



Earthquakes ★ Floods ★ Hurricanes ★ Landslides ★ Tsunamis ★ Volcanoes ★ Wildfires

Grand Challenge #1

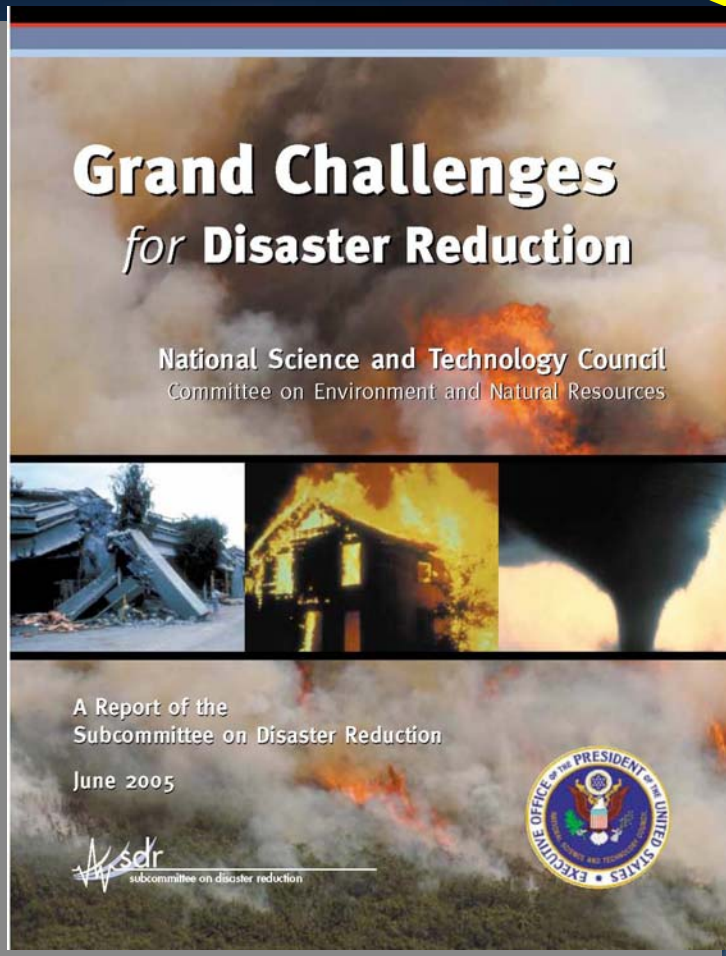
David Applegate
U.S. Geological Survey
applegate@usgs.gov



U.S. Department of the Interior
U.S. Geological Survey

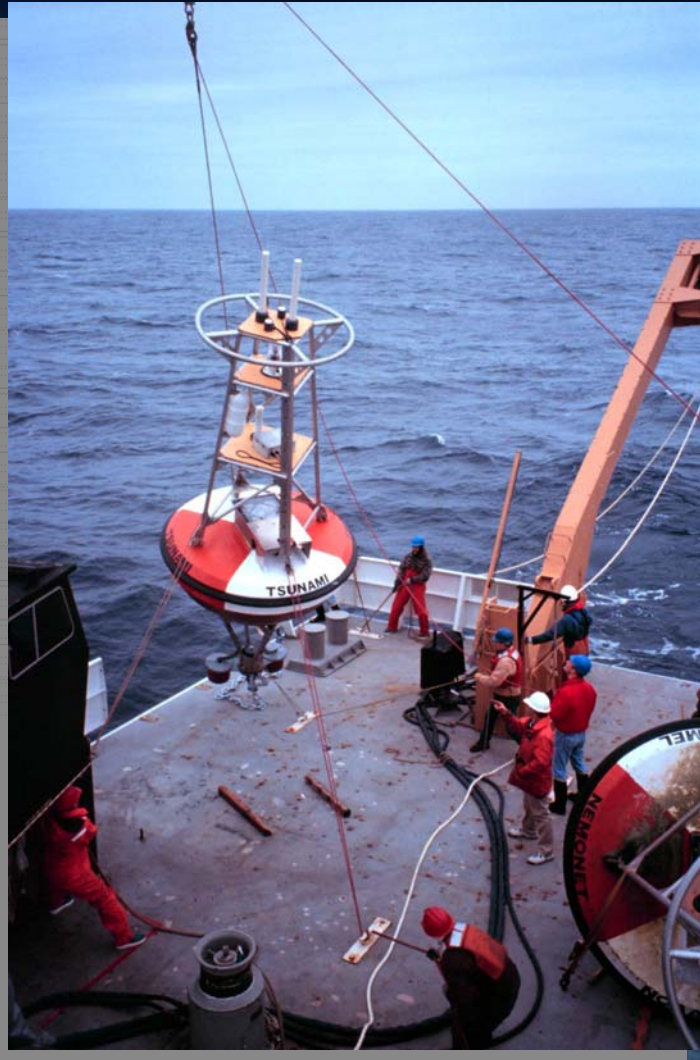
The Grand Challenges for Disaster Reduction (Published June 2005)

1. Provide hazard and disaster information where and when it is needed.
2. Understand the natural processes that produce hazards.
3. Develop hazard mitigation strategies and technologies.
4. Recognize and reduce vulnerability of interdependent critical infrastructure.
5. Assess disaster resilience using standard methods.
6. Promote risk-wise behavior.



<http://www.sdr.gov>

Grand Challenge 1. Provide hazard and disaster information where and when it is needed.



“To identify and anticipate the hazards that threaten communities, a mechanism for real-time data collection and interpretation must be readily available to and usable by scientists, emergency managers, first responders, citizens, and policy makers.

Developing and improving observation tools is essential to provide pertinent, comprehensive, and timely information for planning and response.”

“Warn the right people in the right place at the right time.”



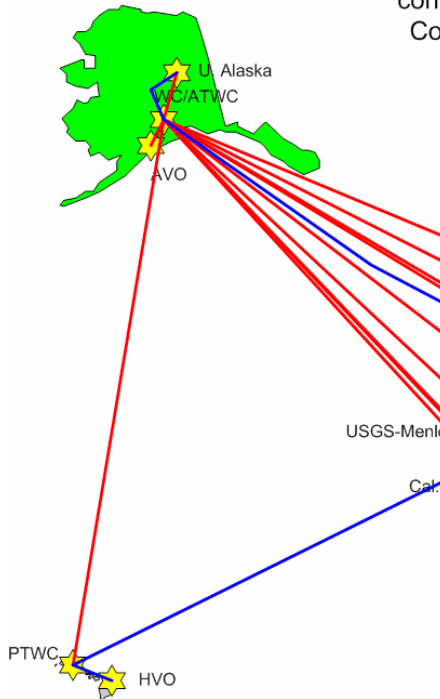
Seismic is the start...

