USGS
science for a changing world

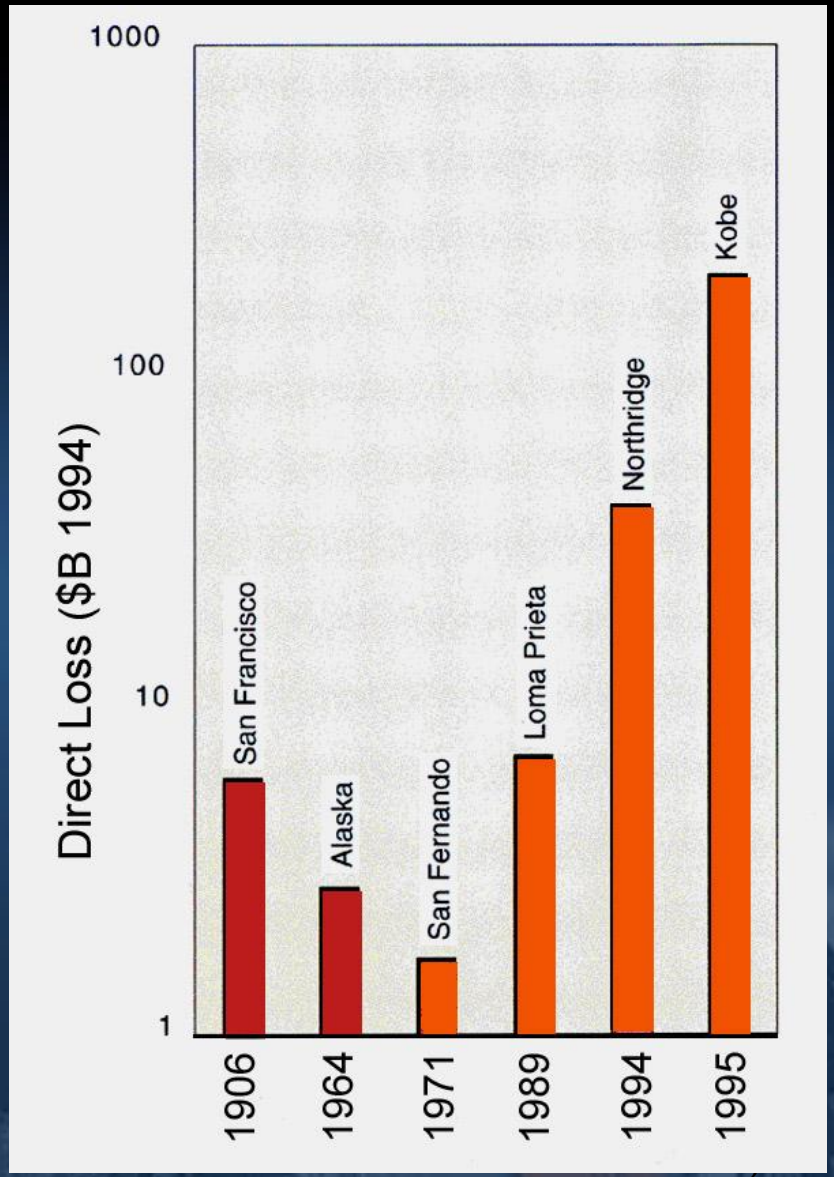
Earthquake Monitoring and Reporting through the Advanced National Seismic System

Briefing for the Natural Hazards Caucus
February 3, 2006

Dr. William Leith
ANSS Coordinator
Earthquake Hazards Program

Earthquake Losses:

- Earthquakes pose the highest, single-event financial risk of any natural hazard.
- Northridge, California, M 6.8 event of 1994 caused an estimated $40 billion in losses.
- Kobe, Japan, M 6.8 event of 1995 caused over $100 billion in direct losses, estimated over $300 billion total losses
- FEMA estimates annual earthquake losses now $5.6 billion



What can an advanced earthquake monitoring system do?

- Provide rapid notification of earthquake occurrences and effects to speed emergency response and recovery.
- Promote mitigation through application of earthquake hazard assessments and data in building codes, structure design, and civic planning.
- Provide data for basic and applied research on earthquake effects and to improve hazard assessments.
- Improve public education and awareness.

