Geological Sciences Department

California State Polytechnic University, Pomona

http://geology.csupomona.edu

What is Geology?
What does a geologist do?

Cal Poly's "learn-by-doing" methods produce skilled Geologists

Wake up call!

Do we really have to go over there?

What's it reading?

When's this lab due anyway?

We offer a Bachelor of Science Degree in Geology

with the flexibility to choose from one of three Emphasis Areas or "Tracks":

- Geology
- Geophysics / Earth Exploration
- Environmental Resources

Why study Geology at Cal Poly?

Small class sizes

Friendship

Learn by doing

Gain Skills in Geological Mapping

Telegraph Peak, San Gabriel Mountains

Sierra Los Alacranes, Mexico

Are you sure that's where we are?

Sample Collecting

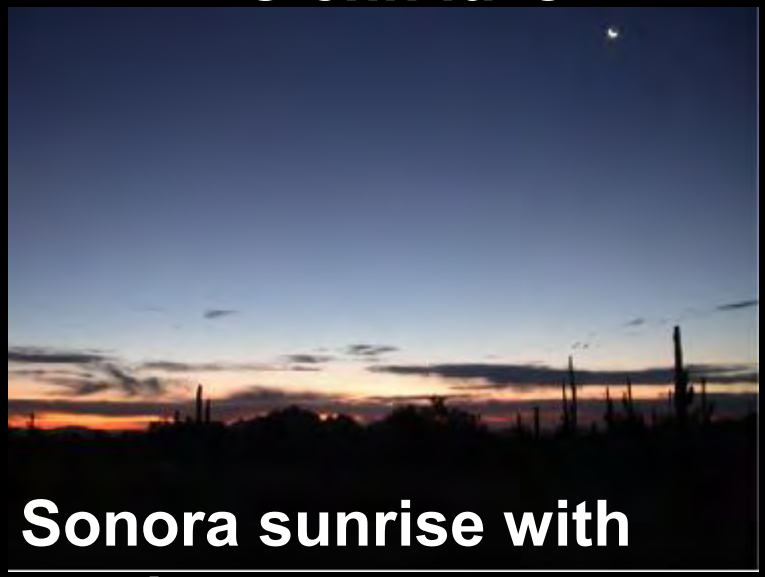
Breaking rock for U-Pb zircon age-dating

Searching for visible gold

Scenery

San Antonio falls

Glenn falls



Sonora sunrise with waning crescent moon

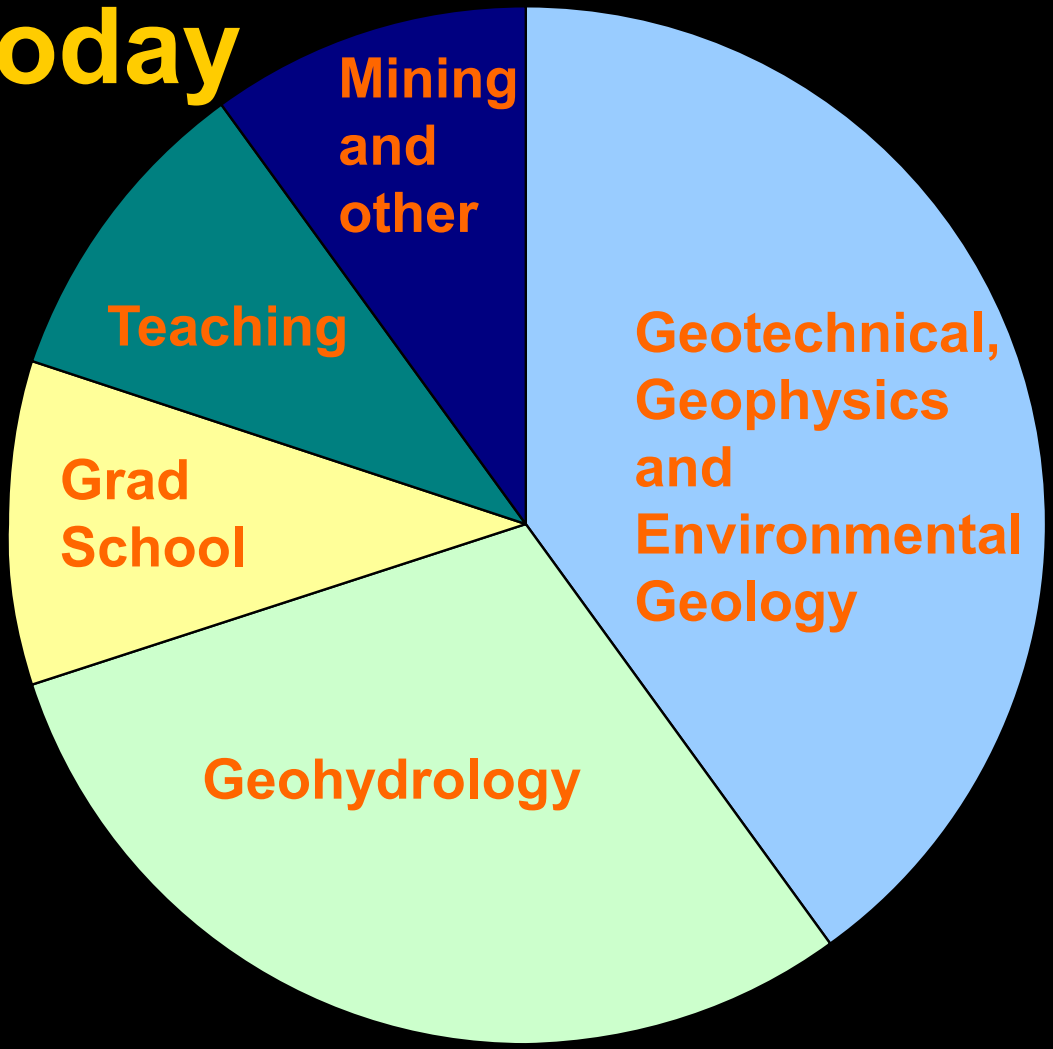
Camping Out

Campfire routine

What's for dinner?

Laboratory Fun!

Jobs and more jobs! Well-trained Geology graduates are in high demand today



Employment Placement of Recent Graduates

Science Magazine (August, 2008) reports:

"In general, the market is hot," says Cindy Martinez, who analyzes geoscience workforce issues at the American Geological Institute (AGI) in Alexandria, Virginia. "Functionally, there's no unemployment of geoscientists right now."

Bloomberg.com (March, 2008) reports:

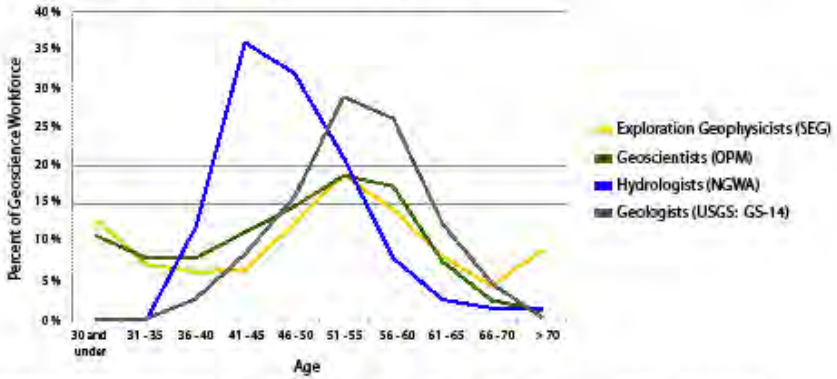
``There is a chronic shortage of skilled people, and wages have skyrocketed,'' said Bart Melek, commodity strategist at BMO Capital Markets in Toronto. ``There's no relief in sight.''

American Geological Institute
GEOSCIENCE CURRENTS
No. 16
09 October 2008

Geoscience Workforce Age Distribution

The majority of geoscientists in the workforce are within 15 years of retirement age. Data from federal sources, professional societies, and industry indicate the imbalance of the age of geoscientists in the profession. The percentage of geoscientists between 31 and 35 years of age is less than half of geoscientists between 51-55 years old.