The beach is the finish

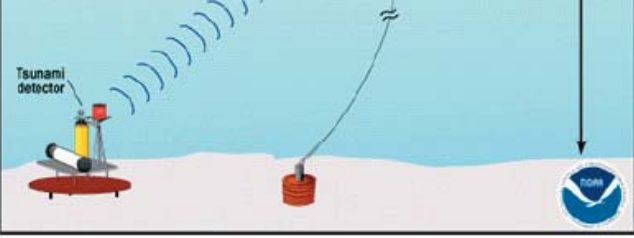
Seismic Data Centers with connections to the West Coast/Alaska Tsunami Warning Center

Legend

- Leased Line
- Internet
- Satellite uplink
- Data Center
- Seismometer



All Hazard Alert Broadcast system installed at Ocean Shores, Washington.



Credit: Washington Emergency Management

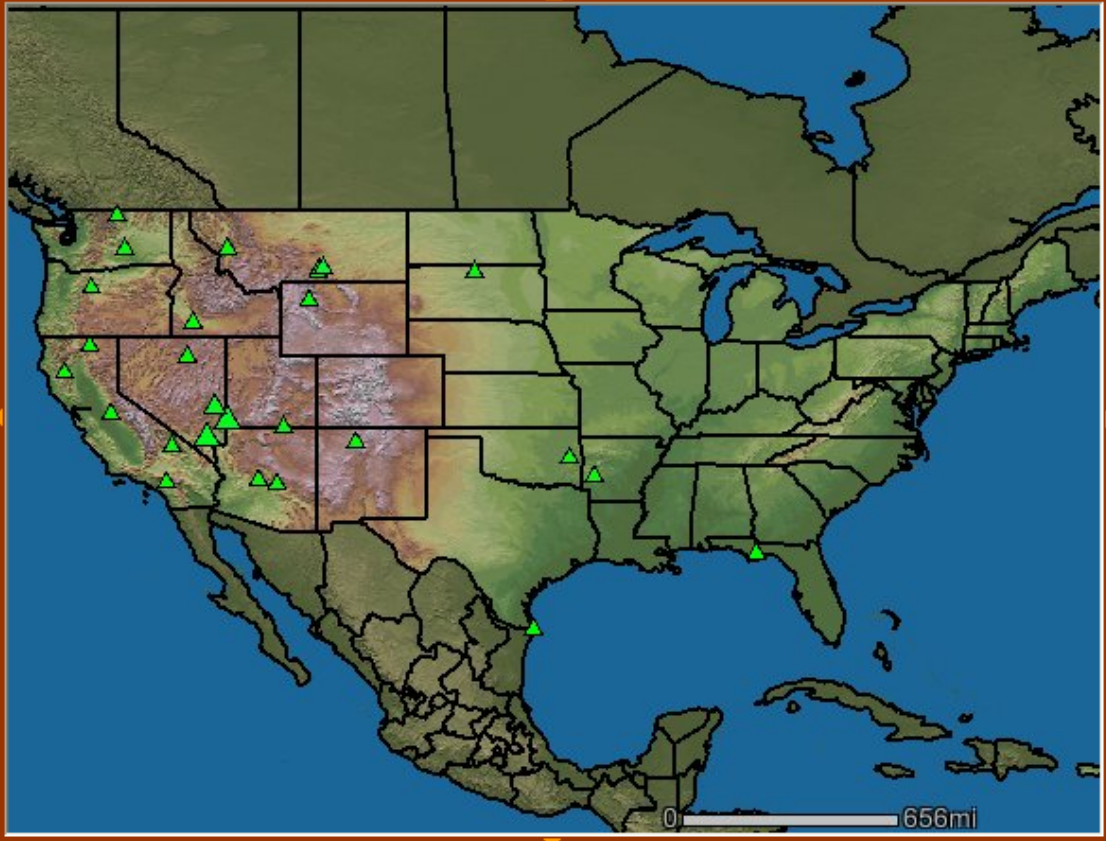
Improving situational awareness

http://geomac.usgs.gov - GeoMAC Wildfire Information - Microsoft Internet Explorer

GEOMAC
WILDLAND FIRE SUPPORT

Wildfire Viewer

Jump to Wildfire:
[Go to Alaska](#) [Find Location](#)



Layer Legend

Map Layers

Visible Active

- Current Fires
- Current Fire Perimeters
- All 2006 Fires
- Past 2006 Perimeters
- 2005 Fires
- 2004 Fires
- 2003 Fires
- 2002 Fires
- States
- Shaded Relief

Refresh Map
Active Layer Info

Locator Off Full Extent **Zoom In** Zoom Out Back Pan
Hyperlink Identify Print Lat/Lon Reload Help

Updated: HMS 2006-07-08; Thermal MODIS 2006-07-06 818 (GMT); Fire Perimeters 2006-07-07; Sit Reports 2006-07-07

