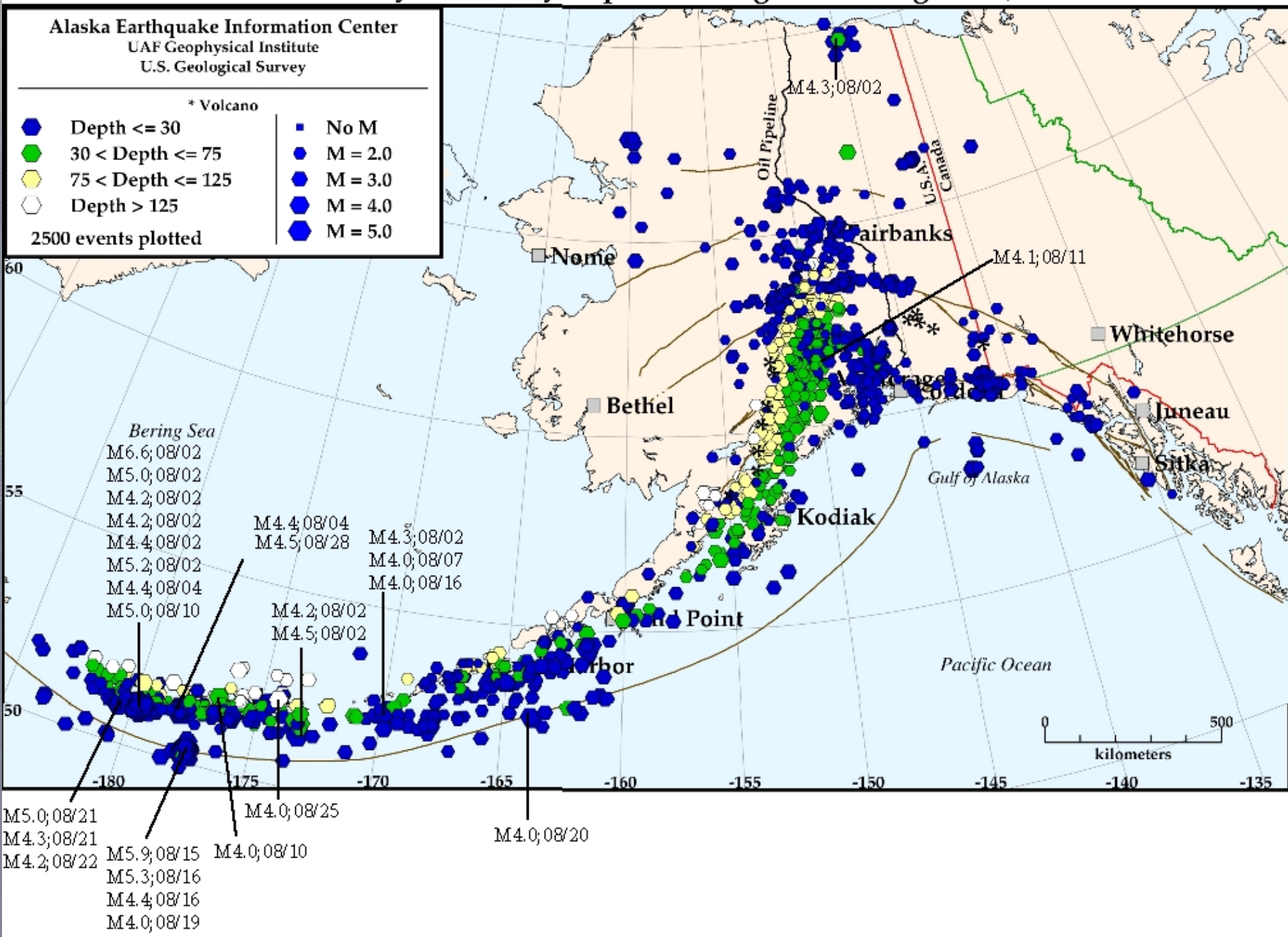
# AEIC Monthly Seismicity Report for August 01 - August 31, 2007

Alaska Earthquake Information Center  
 UAF Geophysical Institute  
 U.S. Geological Survey