All of these activities rely on improved monitoring data…

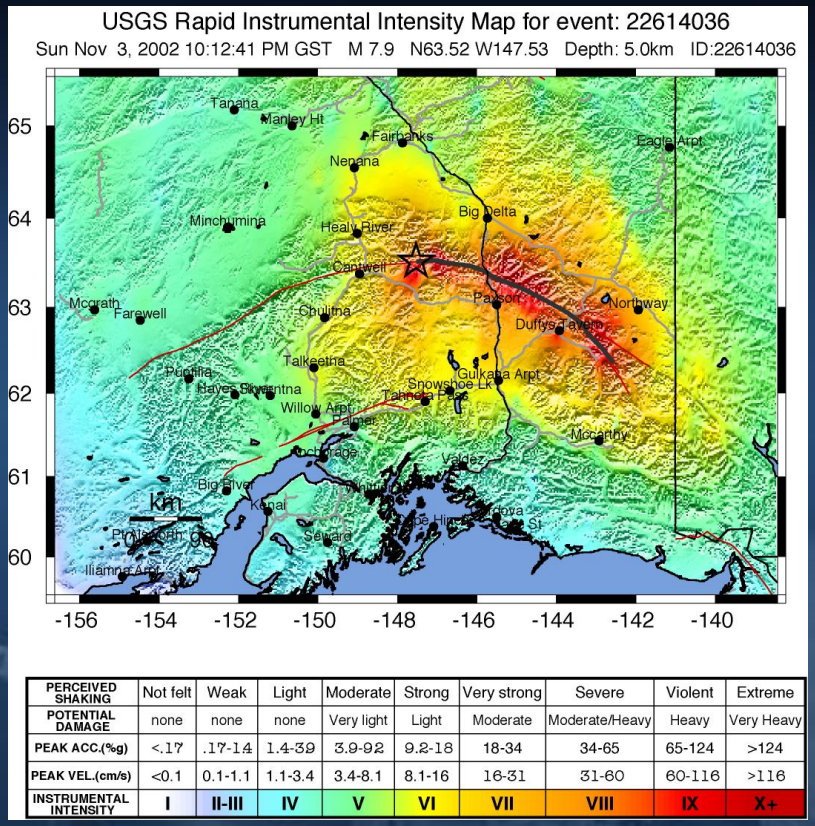
The Advanced National Seismic System

- An integrated national monitoring system
- A focus on the areas of highest risk
  - 26 urban areas slated for dense instrumentation
- A commitment to rapid delivery of earthquake information to critcal users and the public
- A strategy to gather critically needed data on earthquake effects on structures
- A system built through close partnerships with States and local jurisdictions

- 6000 strong motion sensors in 26 at-risk areas
- 50% of these instruments in buildings and structures
- 1000 new or upgraded regional stations
- 50 new national backbone stations

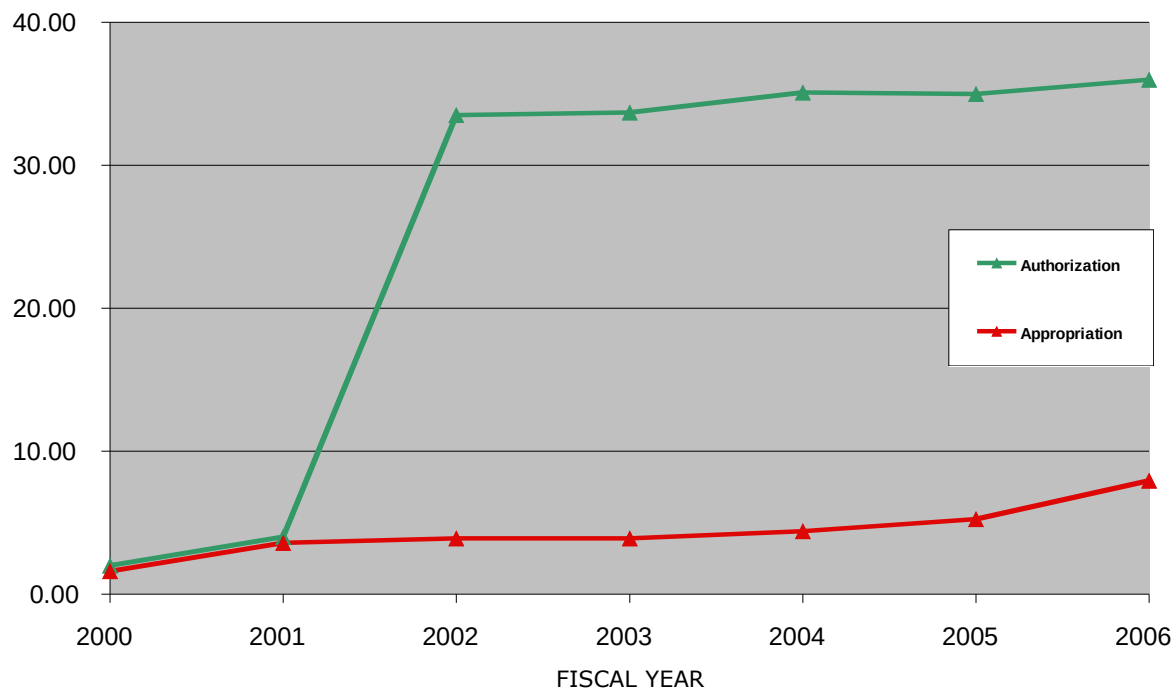
The Building Blocks of the ANSS

- National Earthquake Information Center
  - NEIC, Golden, Colorado
- National Seismic Network
  - ("ANSS Backbone")
- 15 Regional Seismic Networks
  - and data centers at Fairbanks, Seattle, Menlo Park CA, Pasadena CA, Reno. Salt Lake, Memphis, Weston MA
- National Strong Motion Network