NAD83 - Longitude, Latitude: -103.63 , 59.91

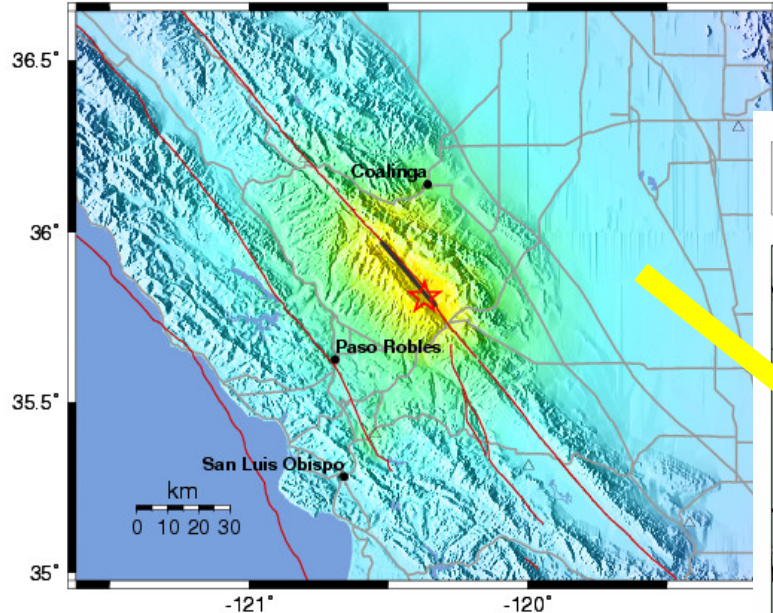
Internet



ShakeMap supports targeted response and rapid loss estimation

ShakeMap for the
M6.0 Parkfield earthquake
Sep. 28, 2004

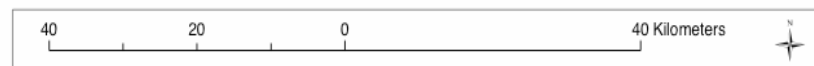
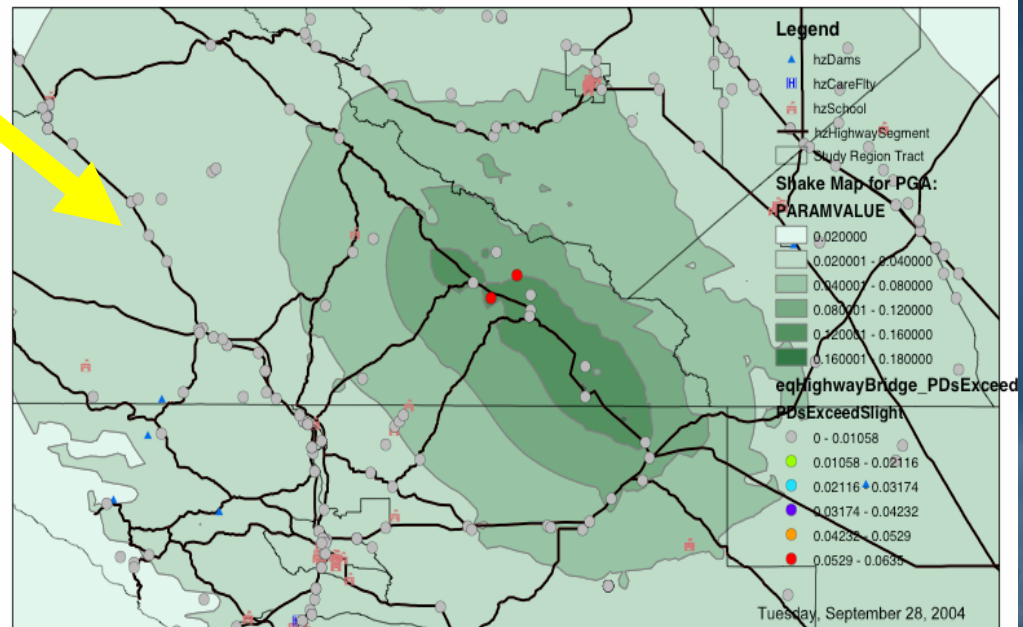
CISN Rapid Instrumental Intensity Map Epicenter: 11 km SSE of Parkfield, CA
Tue Sep 28, 2004 10:15:24 AM PDT M 6.0 N35.81 W120.37 Depth: 7.9km ID:51147892



Processed: Tue Sep 28, 2004 12:18:03 PM PDT, -- NOT REVIEWED BY HUMAN

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Ext
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-18	18-31	31-60	60-118	>
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

Study Region : Parkfield Region
Hazard Scenario : ShakeMap Mw 6.0 Parkfield



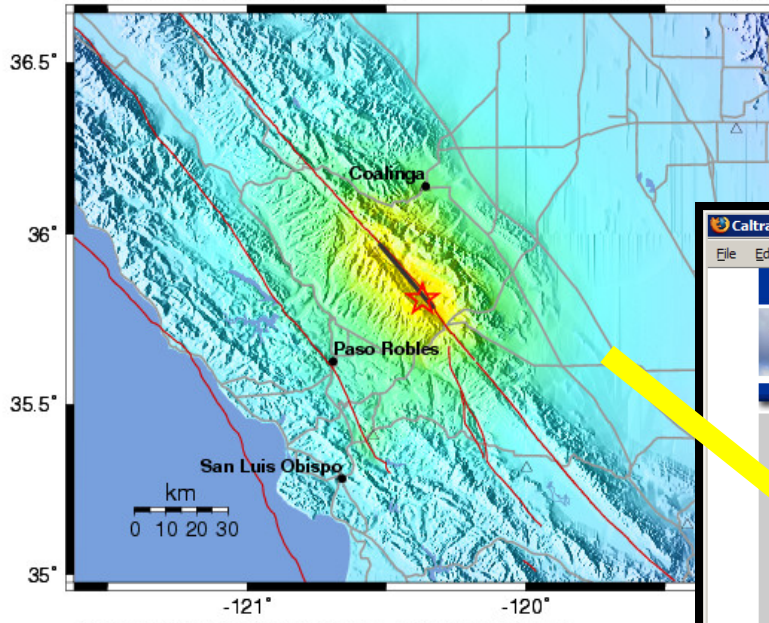
(c) 1997-2003 FEMA



Loss estimation results from FEMA's
HAZUS based on ShakeMap data

ShakeCast: Automatic Damage Assessment for Critical Facilities

CISN Rapid Instrumental Intensity Map Epicenter: 11 km SSE of Parkfield, CA
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Processed: Tue Sep 28, 2004 12:18:03 PM PDT, - NOT REVIEWED BY HUMAN

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-85	85-100
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-18	18-31	31-80	80-100
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX

Caltrans Translab - Mozilla Firefox

Monday, April 3, 2006 Tuesday, February 7, 2006

Welcome to California

Division of Research and Innovation

Caltrans ShakeCast

Event Summary
 Name: Great_Valley_3_se Test Event, Version 1
 Magnitude: 6.9
 ID: Great_Valley_3_se_scte
 Location: Great Valley #3 Scenario
 Latitude: 38.88
 Longitude: -122.19
 Time: 2006-02-23 12:00:00