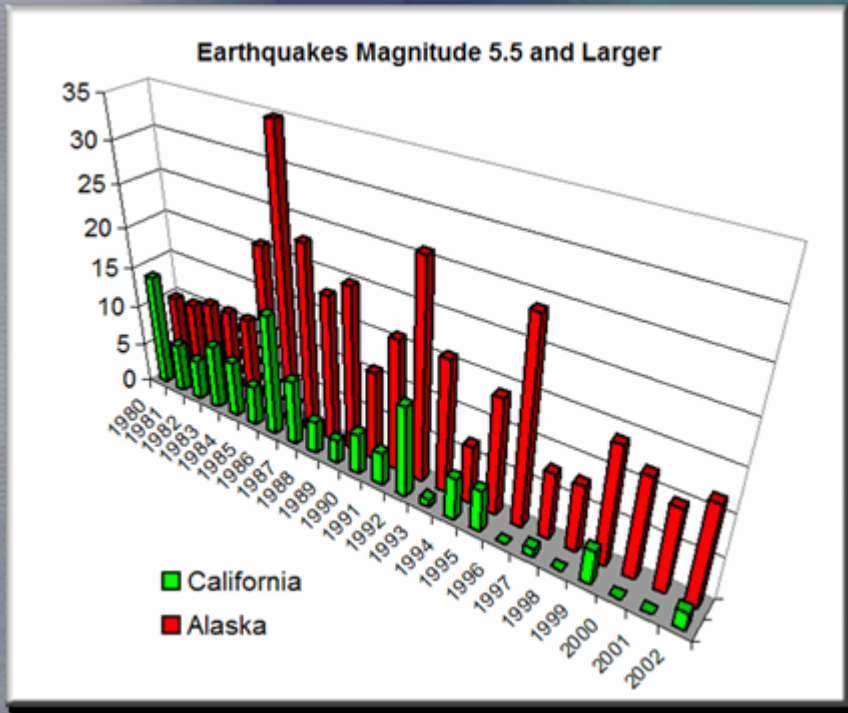
\* Volcano

 Depth <= 30	 No M
 30 < Depth <= 75	 M = 2.0
 75 < Depth <= 125	 M = 3.0
 Depth > 125	 M = 4.0
	 M = 5.0

2500 events plotted



# The Seismic Threat in Alaska



•75 % of N. American earthquakes annually

•20,000 – 30,000 events per year

## World's Largest Earthquakes

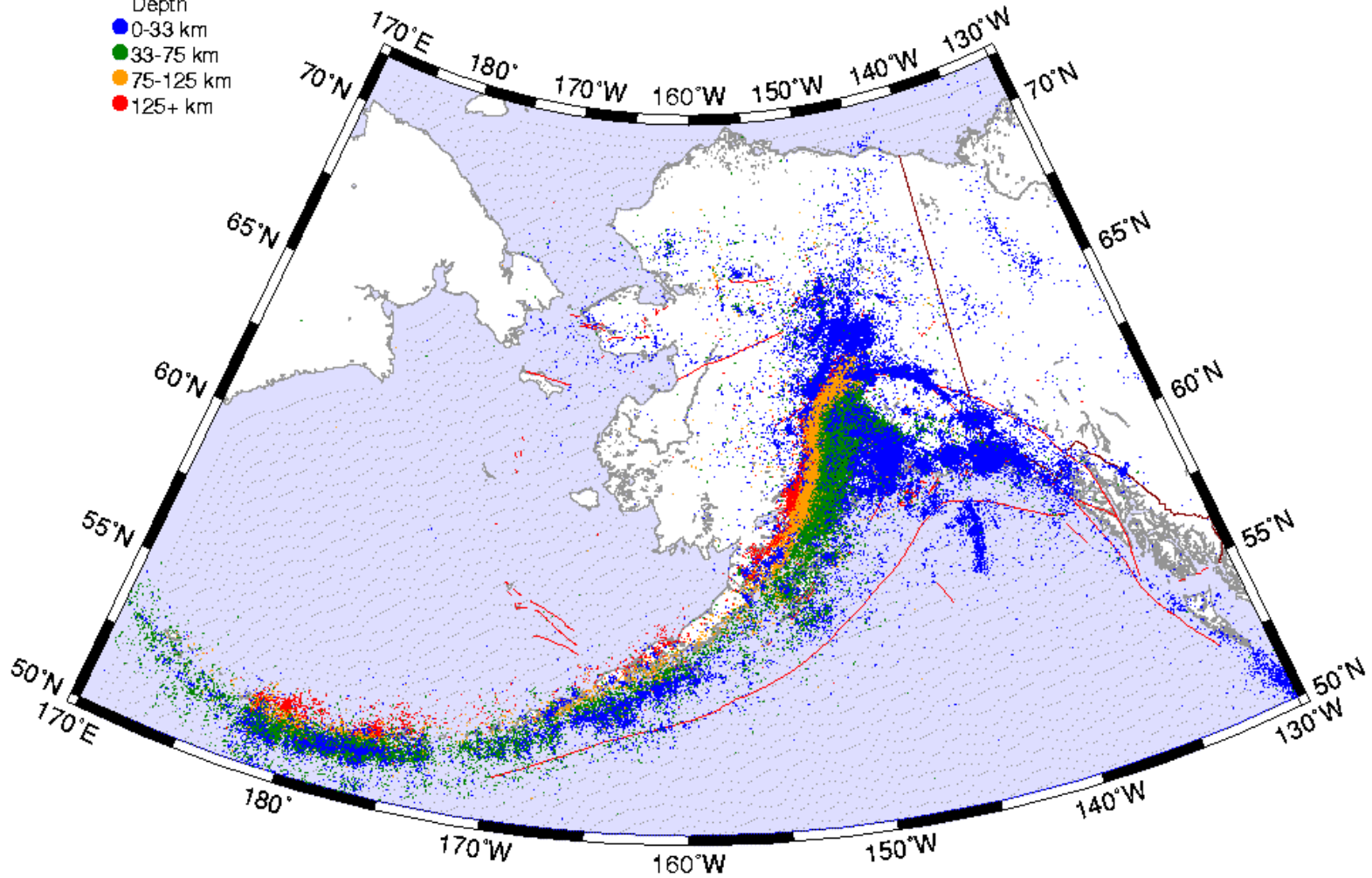
- |                    |             |            |
|--------------------|-------------|------------|
| 1. Chile           | 1960        | 9.5        |
| <b>2. Alaska</b>   | <b>1964</b> | <b>9.2</b> |
| 3. Sumatra         | 2004        | 9.0        |
| 4. Kamchatka       | 1952        | 9.0        |
| 5. Ecuador         | 1906        | 8.8        |
| 6. Sumatra         | 2005        | 8.7        |
| <b>7. Alaska</b>   | <b>1965</b> | <b>8.7</b> |
| <b>8. Alaska</b>   | <b>1957</b> | <b>8.6</b> |
| 9. Assam-Tibet     | 1950        | 8.6        |
| 10. Kurile Islands | 1963        | 8.5        |