USGS

ANSS



ANSS Costs: Capitalization $172M, Operations $43M/yr

ANSS Accomplishments

- Over 600 new earthquake sensors installed; National and Regional Network Upgrades begun.
- *ShakeMap* capability implemented in Los Angeles, San Francisco, Seattle, Salt Lake and Anchorage
- Real-time products and integrated communications, data analysis, and reporting under development
- Management and technical plans completed; National and regional structures in place and working.

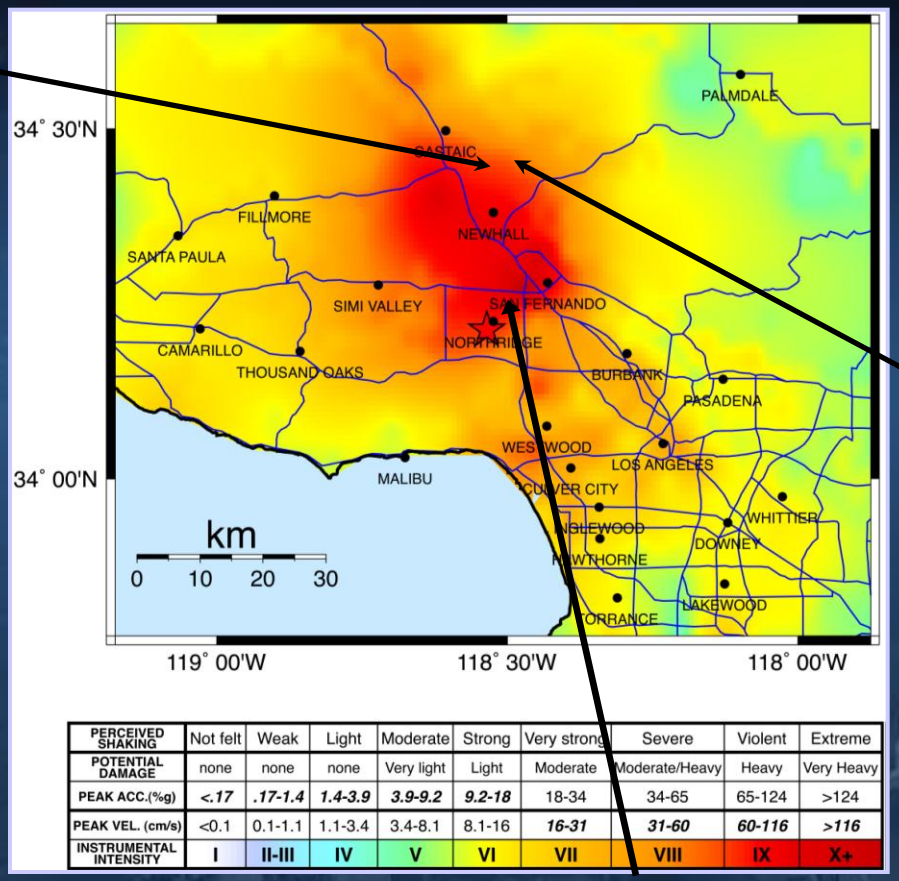
ANSS Products: *ShakeMap*

rapid mapping of strong ground shaking

grew out of the Northridge earthquake experience

Northridge: Intensity IX
Parking Garage Collapse

Provides a rapid indication of probable areas of earthquake damage

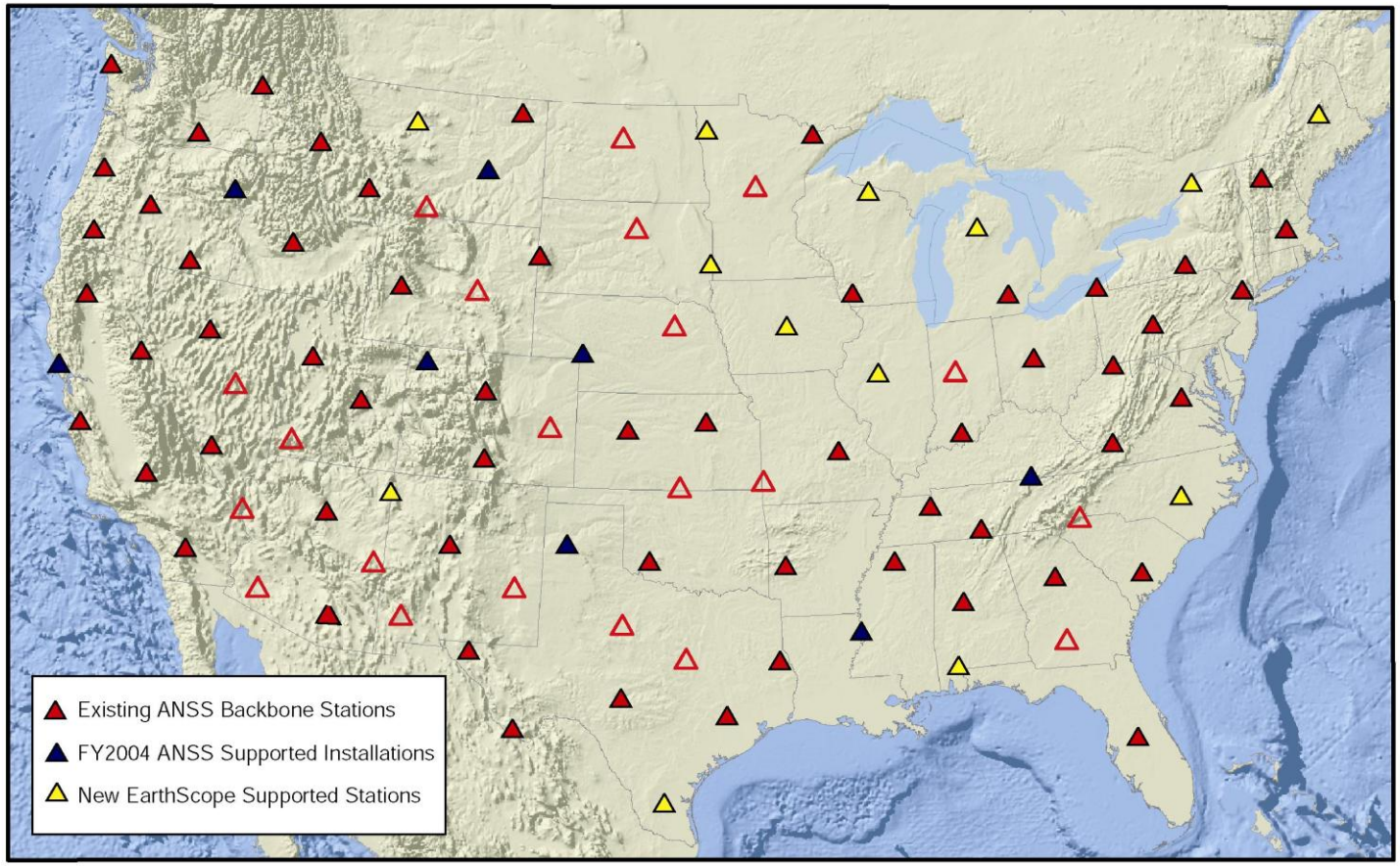


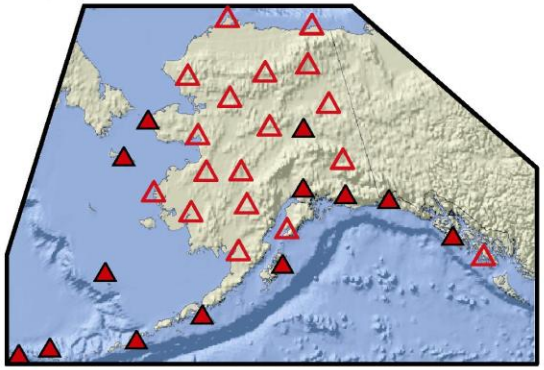
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL. (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Newhall: Intensity IX
Collapse of Overpass

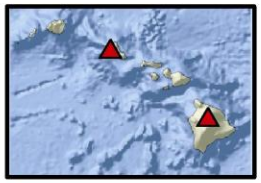
Granada Hills: IX
Gas/Water Line Rupture