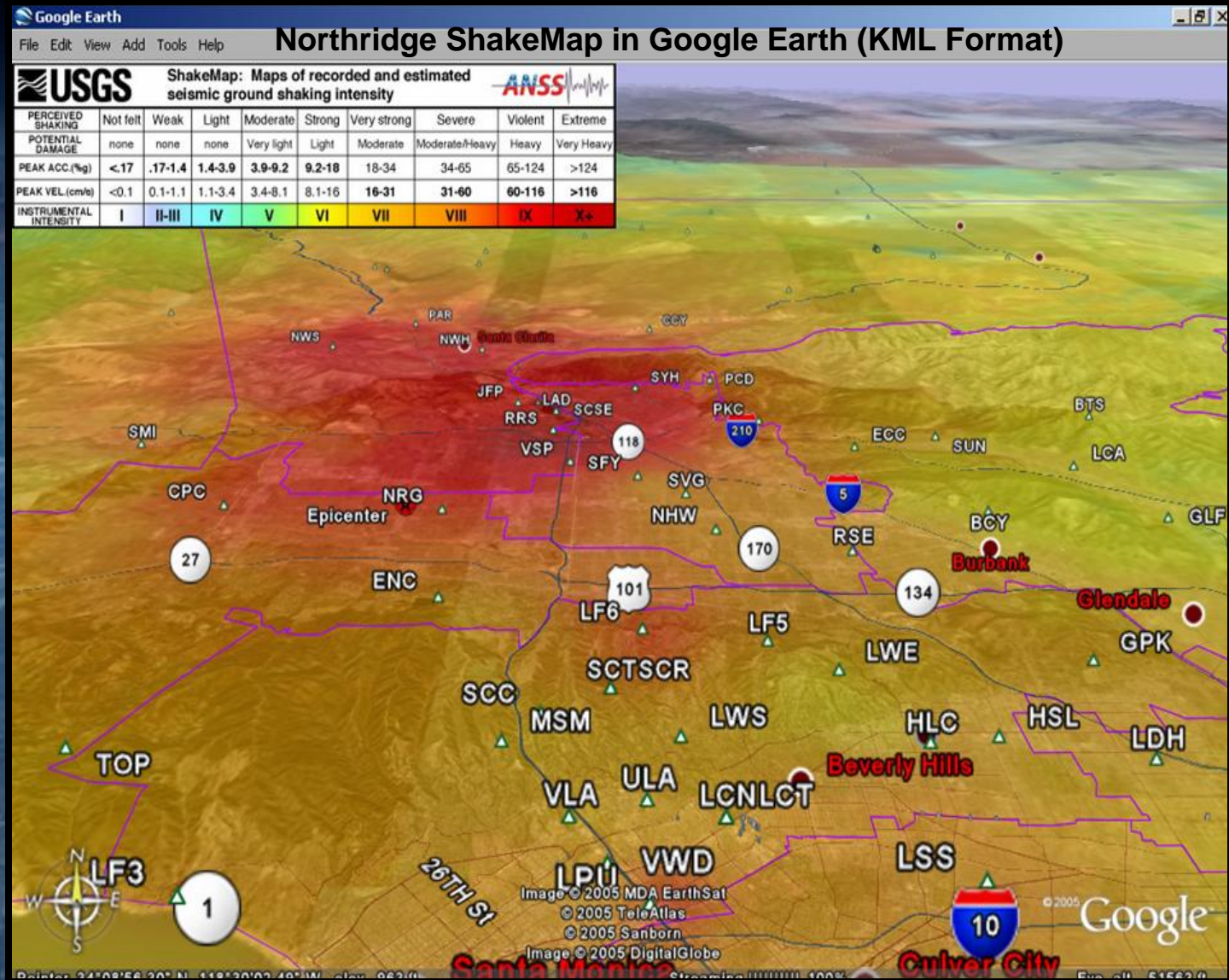
Estimated Bridge Damage Summary
 Maximum Peak 1.0 sec Spectral Acceleration (PSA): 82.9135 (1/100 g)
 Maximum Acceleration: (not measured)
 Number of bridges evaluated: 45
 RED: 3
 YELLOW: 20
 GREEN: 22

Facility Damage Estimates from ShakeMap
 Bridges presented in the table below are sorted in order of potential damage level.

Bridge Name	Bridge No	Dist-City-Rte-PM	Damage Level	Value	Exceedance Ratio
Meyers Road OC	15 0063	03-COL-005-R13.75	RED	42.3686	1.211
Williams OH	15 0066L	03-COL-005-R16.57	RED	36.1202	1.003
Williams OH	15 0066R	03-COL-005-R16.55	RED	36.1202	1.003
Hahn Road OC	15 0061	03-COL-005-R10.31	YELLOW	42.2364	0.577
Salt Creek	15 0005L	03-COL-005-R7.99	YELLOW	43.1074	0.477
Salt Creek	15 0005R	03-COL-005-R7.99	YELLOW	43.1074	0.477

USGS

ShakeMap now available to users as Google Earth transparent overlay



Situational awareness for humanitarian response

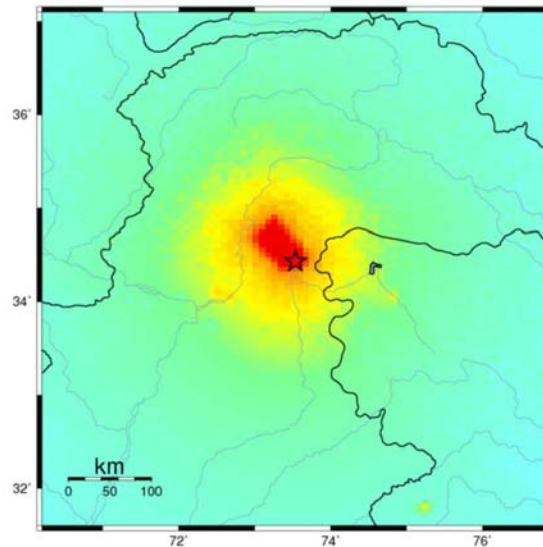


Prompt Assessment of Global Earthquakes (PAGER)