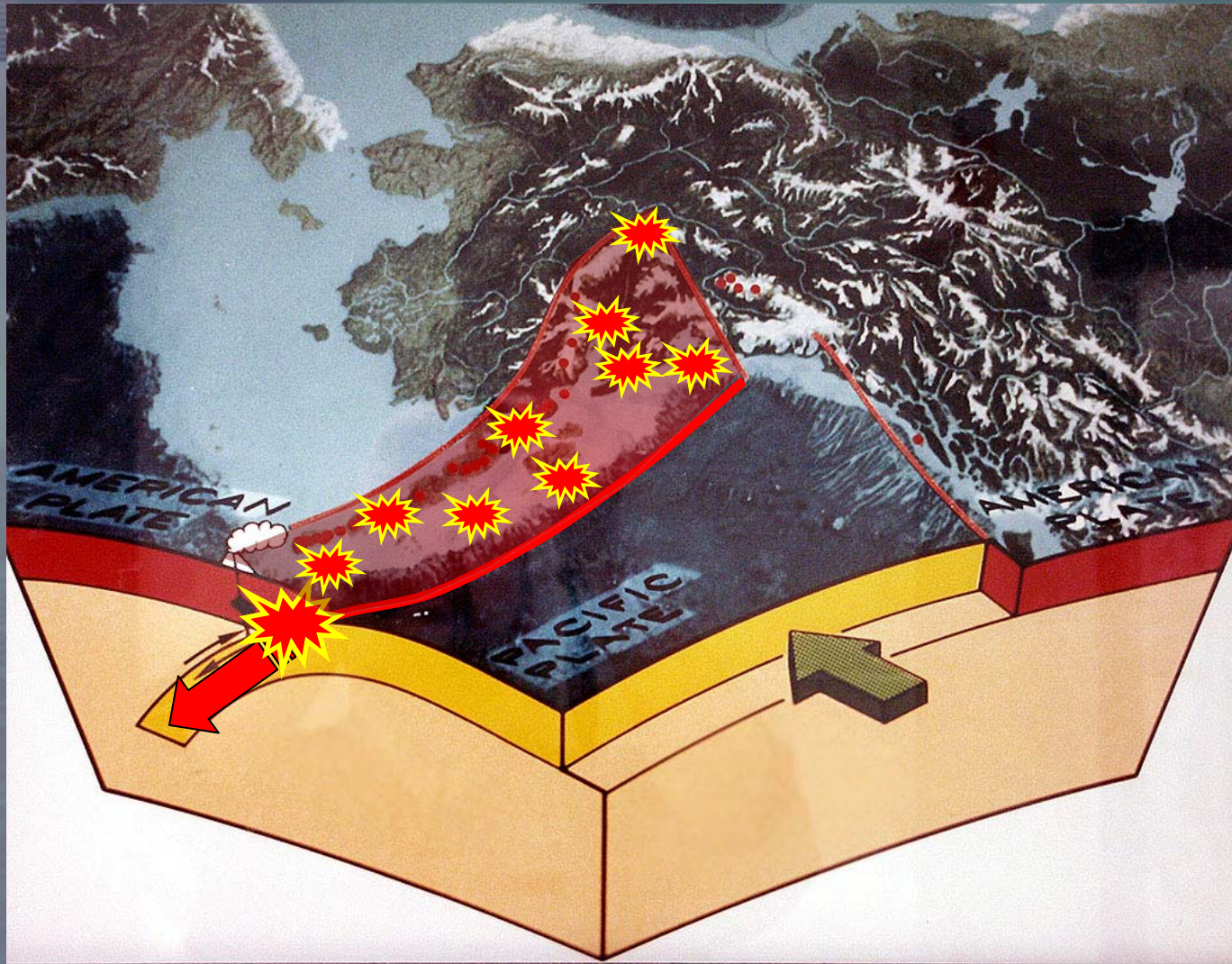
# Earthquake Catalog 1898 – 2006

~250,000 Events

- Depth
- 0-33 km
  - 33-75 km
  - 75-125 km
  - 125+ km



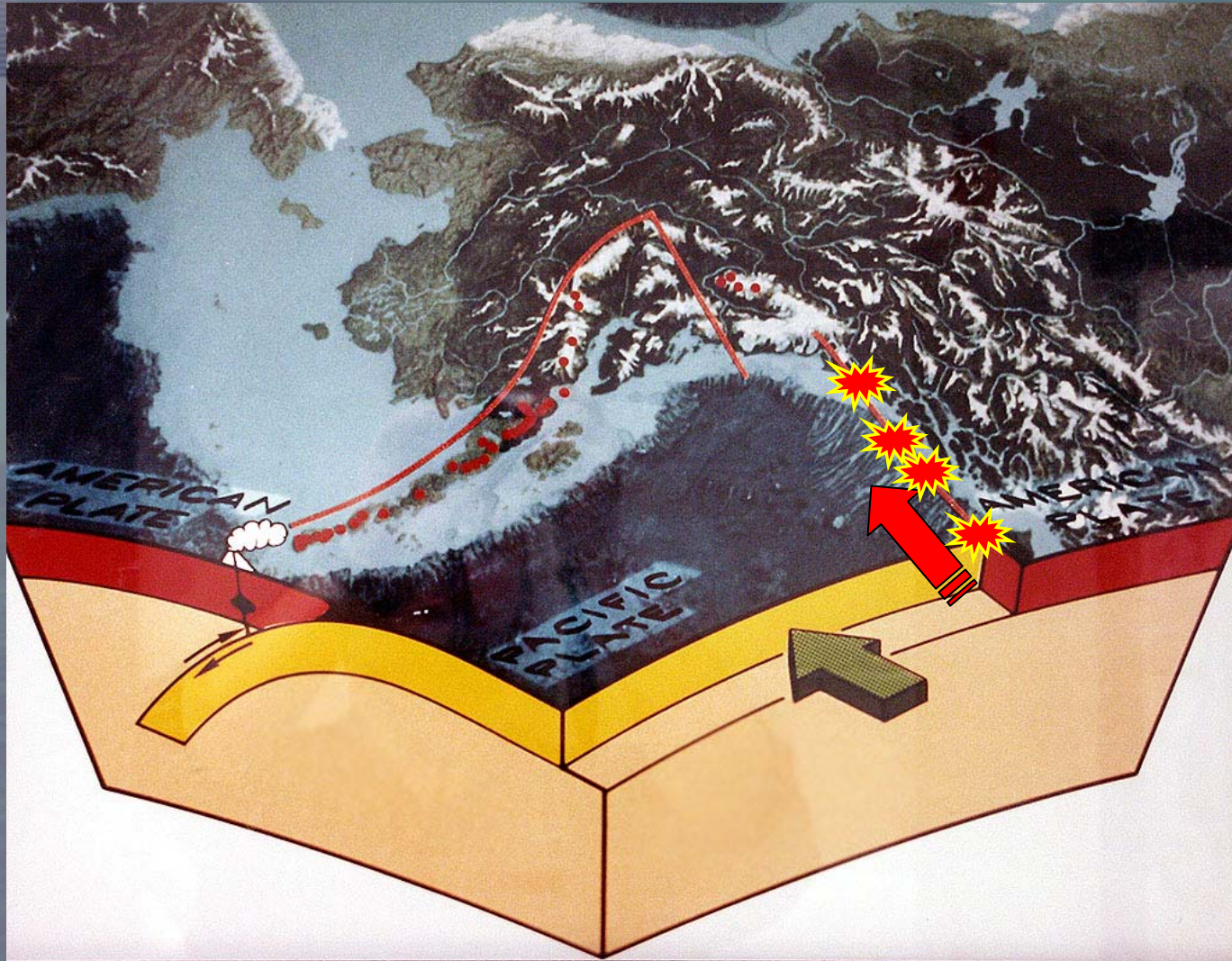
# Tectonic Setting



Pacific Plate Subduction and Earthquakes on the Aleutian Megathrust



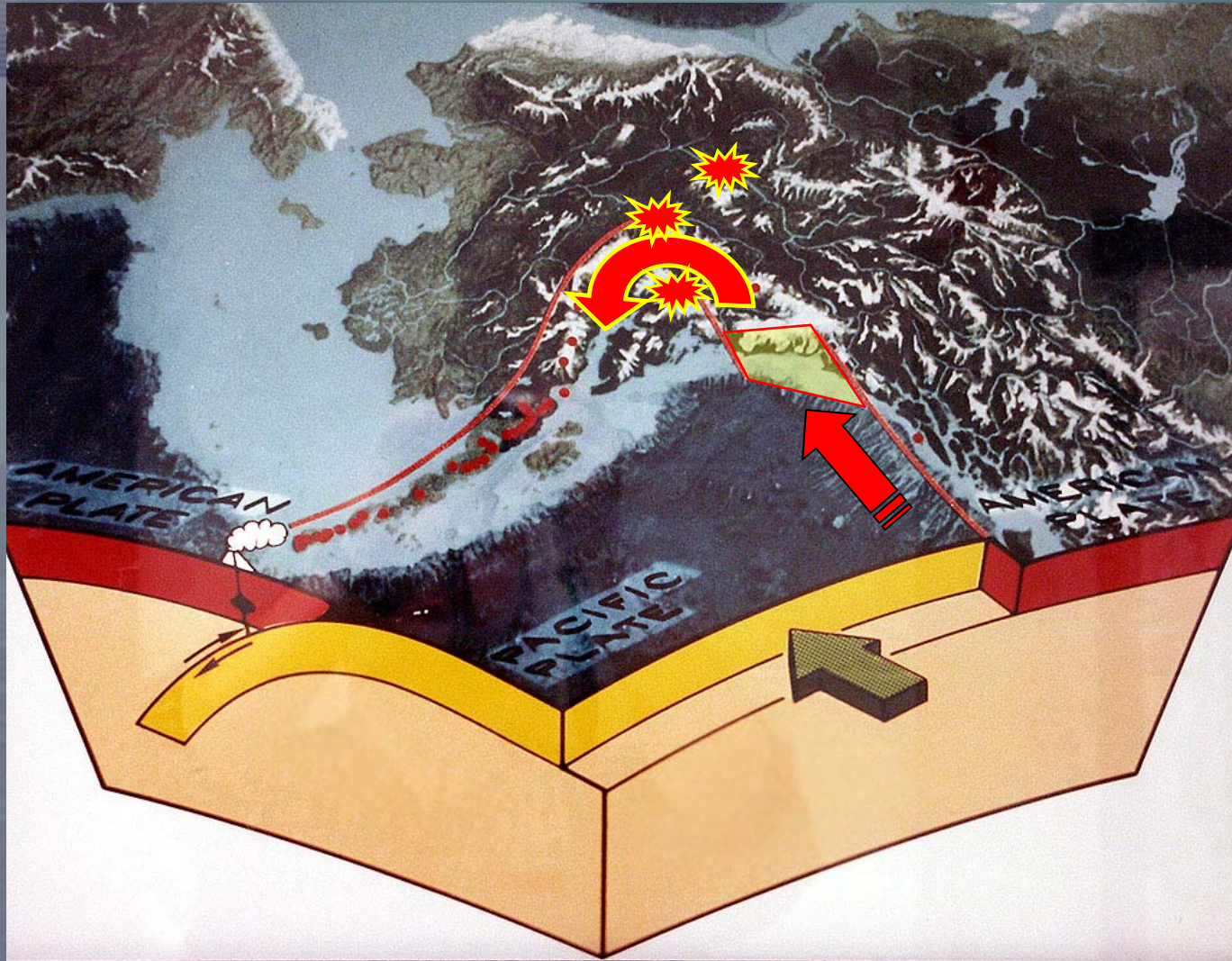
# Tectonic Setting



**Right-lateral Strike Slip Faulting on the Plate Boundary  
(Queen Charlotte-Fairweather Fault)**



# Tectonic Setting



Yakutat Block Accretion, Crustal Rotation, and Interior Seismicity

# Historical Seismicity

## Large Magnitude Earthquakes on the Aleutian Megathrust

### Earthquakes in Alaska

Earthquake risk is high in much of the southern half of Alaska, but it is not the same everywhere. This map shows the overall geologic setting in Alaska that produces earthquakes. The Pacific plate is sliding northwestward past southeastern Alaska and then dives beneath the North American plate in southern Alaska, the Alaska Peninsula, and the Aleutian Islands. Most earthquakes are produced where these plates come into contact and slide past each other. Major earthquakes also occur throughout much of interior Alaska as a result of collision of a piece of crust with the southern margin.

This map is modified from "Earthquakes in Alaska" by Peter Haeussler and George Plafker, U.S. Geological Survey Open File Report 95-624 <http://geopubs.wr.usgs.gov/open-file/of95-624/>