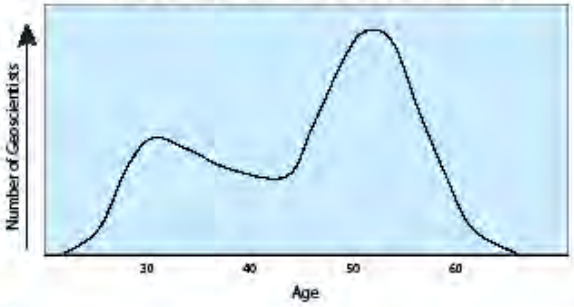
Age Distribution of Geoscientists in Industry



Data Sources: Society of Exploration Geophysicists (SEG), US Office of Personnel Management (OPM), National Groundwater Association (NGWA); USGS Workforce Demographics and Trends, Peter T. Lyons 33rd IGC, Oslo, Norway, August 19, 2008 (USGS)

Even in oil & gas companies, which typically offer the highest salaries of all geoscience employing industries, the supply of new geoscientists is short of replacement needs. The number of younger geoscientists in their early 30's is approximately half the number of those nearing retirement age. This number is more than the data reported from federal agencies and professional societies.

Typical Age Distribution for an Oil & Gas Company



- Leila Gonzales

Starting Salaries for Geologists

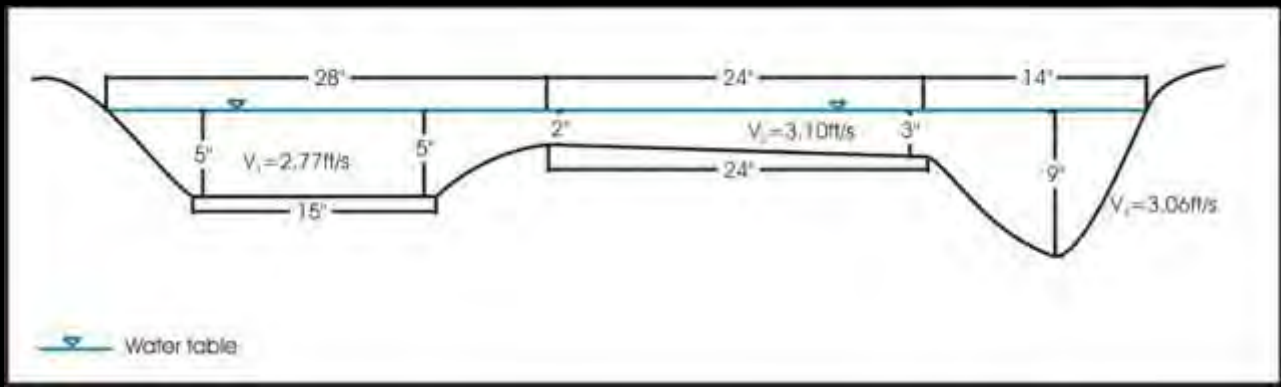
- **Bachelor's Degree (B.S.)**
  - Consulting (engineering, environmental, groundwater) $40,000-$55,000
  - Mining Industry $50,000-$80,000
  - Government Agencies $40,000-$55,000
  - Teaching $35,000-$50,000
- **Master's Degree (M.S.)**
  - Petroleum Industry $75,000-$100,000
  - Consulting $60,000-$90,000
  - Government Agencies $50,000-$75,000

Geohydrology (Drs. Nourse and Marshall)

- Groundwater exploration
- Surface flow measurements
- Development of well fields
- Reservoir modeling
- Database management
- Water quality monitoring
- Water resource planning

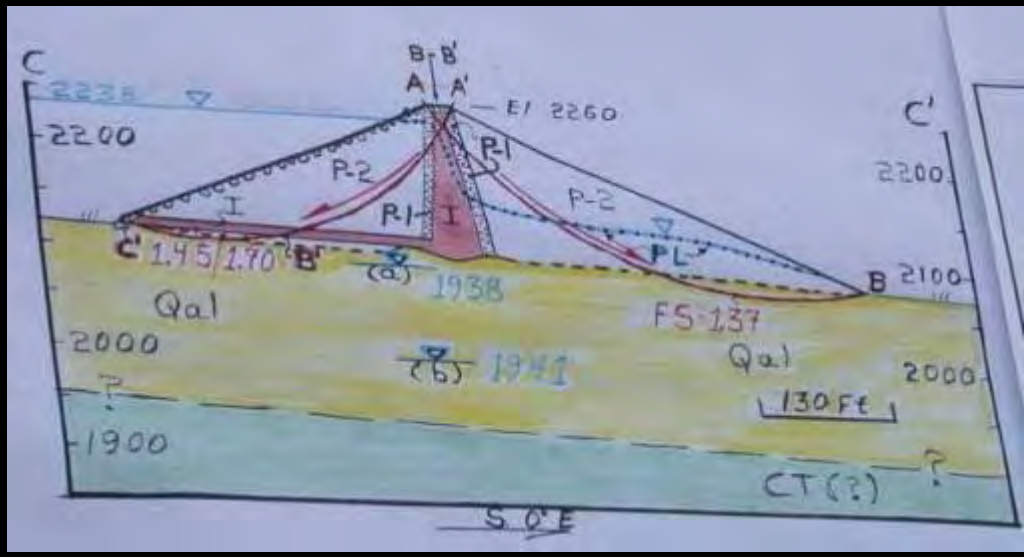
Groundwater Geology Laboratory (GSC 360) in the San Gabriel Mountains

Techniques for measuring water flow:



Geotechnical/Engineering Geology

- Site evaluations
- Earthquake hazard mitigation:
  - fault trenching
  - seismic retrofitting
- Grading plans
- Slope stability
- Dam safety
- Soil testing
- Subsurface studies
- Site remediation
- Legal consultation



Landslide closes 57 Freeway connector, February 18, 2010

Cal Poly Geology alumnus Darrin Hashim (from Kleinfelder, Inc.) tells us: “This is where I work these days. I think it is pretty cool.”

Field Experiences in Engineering Geology Course (GSC 321)

Environmental Geology

- Geologic Hazards Assessment
- Environmental impact statements
- Floodplain zoning
- Hazardous waste disposal
- Air/water monitoring
- Environmental planning
- Regulatory enforcement
- Reclamation