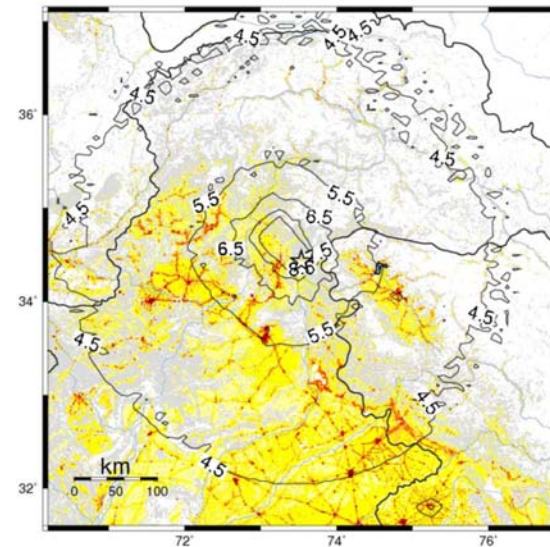
M7.6 PAKISTAN

N34.43 E73.53 10km Sat Oct 08, 2005 03:50:38 AM GMT

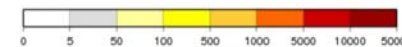
Shaking Intensity



Population per km²



PERCEIVED SHAKING POTENTIAL DAMAGE	Notice none	Weak	Light	Modest	Strong	Very strong	Severe	Violent	Extreme
PEAK AOC (g)	< 0.17	0.17-0.33	0.33-0.50	0.50-0.67	0.67-1.00	1.00-1.50	1.50-2.00	2.00-3.00	> 3.00
PEAK VEL (cm/s)	< 0.1	0.1-1.0	1.0-3.4	3.4-8.1	8.1-16	16-37	37-80	80-150	> 150
INSTANTANEOUS INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X



(Data from LandScan 2003)

Population exposed to shaking

MMI Intensity	Population
IX	525,000
VIII	827,000
VII	1,550,000



Greater specificity and lead time for warnings



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CAP Alert

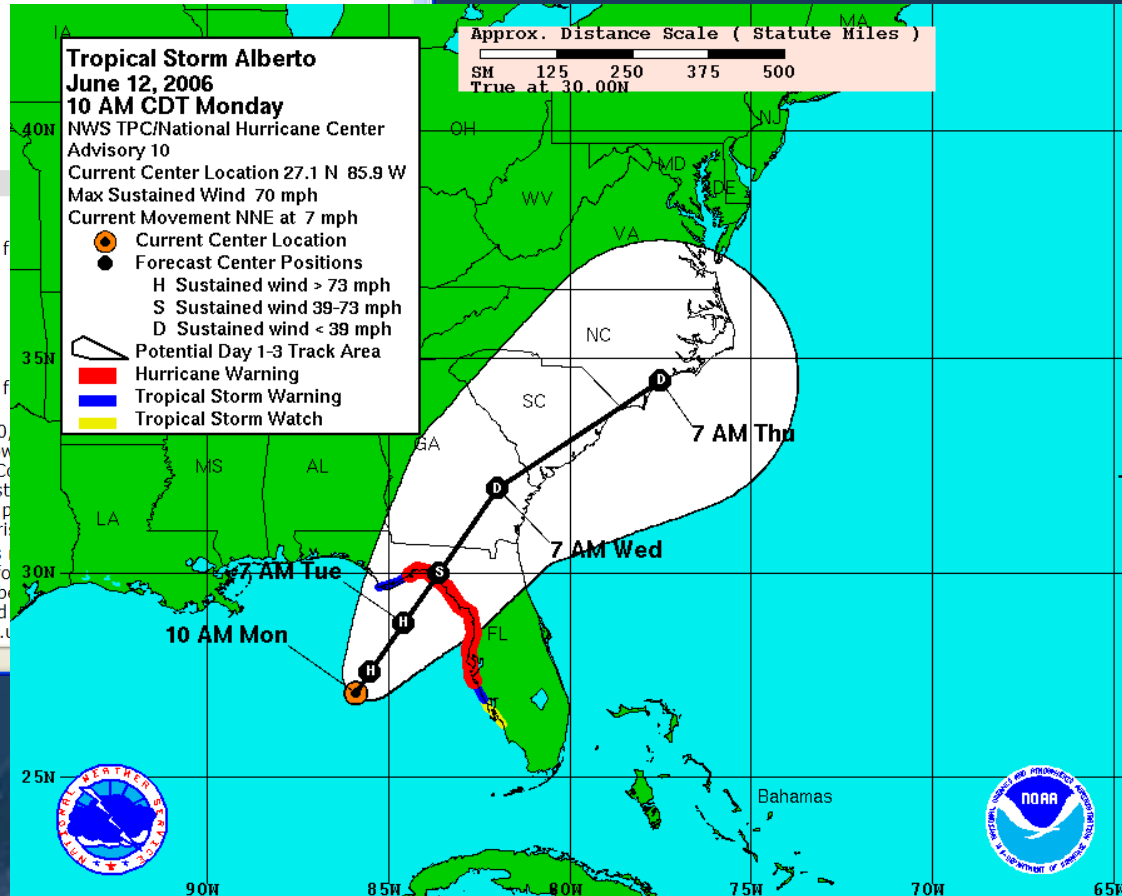
Flash Flood and Debris Flow Watch for Recently Burned Areas in Southern California