#### Pre-1964 Earthquakes

#### Post-1964 Earthquakes

#### EQ Magnitudes (M)

● M 6.0 - 6.9

● M 7.0 - 7.9

● M 8.0 - 8.4

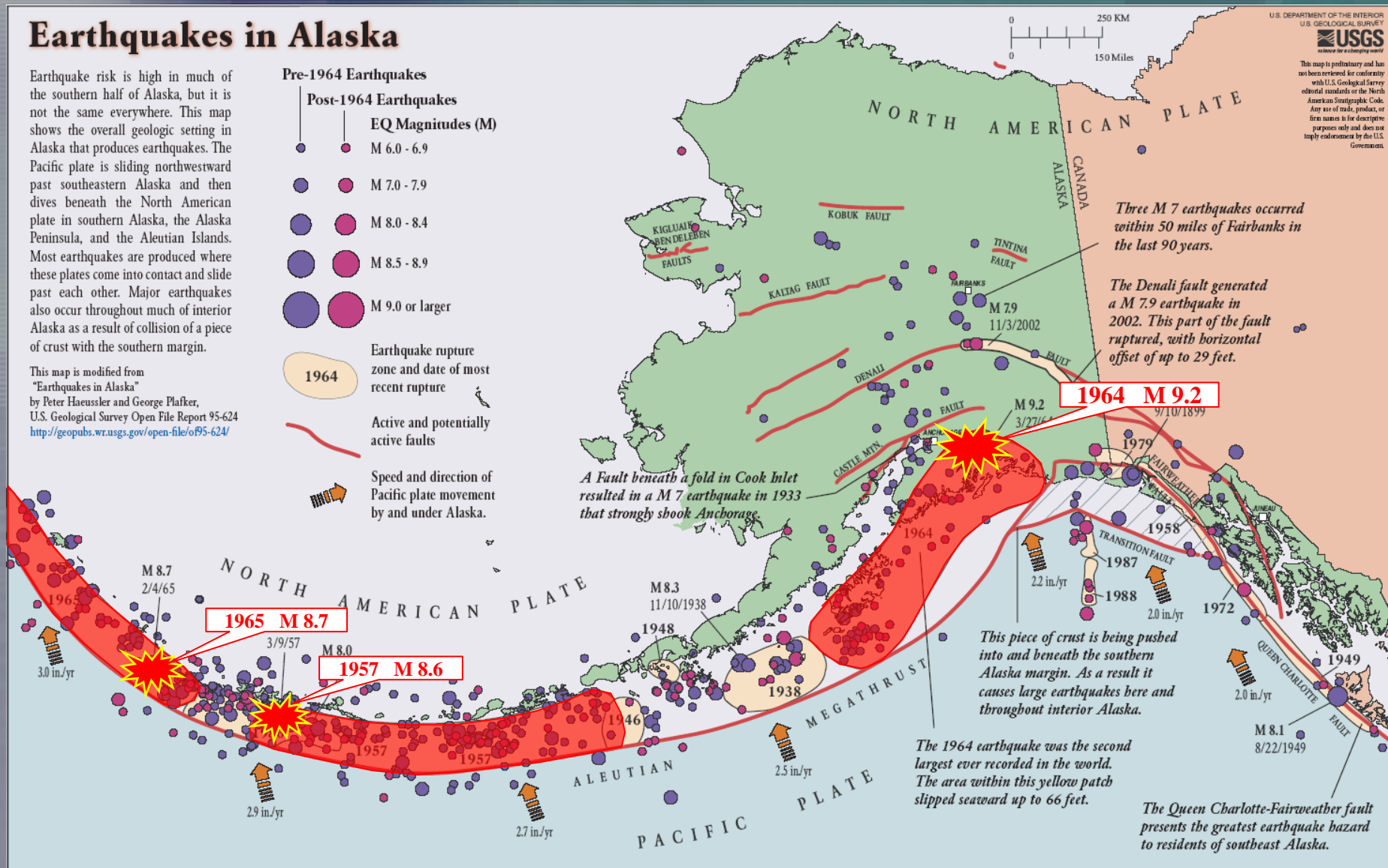
● M 8.5 - 8.9

● M 9.0 or larger

○ 1964  
Earthquake rupture zone and date of most recent rupture

— Active and potentially active faults

→ Speed and direction of Pacific plate movement by and under Alaska.



Three M 7 earthquakes occurred within 50 miles of Fairbanks in the last 90 years.

The Denali fault generated a M 7.9 earthquake in 2002. This part of the fault ruptured, with horizontal offset of up to 29 feet.

**1964 M 9.2**

A Fault beneath a fold in Cook Inlet resulted in a M 7 earthquake in 1933 that strongly shook Anchorage.

This piece of crust is being pushed into and beneath the southern Alaska margin. As a result it causes large earthquakes here and throughout interior Alaska.