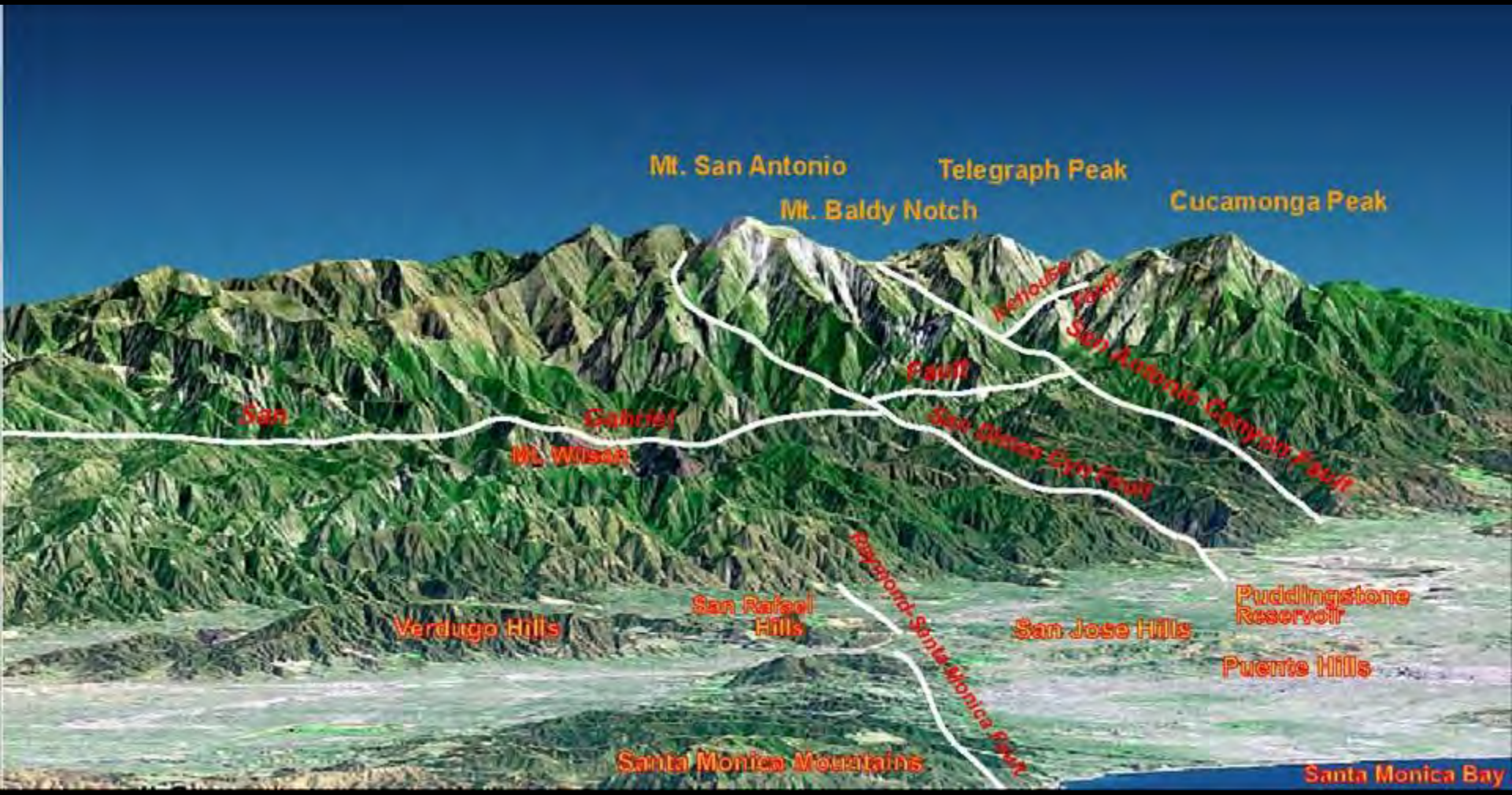
Flood of 1969

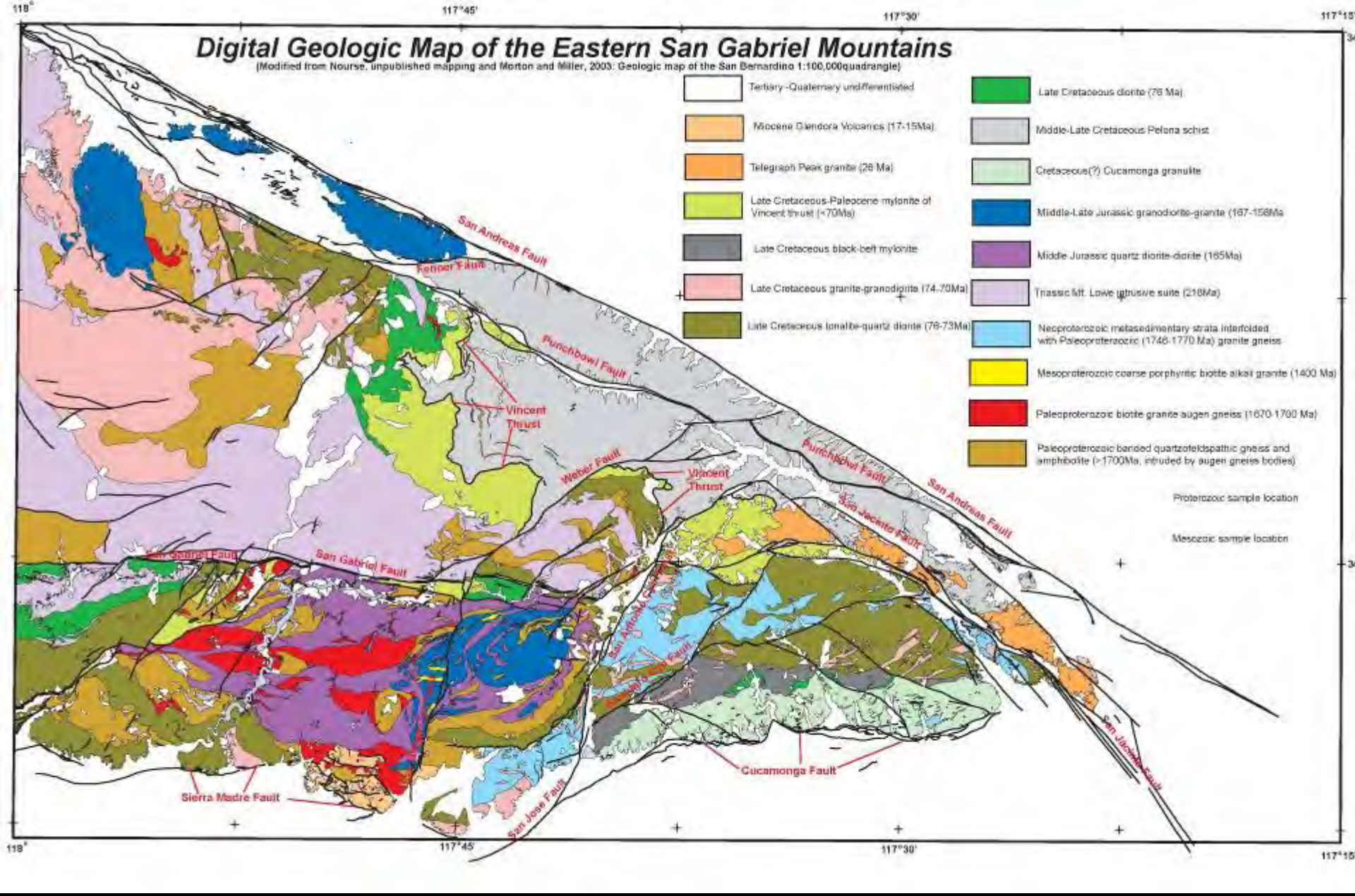
2005 Landslide in San Dimas Canyon

2005 lower San Dimas Canyon flood

Local Earthquake Hazards

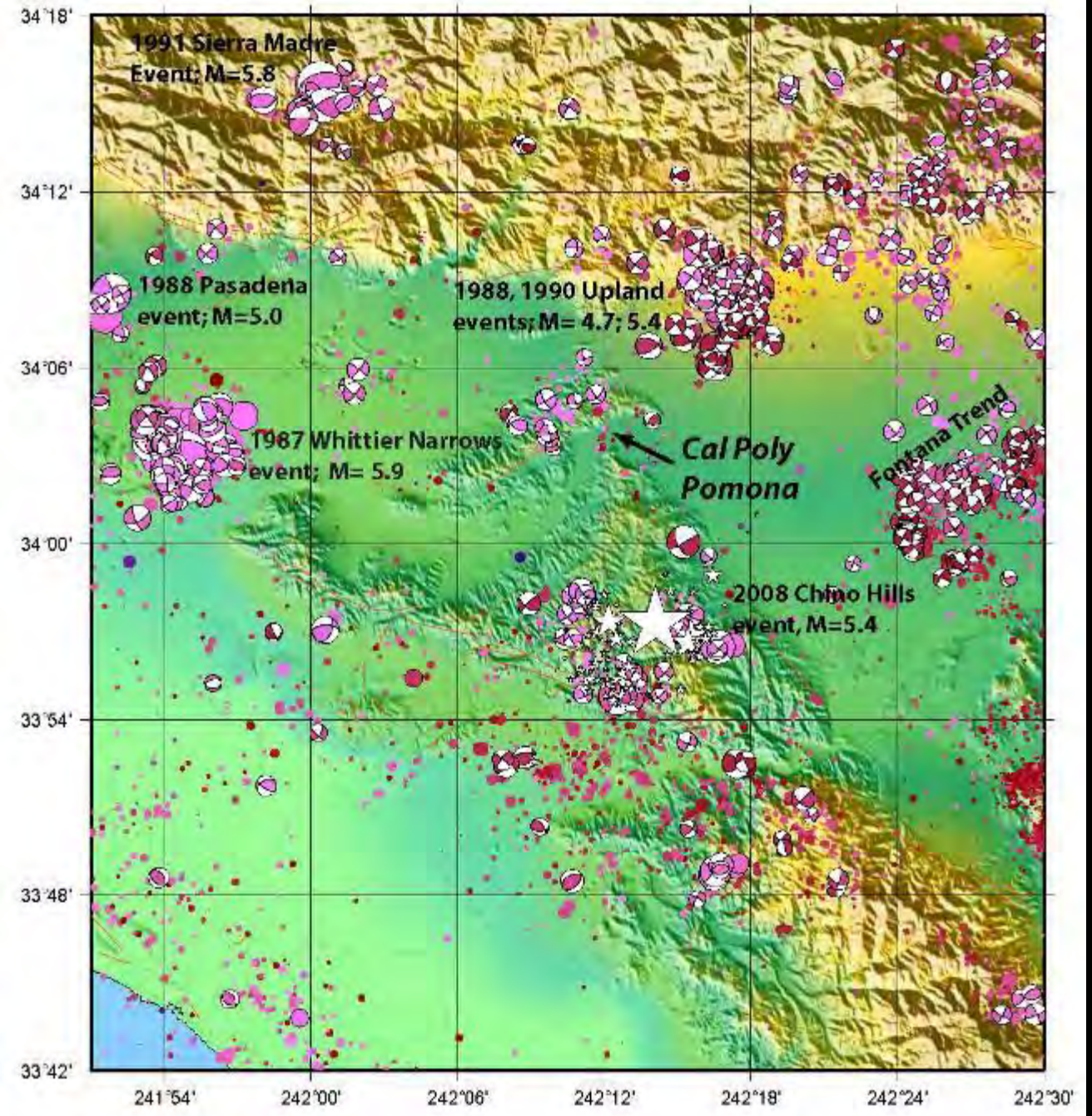
(Drs. Nourse and Polet)





Important faults in the eastern San Gabriel Mountains

(digital compilation by Dr. Nourse, 2007)



July 29, 2008 Magnitude 5.4 Chino Hills Earthquake