USGS





ANSS Backbone Network

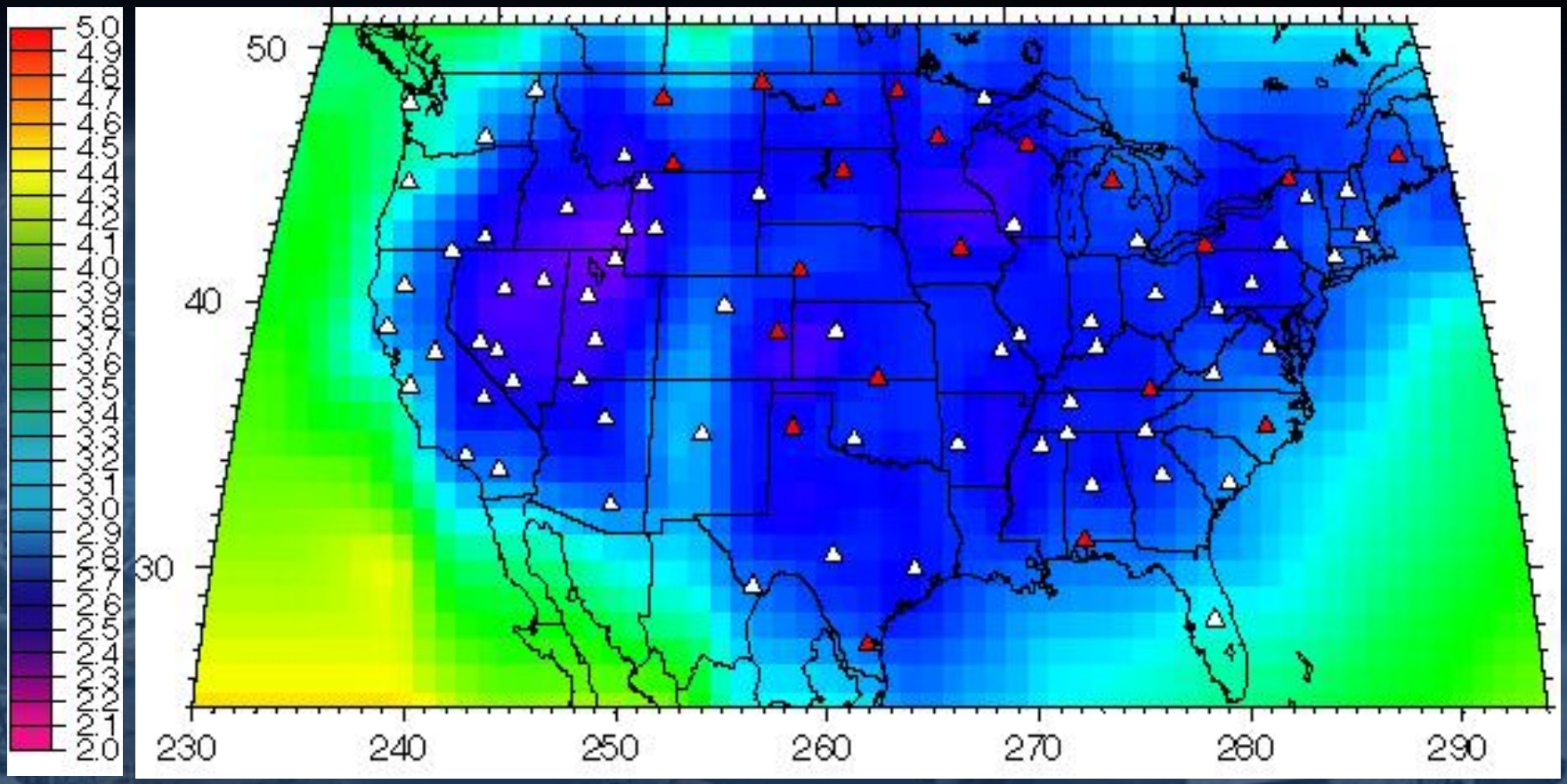


In partnership with:

earthscope PROJECT

NSF

ANSS Backbone: Estimated Detection Capability

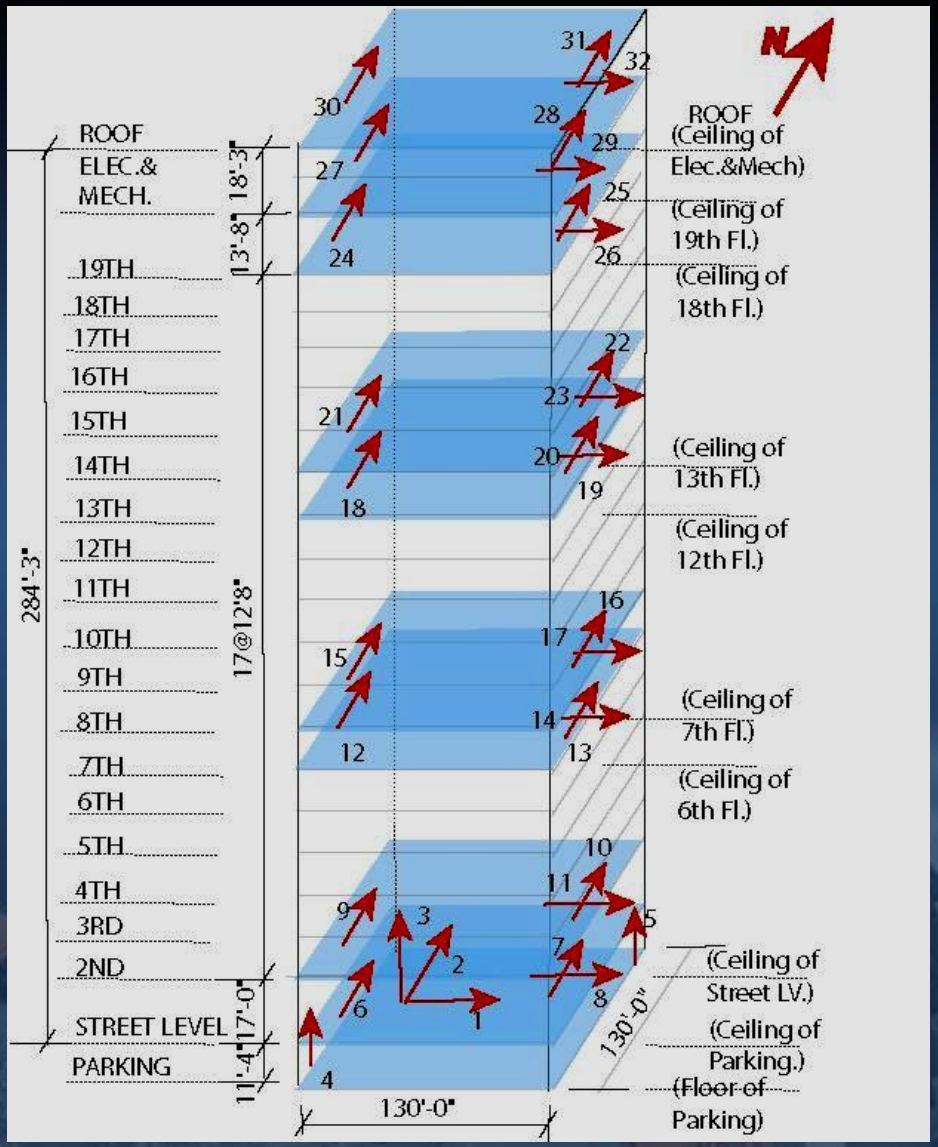


Simulated future detection capabilities with 22 planned ANSS backbone stations added