The 1964 earthquake was the second largest ever recorded in the world. The area within this yellow patch slipped seaward up to 66 feet.

The Queen Charlotte-Fairweather fault presents the greatest earthquake hazard to residents of southeast Alaska.

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U.S. GEOLOGICAL SURVEY  
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science for a changing world  
This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or the North American Stratigraphic Code. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.







# Denali Fault Earthquake

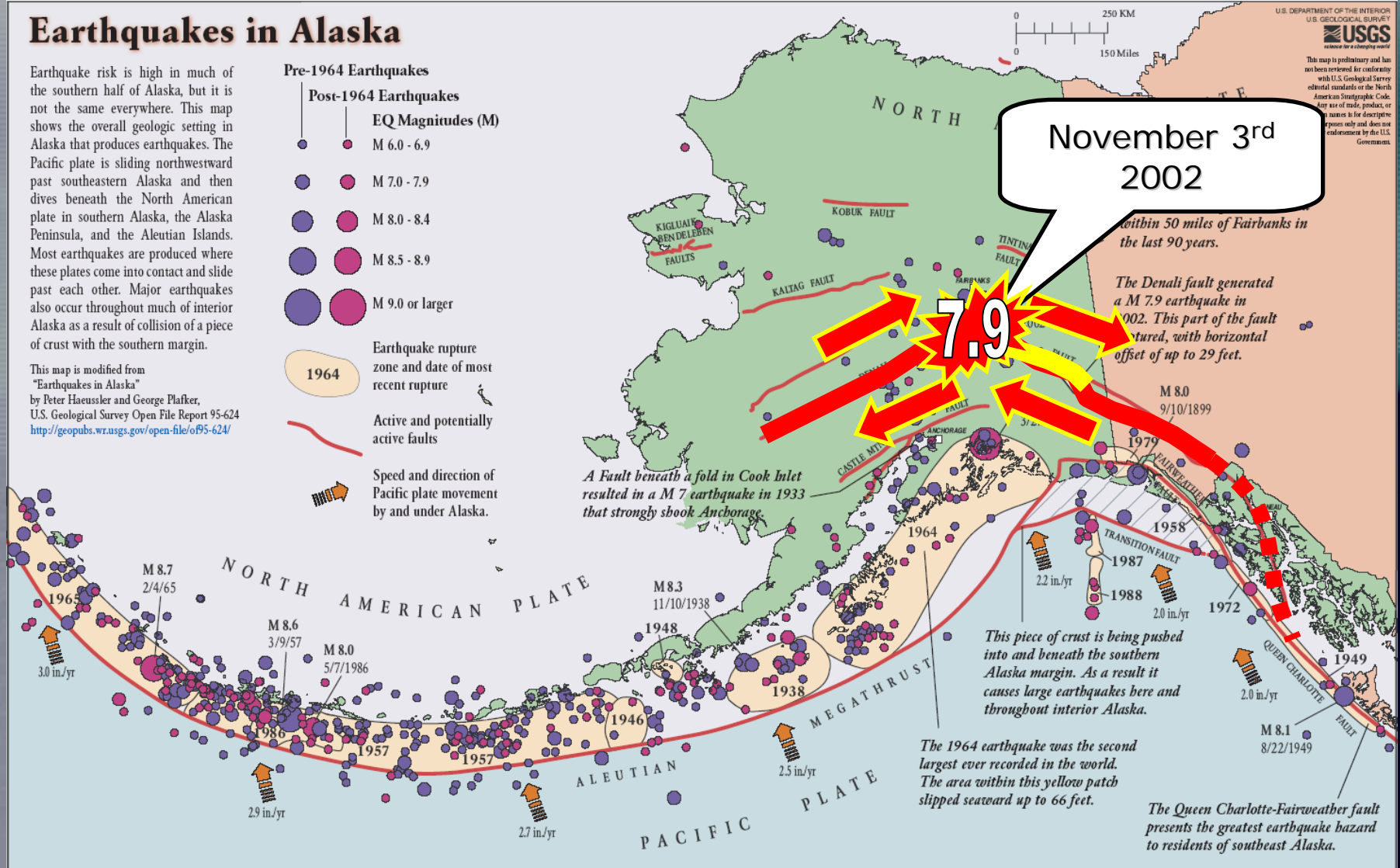
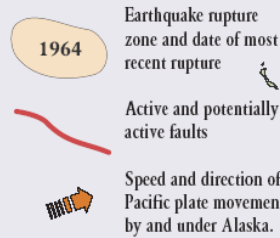
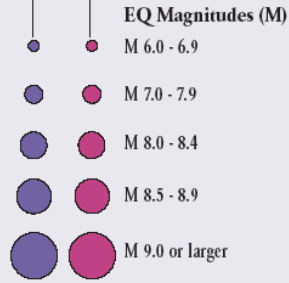
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### Pre-1964 Earthquakes