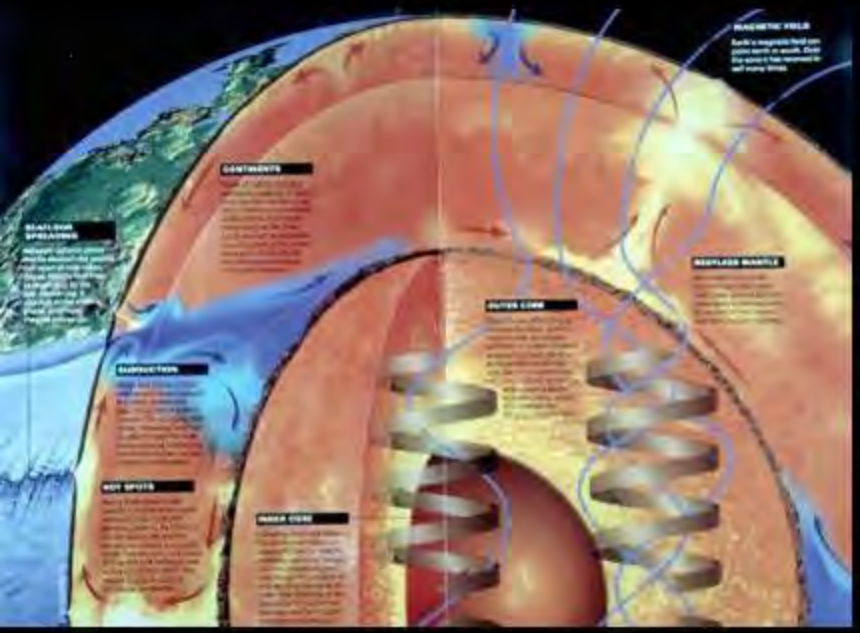
(a compilation of earthquake epicenters and focal mechanisms by Dr. Polet)

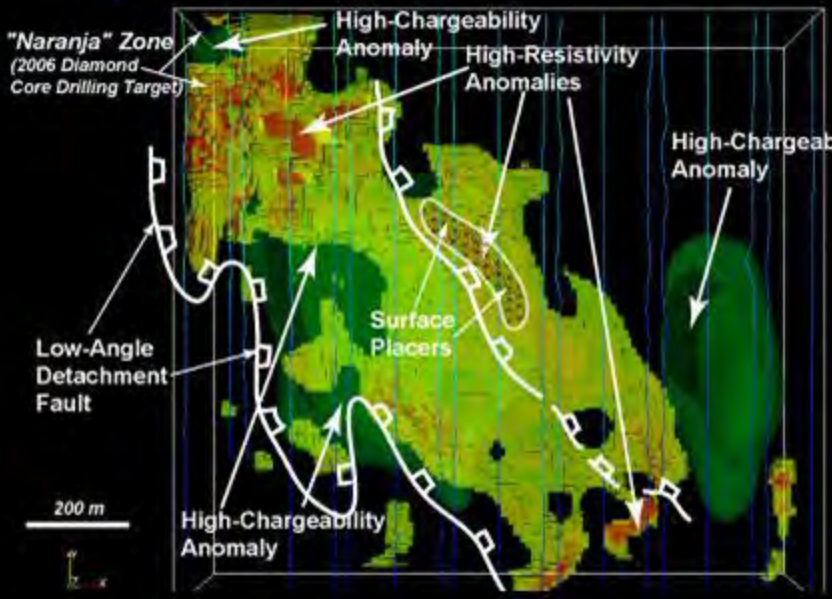
Geophysics and Seismology

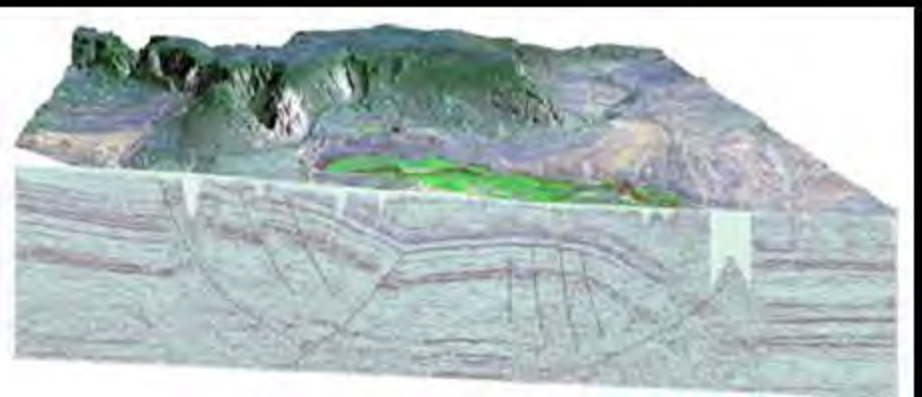
Dr. Jascha Polet

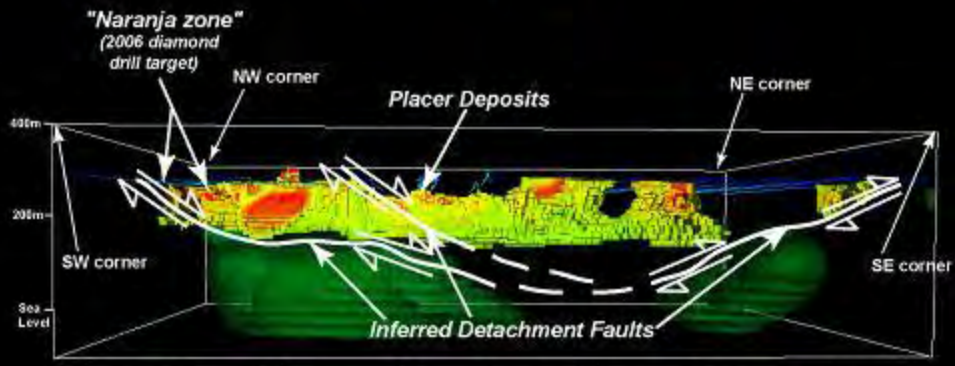
Geophysics

The study of the Earth by application of quantitative, physical, methods:







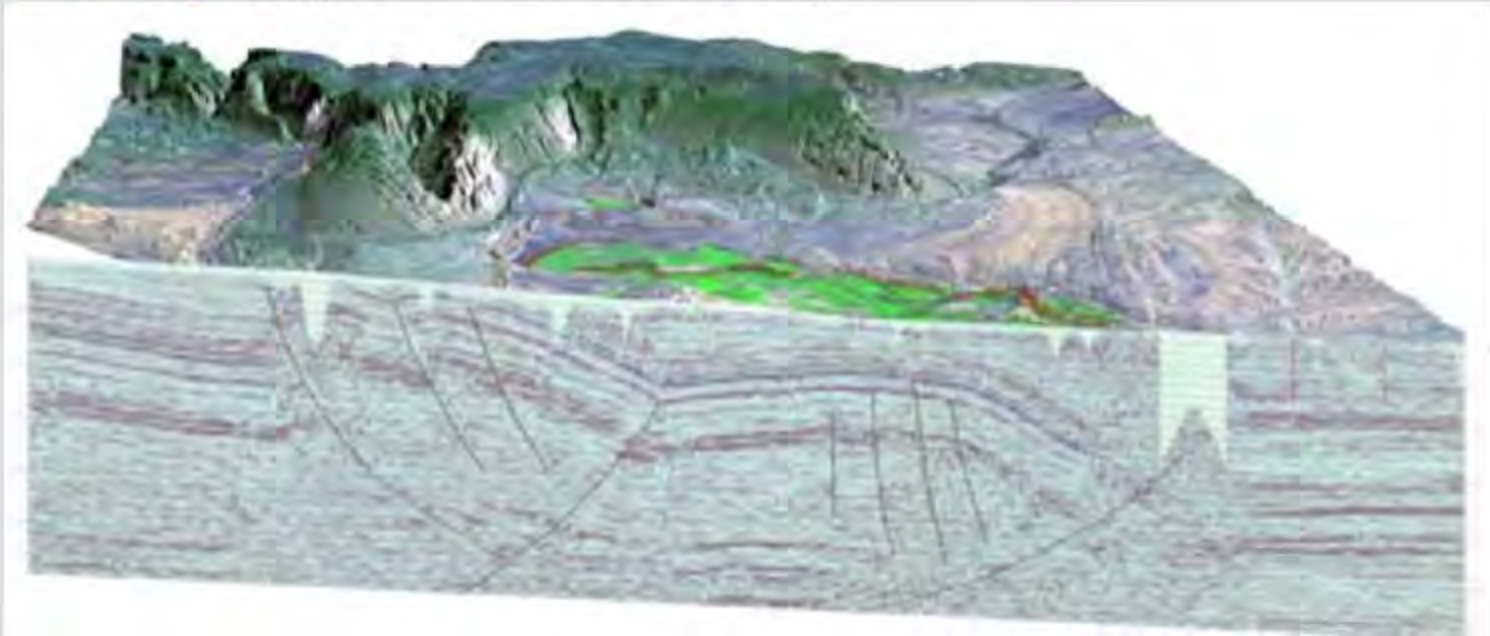


Profile View of Electrical Geophysical Survey Results Showing High-Resistivity Anomalies (reds, oranges, and yellows) Situated Above High-Chargeability Anomalies (dark greens).

What do Geophysicists do?

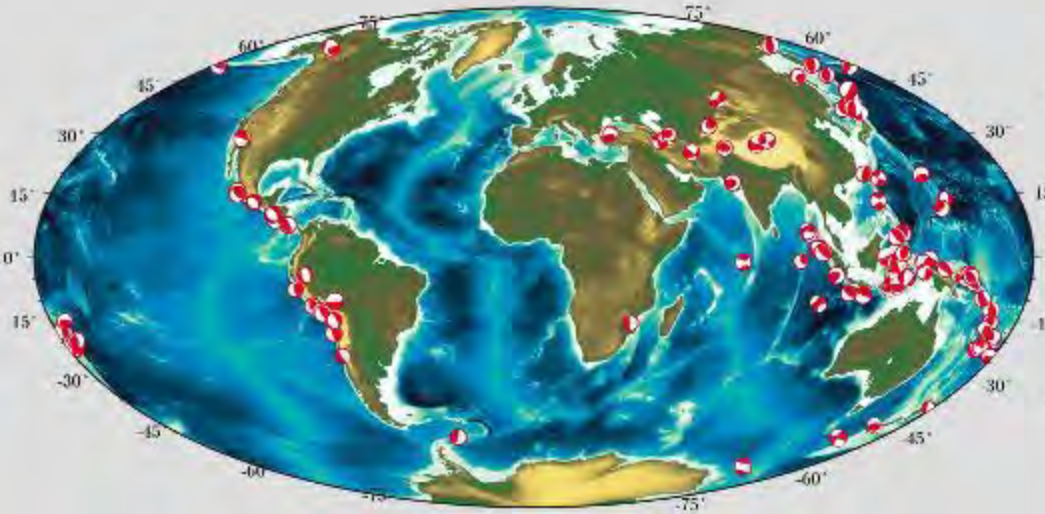
Possible career paths are broad:

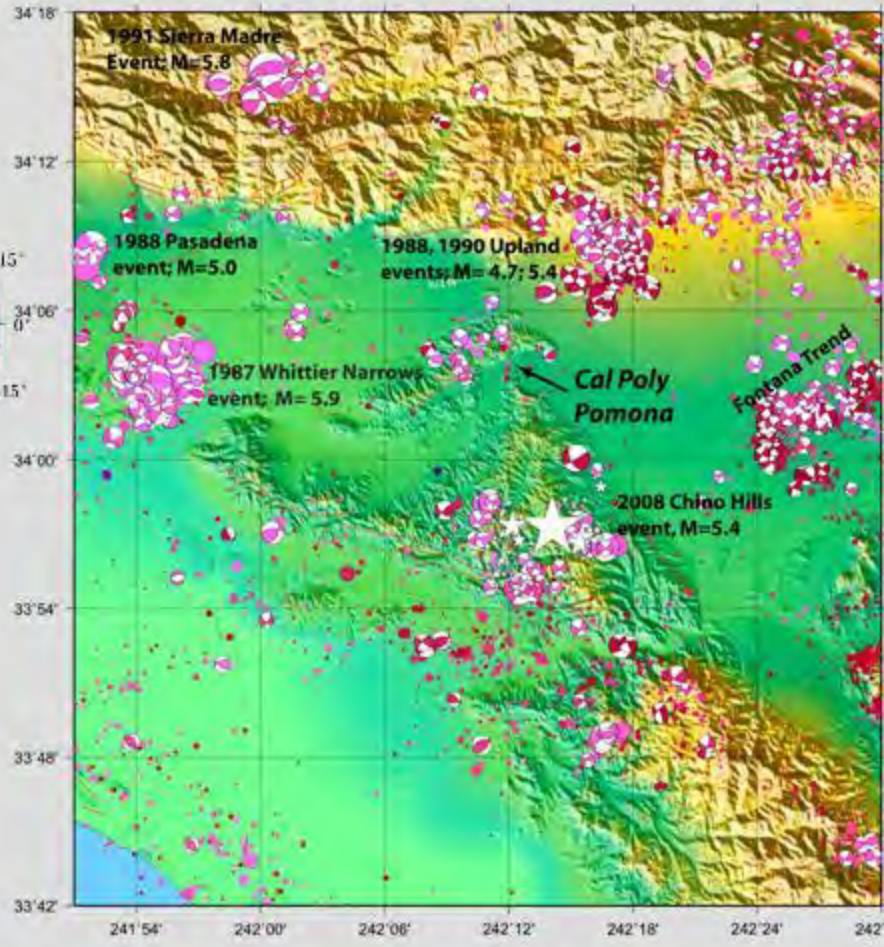
- **Research:** academia, US Geological Survey, JPL, etc.
- **Environmental** companies
- Oil and mineral **exploration** industry
- **Engineering and insurance** companies
- **Defense** industry
- **Teaching:** high-school to college