Structural Array in Atwood Building, Anchorage

Instrumentation monitors for drift, translation, torsion, and rocking

M. Celebi



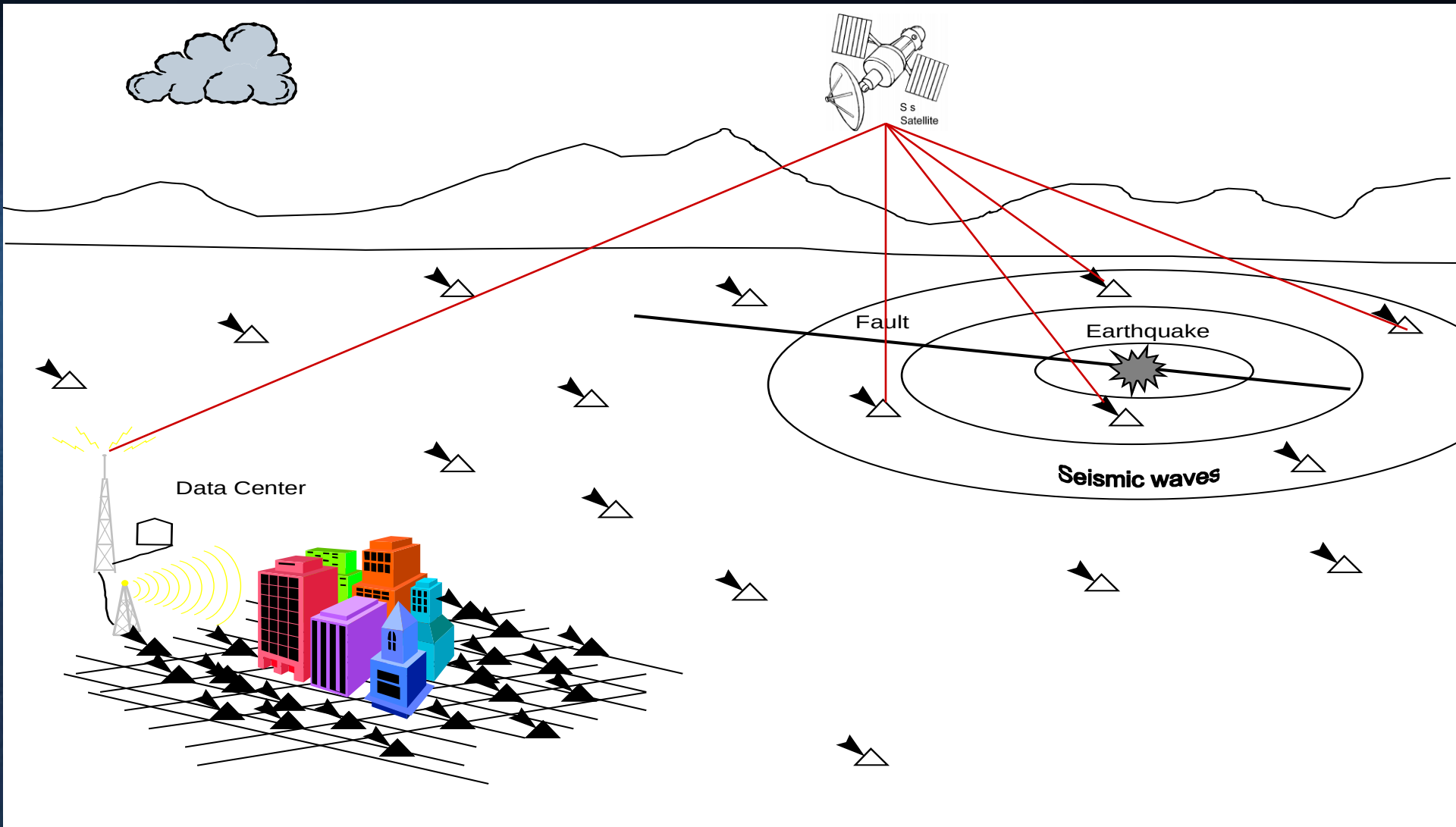
USGS

ANSS Performance Goals

Through the modernization, expansion, and integration of earthquake monitoring and notification nationwide the completed ANSS will:

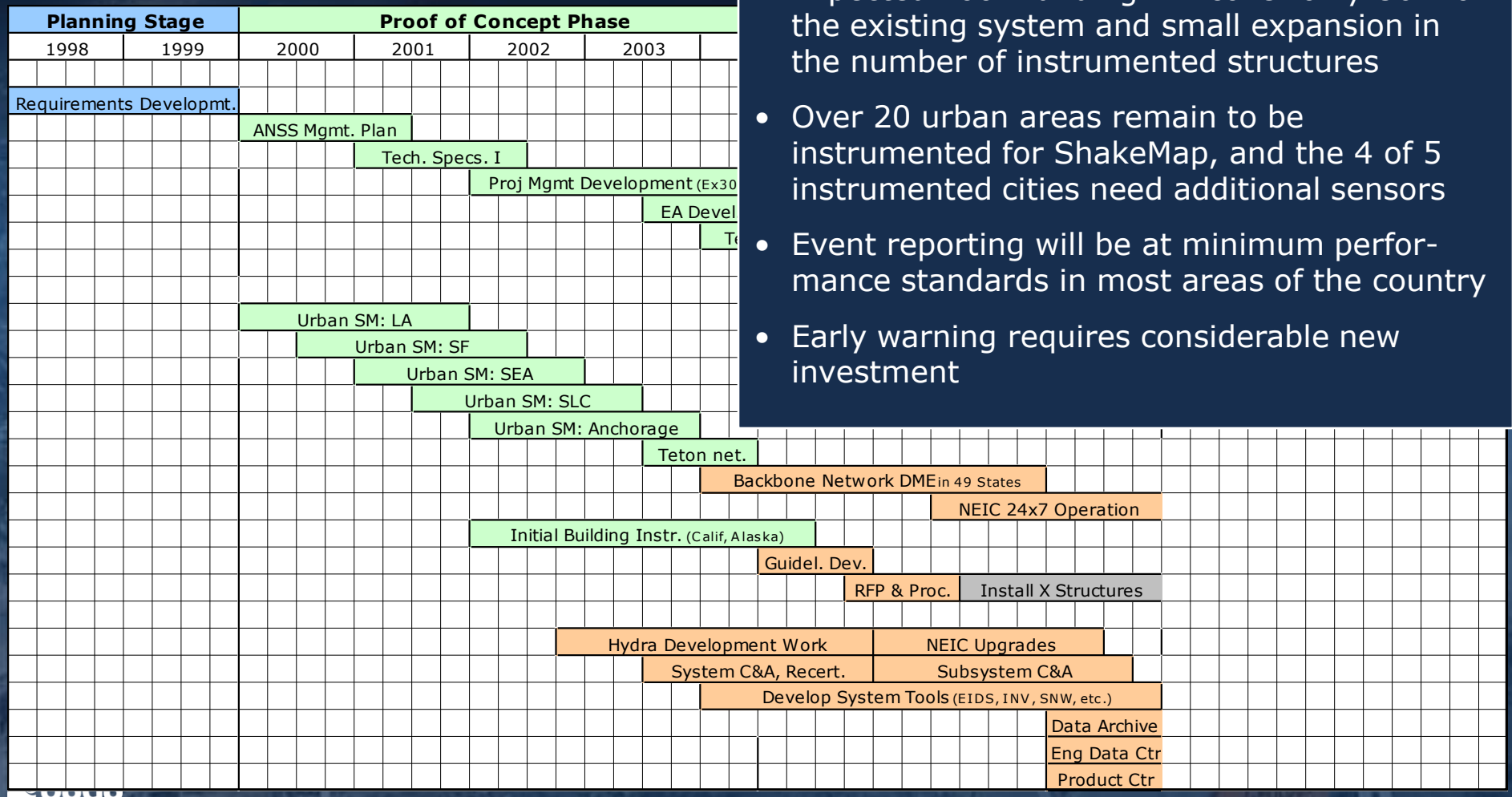
- Provide an accurate assessment of the severity and distribution of strong ground shaking in high-risk urban areas at risk within 10 minutes
- Acquire the seismic data necessary to improve earthquake hazards assessments and improved earthquake resistant construction and performance based design.
- Provide a few tens of seconds warning of imminent strong ground shaking in urban areas.