### Post-1964 Earthquakes



November 3<sup>rd</sup>  
2002

within 50 miles of Fairbanks in the last 90 years.

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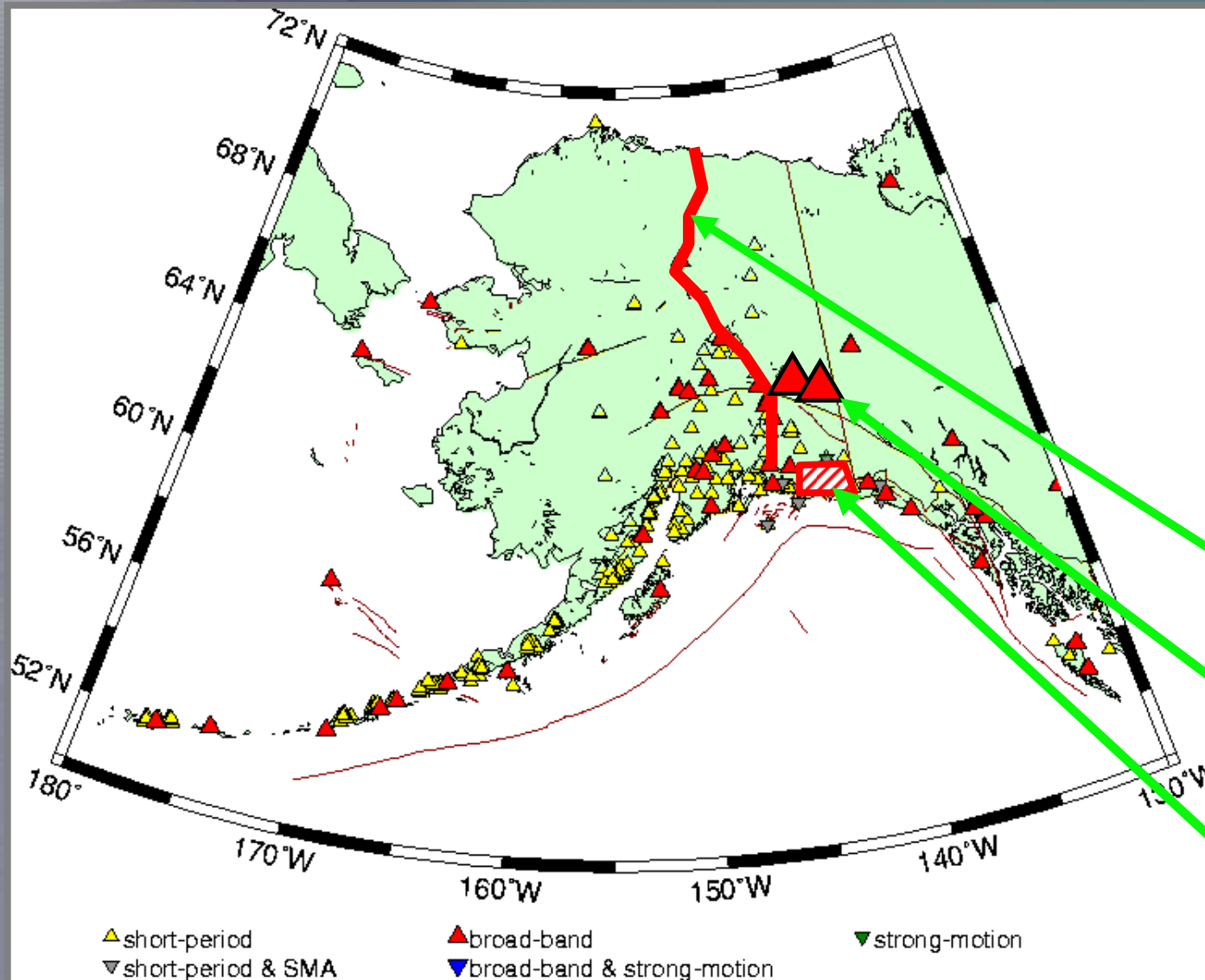


## Damage from the 2002 Denali Fault Earthquake





# Seismic Monitoring Station Network



420+ Stations

Integrated network...

- AEIC
- AVO
- USGS
- WC/ATWC

Network expansion...