Summary

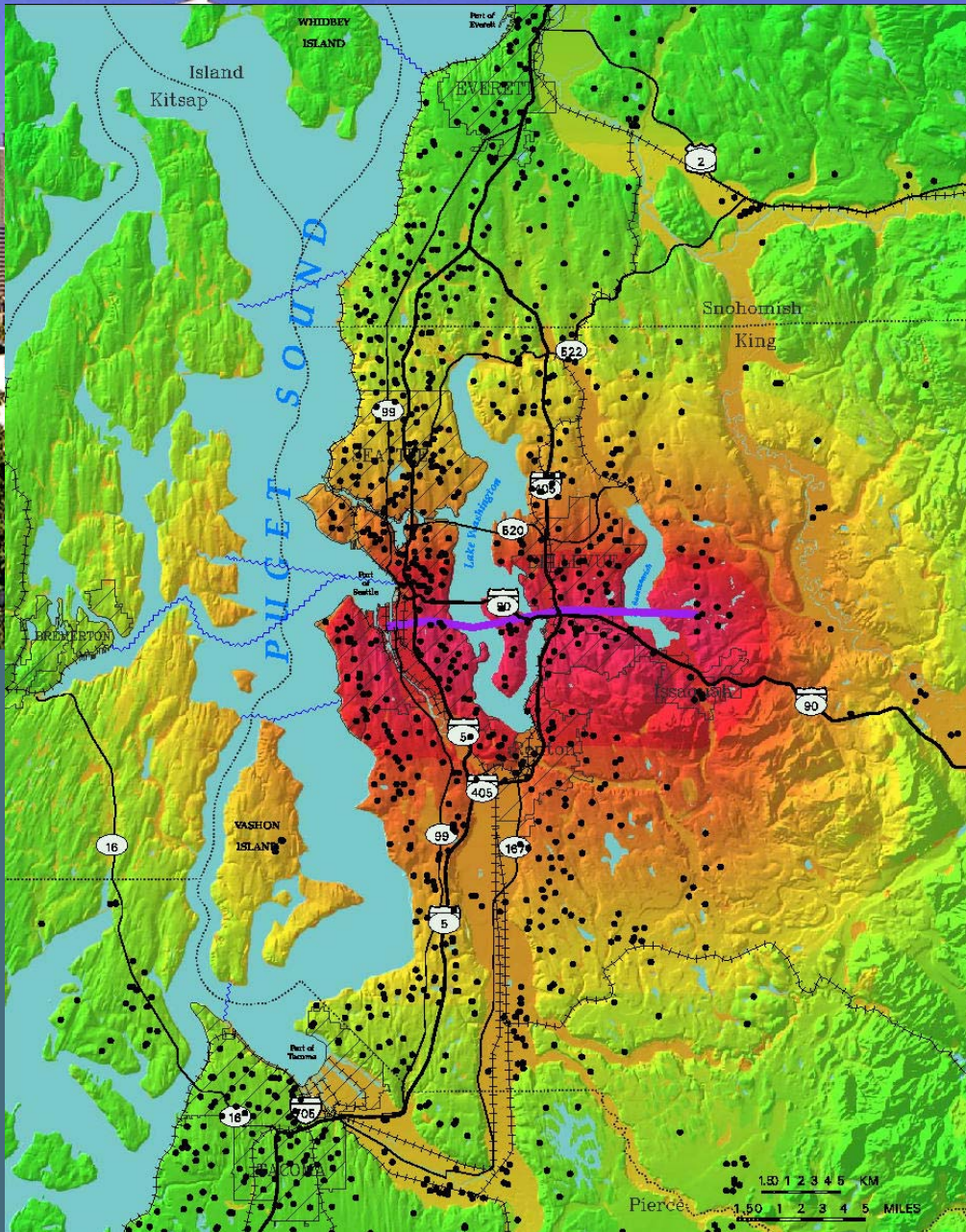
Identifier: USGS-landslides.20060522T144154
Sender: cannon@usgs.gov
Sent: 20060522T144154.000Z
Status: Actual
Message Type: Alert
Scope: Public

Additional Details:

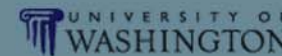
Category: Geo
Event: Flash Flood and Debris Flow Watch for Recently Burned Areas in Southern California
Urgency: Future
Severity: Unknown
Certainty: Possible
Sender Name: Susan Cannon
Headline: Flash Flood and Debris Flow Watch for Recently Burned Areas in Southern California
Description: At 8:41 pm PDT on Saturday May 20, 2006, the USGS issued a Flash Flood and Debris Flow Watch for recently burned areas in Southern California, including Santa Barbara, Ventura and Los Angeles Counties. The watch is in effect through Monday morning, May 22, 2006. A steady rainfall rate of one half of an inch per hour is expected to exceed thresholds for flash floods and debris flow flows.
Instruction: Residents or persons with interests in recently burned areas should monitor later forecasts for flash flood warnings. If you live near a recently burned area, you should take action should flash flood warnings be issued. For more information, do if you live near a recently burned area, you should take action should flash flood warnings be issued. For more information, see: <http://landslides.usgs.gov>



Overview of Schools

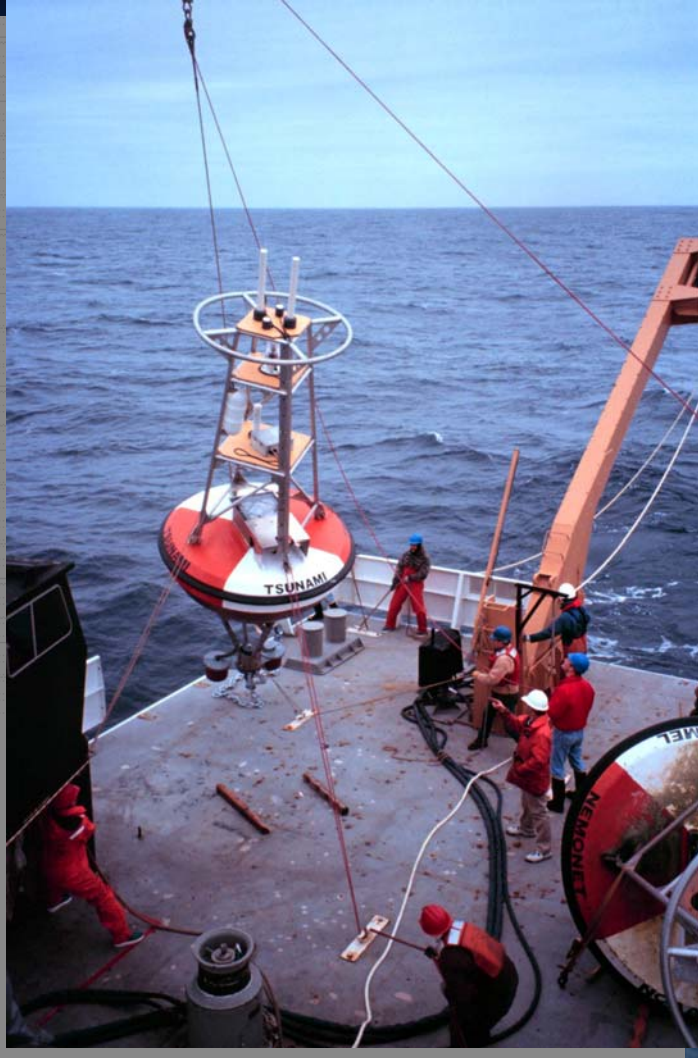


- Over 1,200 schools and campuses in region
- Wide range of construction materials and age
- Some level of upgrade completed but not well documented as a region



Earthquake Engineering
Research Institute

Grand Challenge 1. Provide hazard and disaster information where and when it is needed.



Challenges:

- Improve data collection to increase understanding of the ways in which hazards evolve.
- Create standards for sharing, storing and analyzing data.