Modern networks can give detailed picture of seismic shaking in urban areas and possibly give tens seconds warning of imminent ground shaking



Continued Expansion of the System

- Expect completion of system development phase in 2007
- Expected 2007 funding will cover only O&M of the existing system and small expansion in the number of instrumented structures
- Over 20 urban areas remain to be instrumented for ShakeMap, and the 4 of 5 instrumented cities need additional sensors
- Event reporting will be at minimum perfor-mance standards in most areas of the country
- Early warning requires considerable new investment



USGS science for a changing world

USGS Home
Contact USGS
Search USGS

Earthquake Hazards Program

Home | Earthquake Center | Regional Information | Learning & Education | Research & Monitoring | Additional Resources

Welcome to the U.S. Geological Survey Earthquake Hazards Program

News & Highlights

- Magnitude 7.6 BANDA SEA January 27, 2006
- 01/19/06 - National Earthquake Center Goes 24/7
- Magnitude 6.8 SOUTHERN GREECE January 08, 2006
- Magnitude 6.6 GULF OF CALIFORNIA January 04, 2006
- Magnitude 3.6 ILLINOIS January 02, 2006
- Magnitude 7.3 EAST OF THE SOUTH SANDWICH ISLANDS January 02, 2006

News & Highlights Archive

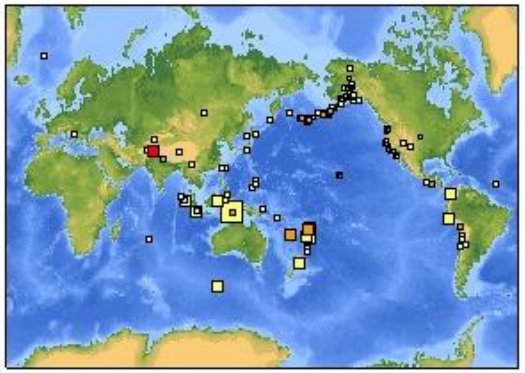
Recent Earthquake Activity

Click maps for more information

Latest Earthquakes - Last 7 Days

World (Magnitude 2.5+) GSN

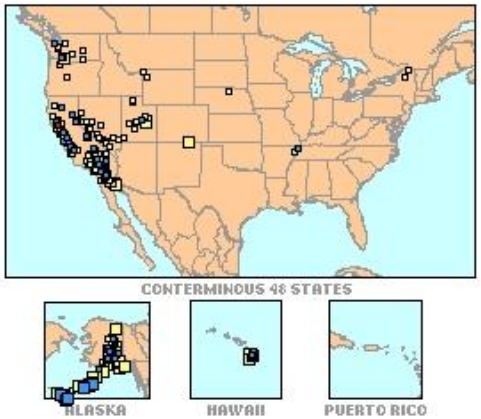
Thu Feb 02 22:17:17 UTC



World Lists Magnitude 2.5/4+ | 5+
Last EQ in World

USA (Magnitude 1+) ANSS

Thu Feb 02 22:02:38 UTC



USA Lists Magnitude 1+ | 3+
Last EQ in USA

USGS