Seismology

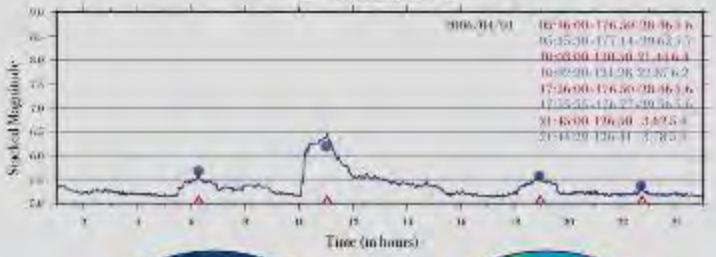
The study of earthquakes and Earth structure through the waves that earthquakes produce

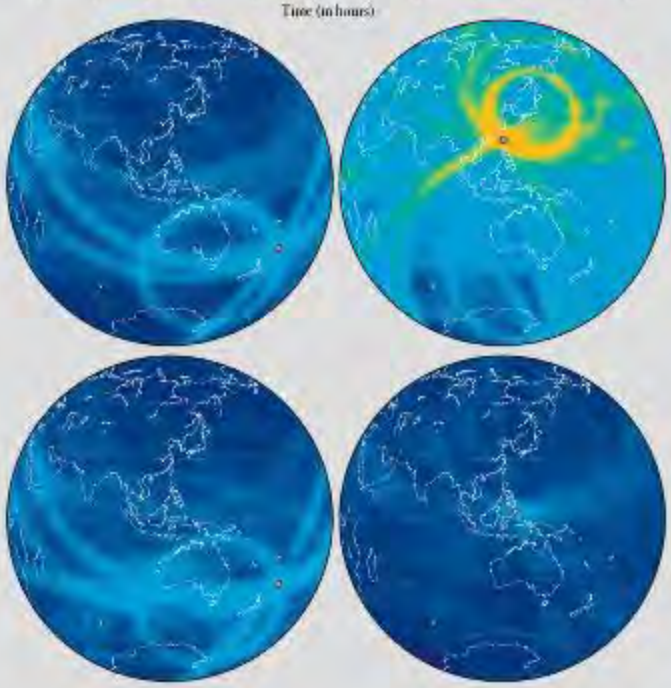




July 29, 2008 Magnitude 5.4 Chino Hills Earthquake

Seismology Research at Cal Poly Pomona





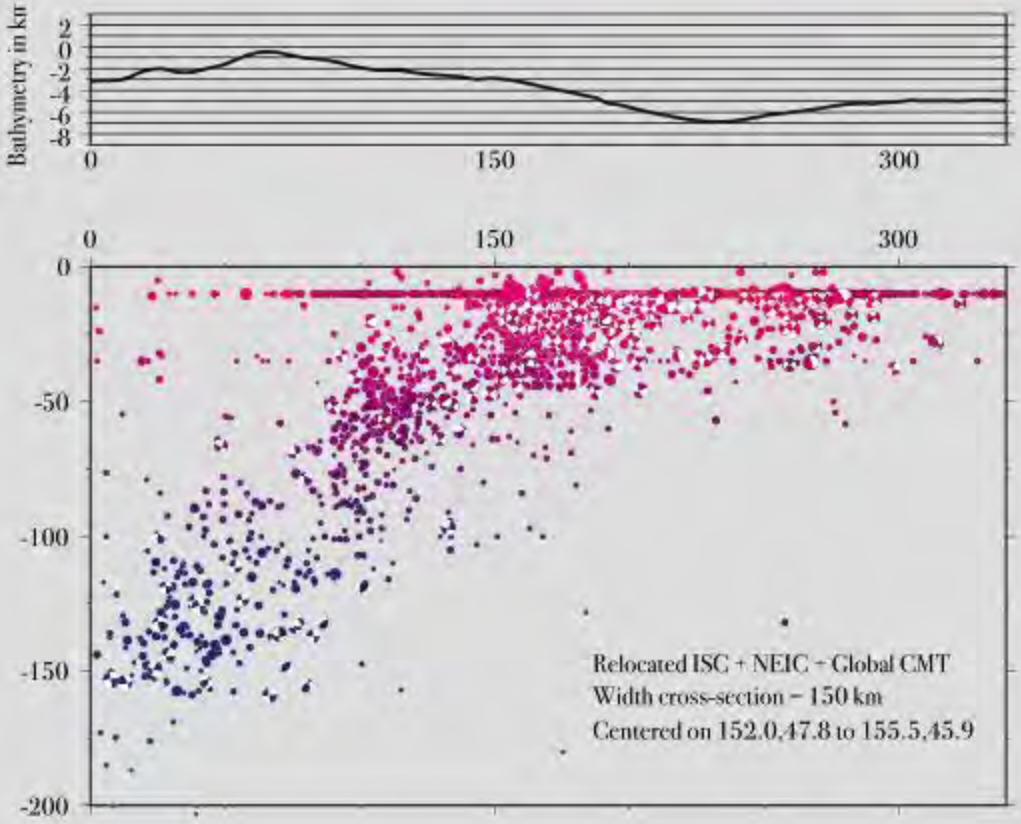
At Cal Poly Pomona, you could participate in seismology research on:

Near Real Time Seismology:

determine the magnitude and location of global earthquakes

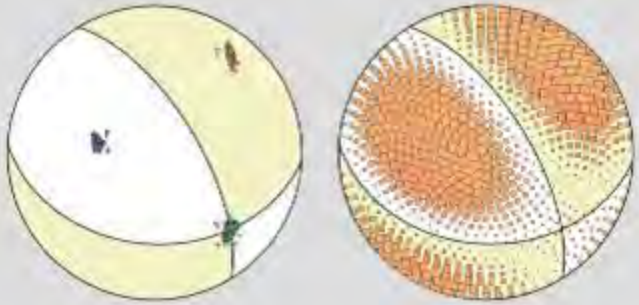
right after they occur

Seismology Research at Cal Poly Pomona



and determine the type of faulting responsible for generating the earthquake

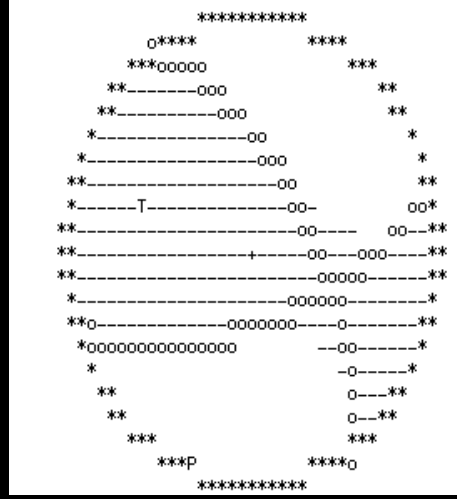
Oct 15 2006 Hawaii

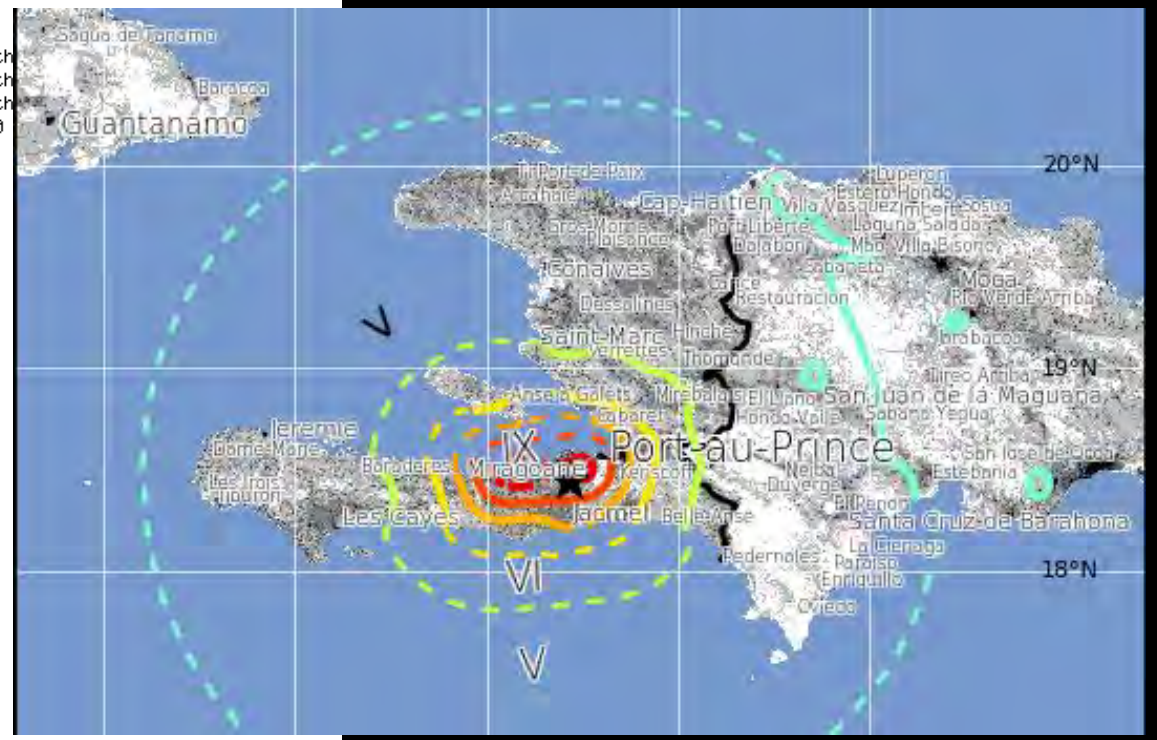


Haiti Earthquake

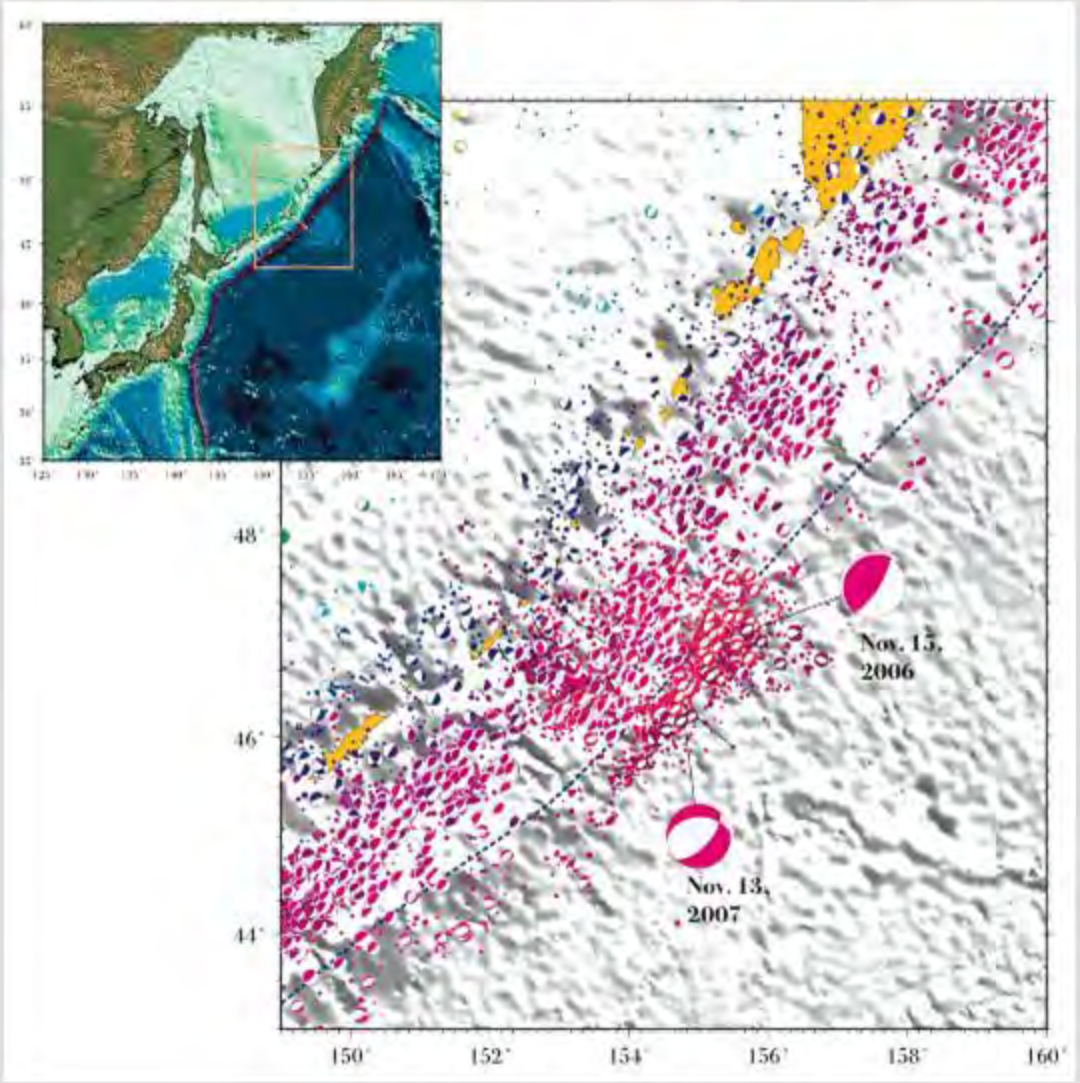
From: USGS research CMT <researchcmt@geohazards.usgs.gov>
Subject: **[rCMT] Mw=7.0 HAITI REGION**
Date: January 12, 2010 2:50:17 PM PST
To: researchCMT@geohazards.cr.usgs.gov
Reply-To: researchcmt-owner@geohazards.cr.usgs.gov

```
USGS research CMT: maintained and developed by Jascha Polet at Cal Poly Pomona.
This is a research system and solutions are *not* official USGS earthquake magnitudes.
General region :  2010upd6 HAITI REGION
surface waves  (3.0,3.5,7,7.5 mHz)
Stations used : BFO COR ESK FFC HKT KEV KIP KONO LVC LVZ SFJD TUC WCI
Origin time: 2010   12  21  53   9
Original location (lat,lon,depth) :      18.5000   -72.4000  20
Moment tensor (x1.e26 dyncm) :
Mrr :      1.911119 Mtt :     -3.815543
Mff :      1.904425 Mrt :      0.660249
Mrf :      1.570869 Mtf :      2.434066
T-axis:  moment=     4.115   plunge=    37.688  azimuth
N-axis:  moment=     0.597   plunge=    52.303  azimuth
P-axis:  moment=    -4.712   plunge=     0.709  azimuth
best double couple: Mo=    4.414(x1.e26 dyncm)  Mw=7.0
nodal planes (strike/dip/slip):   71.89/ 64.94/ 29.14
Centroid location :   18.449   -72.317    17.665
Centroid time :      3.792
Variance reduction (%) :  66
```