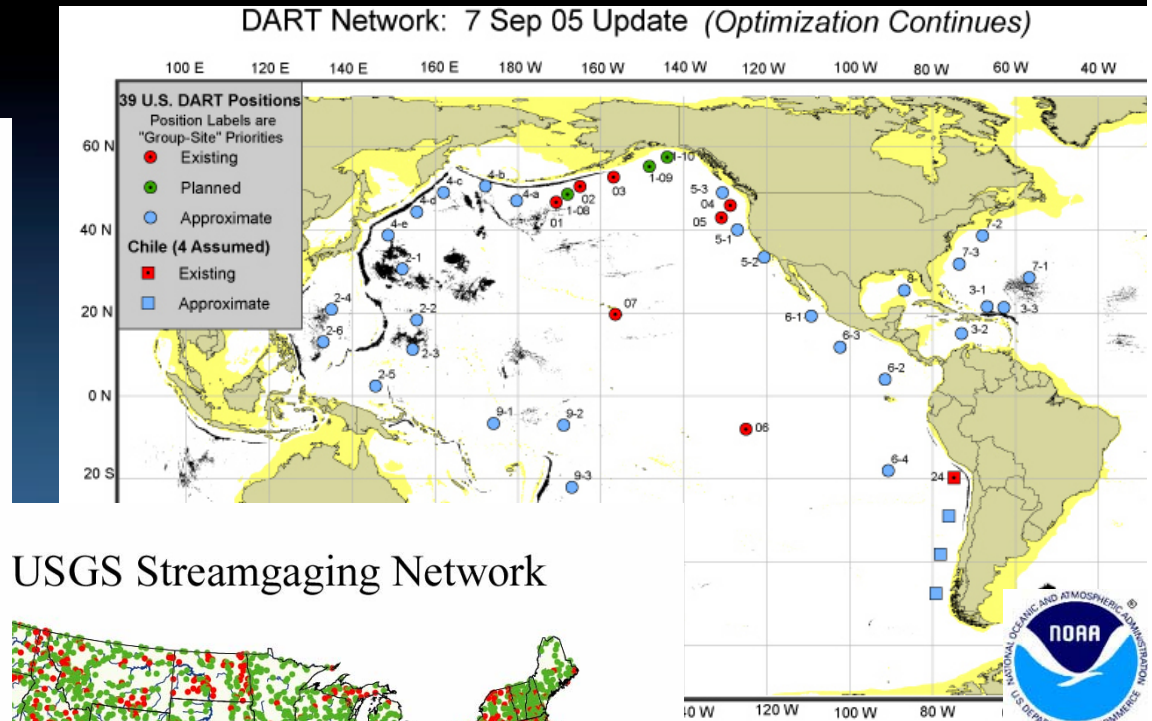
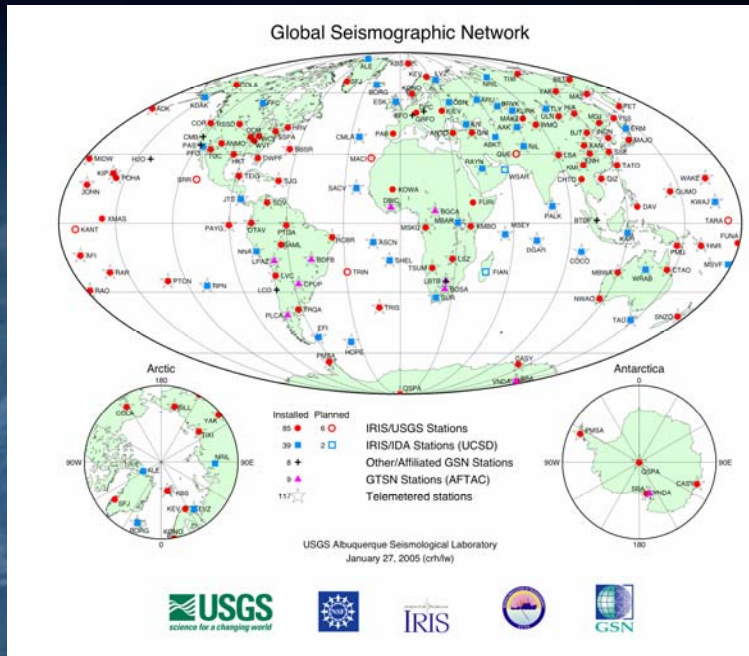


National Volcano Early Warning System: Closing the monitoring gap

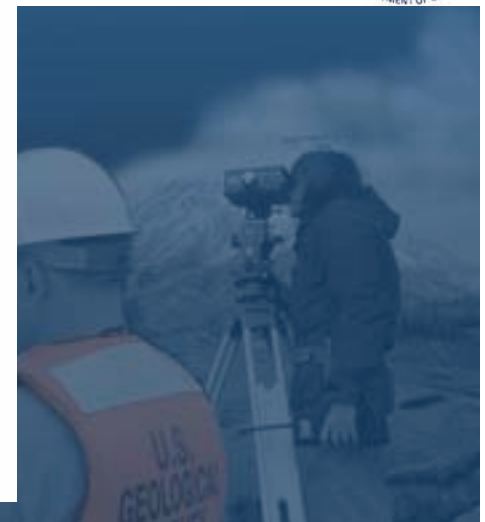
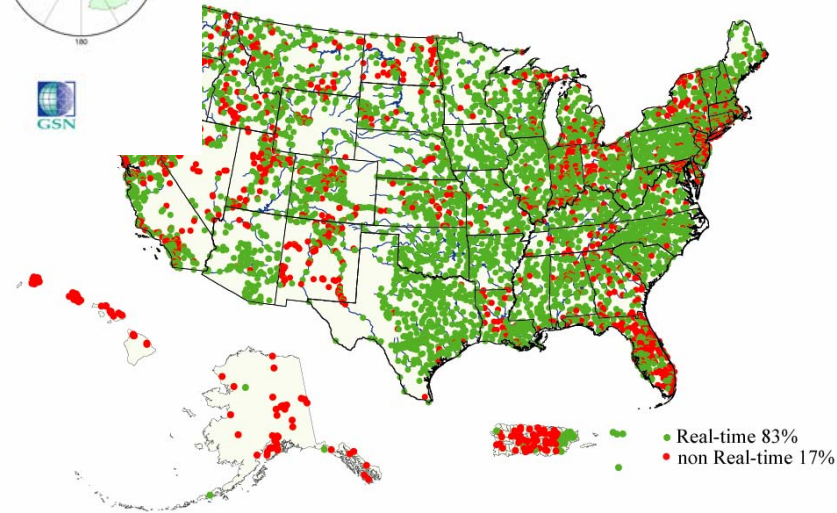