- Trans-Alaska Pipeline
- Gas Pipeline Corridor Project - DGGS
- STEEP/NSF



# Seismic Monitoring Stations



Nikolski



# Seismic Monitoring Stations



St. Paul



# Seismic Monitoring Stations



Photo by D. Parrett

Unalaska



# Seismic Monitoring Stations



Atka



# Goat Mountain





# STEEP





# STS2 Broadband Seismometer





# STEEP



JUL 15 2006



# STEEP



# AEIC Earthquake Response







## INFORMATION RELEASE

### ALASKA EARTHQUAKE INFORMATION CENTER



May 9, 2006  
7:18 pm

The Alaska Earthquake Information Center located a moderate earthquake that occurred on Tuesday, May 9th at 6:42 PM AKDT in the Fox Islands region of Alaska. This earthquake had a preliminary magnitude of 5.9 and was located at a depth of about 5 miles (8 km). The magnitude and location may change slightly as additional data are received and processed. This event was felt in Nikolski and Unalaska. No reports of this event causing damage have been received at this time.

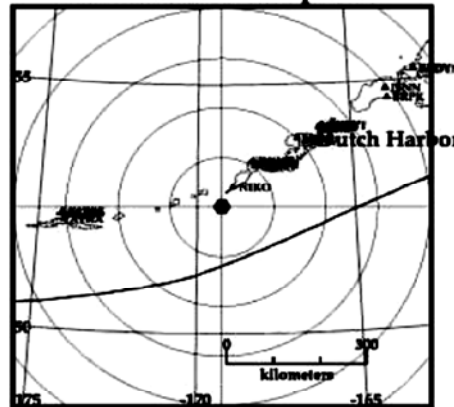
#### Distance to nearby locations:

49 km ( 31 miles) SSW of Nikolski  
189 km ( 118 miles) E of Amukta Pass  
232 km ( 145 miles) SW of Unalaska  
234 km ( 146 miles) SW of Dutch Harbor  
289 km ( 181 miles) SW of Akutan  
340 km ( 213 miles) E of Atka  
460 km ( 288 miles) WSW of False Pass  
512 km ( 320 miles) ENE of Adak

#### Preliminary earthquake parameters:

Origin Time (UT): 05/10/2006 02:42:54  
Latitude: 52 N 33'  
Longitude: 169 W 13'  
Depth: 8 km  
Magnitude: mb (NEIC) 5.9

#### Location of Earthquake



Circles are 111 km (70 miles) apart.

The location and magnitude for this earthquake may be updated as data from additional seismic stations are received. The Alaska Earthquake Information Center will continue to gather data and may issue additional releases as appropriate. With any moderate or large earthquake, aftershocks should be expected to occur.

#### For more information contact:

Roger Hansen  
State Seismologist  
Geophysical Institute  
907-474-5533  
roger@giseis.alaska.edu

Natasha Ruppert  
Seismologist  
Geophysical Institute  
907-474-7472  
natasha@giseis.alaska.edu

The Alaska Earthquake Information Center (AEIC) monitors earthquakes in Alaska and provides earthquake information to the citizens and public officials of Alaska. The Center is a cooperative program of the Geophysical Institute of the University of Alaska and the U.S. Geological Survey and is located at the Geophysical Institute in Fairbanks with the Alaska State Seismologist's Office.

Additional information may be obtained from: AEIC, Geophysical Institute, Fairbanks, AK, 99775-7320  
Ph: (907) 474-7320; Fax: (907) 474-5618; Internet: <http://www.aeic.alaska.edu>  
OR USGS National Earthquake Information Center, Denver, CO. Ph: (303) 273-8500; Fax: (303) 273-8450

• Earthquake information releases are automatically distributed to local, state, and federal agencies and to the news media.

• The public can view information releases on the AEIC web site:

[www.aeic.alaska.edu](http://www.aeic.alaska.edu)

• The public can submit “*felt reports*” by phone or on the web - they are invaluable!

# AEIC Outreach and Education

## Publications

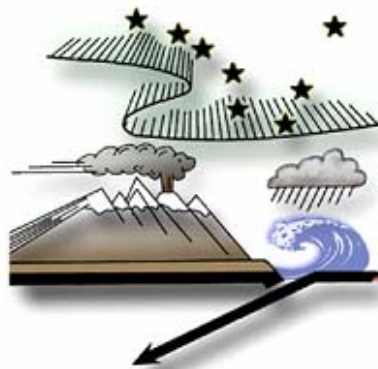
- “Are You Prepared for the Next Big Earthquake in Alaska?” Earthquake Preparedness & Safety
- Tsunami Hazard Brochures with Evacuation Maps
- Other products being developed by ADHS&EM and AEIC with TWEAK funding...
  - General tsunami hazard brochures
  - Brochures for children
  - Promotional items to raise tsunami hazard awareness:
    - Magnets, posters, etc...



# AEIC Outreach and Education

## Public Contact

- Seismology lab tours for the public and school groups.
- Classroom presentations in Fairbanks area schools.
- Earthquake information booth at the Tanana Valley State Fair.
- Assist National Weather Service WC/ATWC with “Tsunami Ready” community outreach presentations in Alaska’s coastal communities.
- Assist the Geophysical Institute with the “*Alaska Tsunami Education Program*” (ATEP). K-12 science curriculum development.



# **AEIC** *Alaska Earthquake Information Center*

Geophysical Institute, UAF