NVEWS TARGETS	MONITORING GAP
Kilauea, HI	1 ERUPTION
St. Helens, W A	1 ERUPTION
Rainier, W A	3
Hood, OR	3
Shasta, CA	3
South Sister, OR	3
Lassen, CA	3
Mauna Loa, HI	2
Redoubt, AK	2
Makushin, AK	2
Glacier Peak, W A	4
Akutan, AK	2
Baker, W A	3
Spurr, AK	2
Newberry Volcano, OR	3
Augustine, AK	2
Crater Lake, OR	4
Inyo Craters., CA	3
Adams, W A,	2
Veniaminof, AK	1 ERUPTION
Wrangell, AK	2
Mono Craters, CA	3
Hualalai, HI	2
Medicine Lake, CA	3
Pagan, CNMI	3
Churchill, AK	3
Anatahan, CNMI	2 ERUPTION
Clear Lake, CA	3
Alamagan, CNMI	3
Kaguyak, AK	2
Dutton, AK	2
Hayes, AK	3
Emmons Lake, AK	2
Seguam, AK	3
Chiginagak, AK	3

Expansion of real-time in situ networks



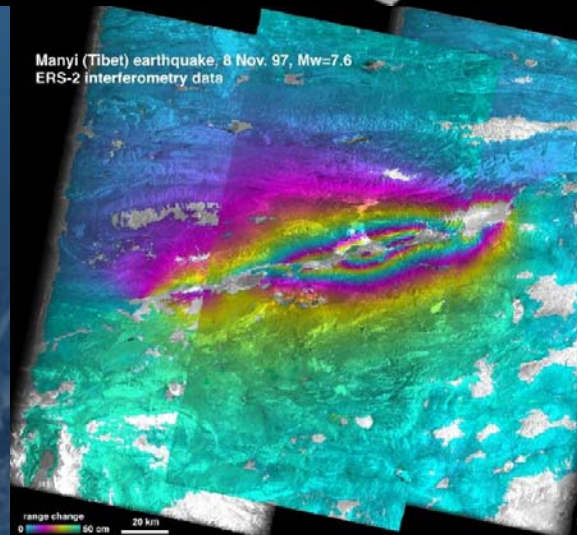
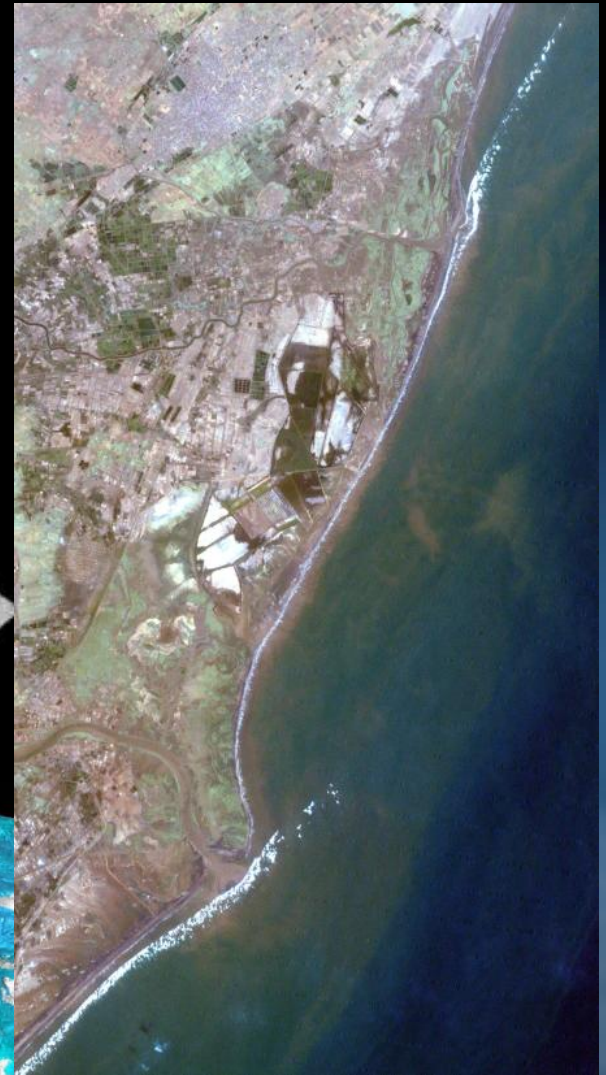
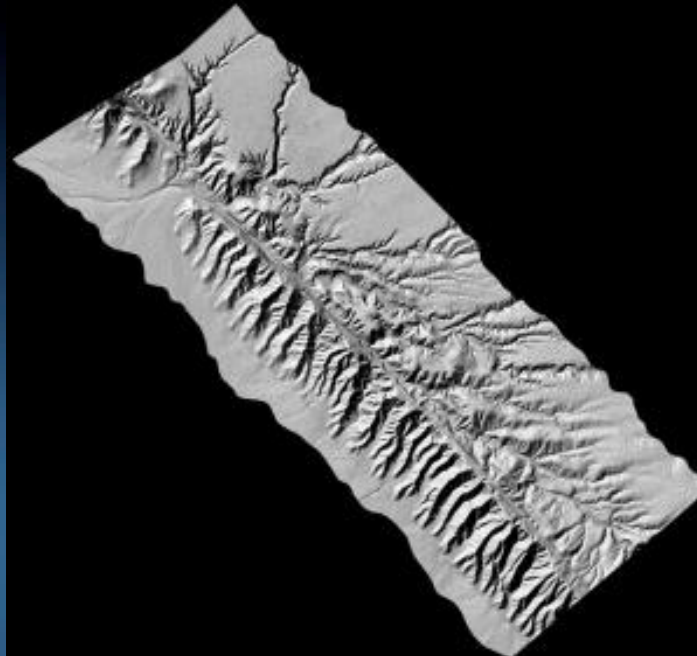
USGS Streamgaging Network



USGS



A new generation of satellites and other remote-sensing capabilities



 USGS