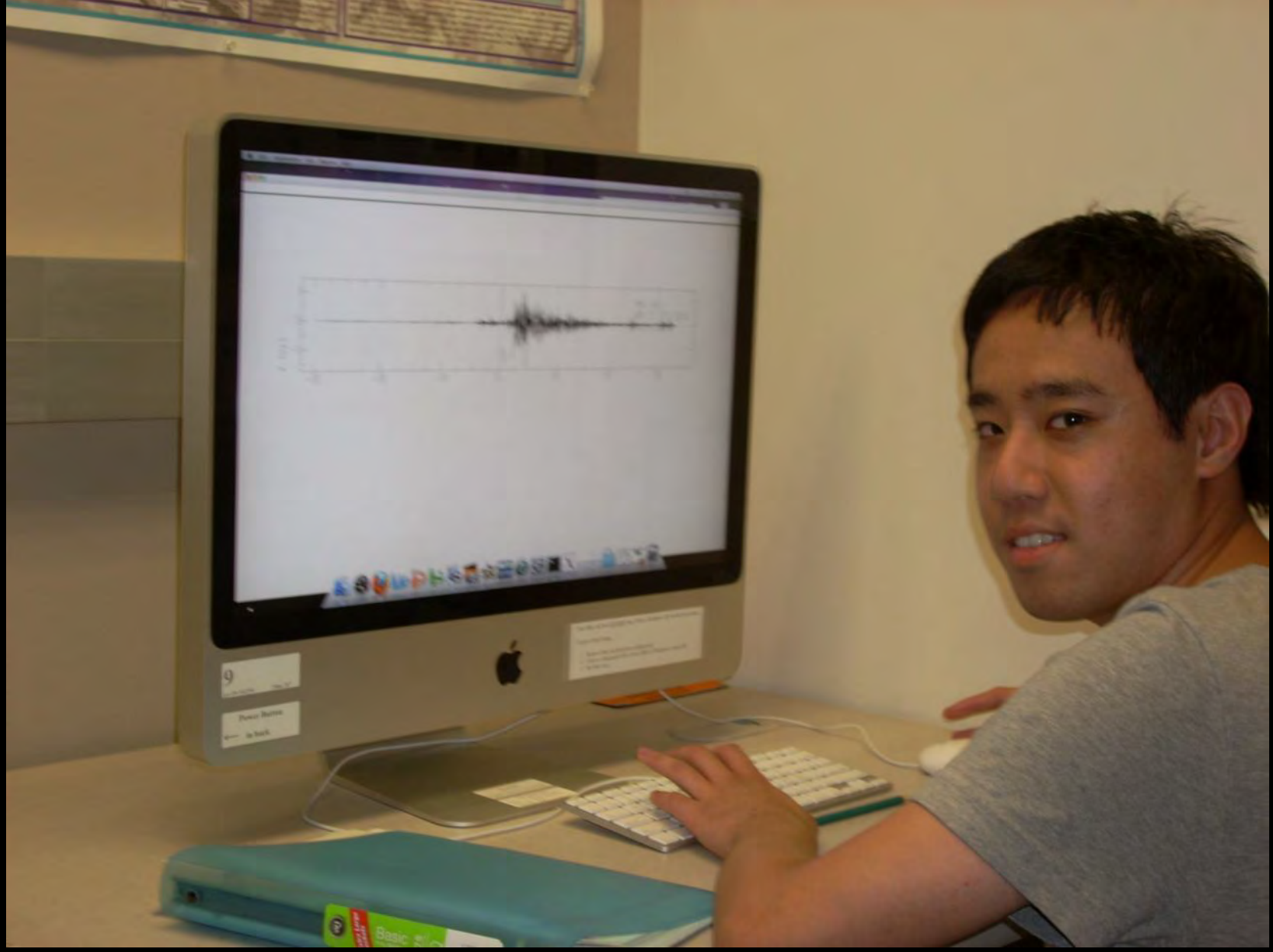


Seismology Research at Cal Poly Pomona



Global Tectonics:

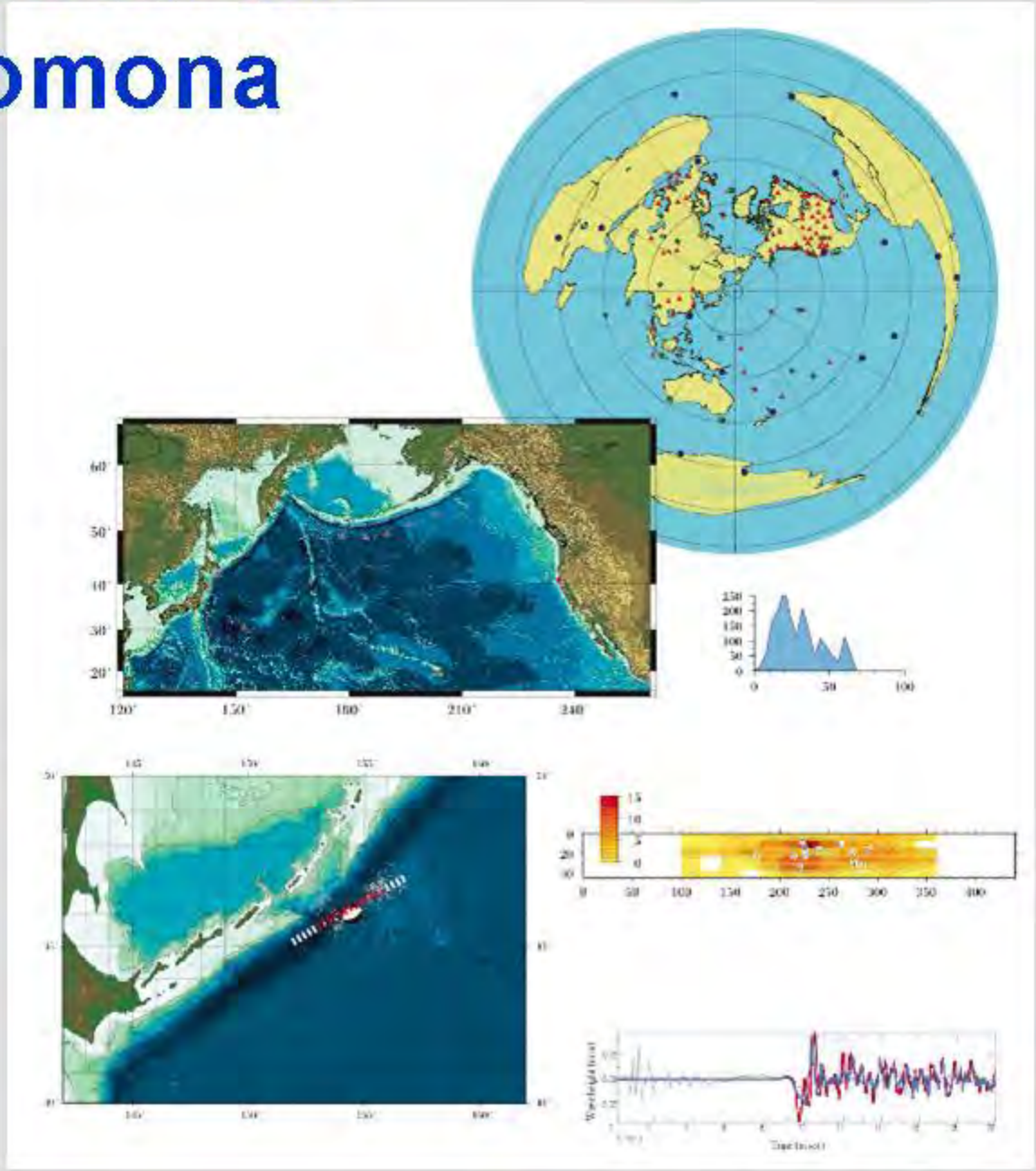
help explain why large earthquakes occur in certain parts of the world more often that others



Kevin Kwong working on seismogram from the Easter, 2010 Laguna Salada earthquake

Seismology Research at Cal Poly Pomona

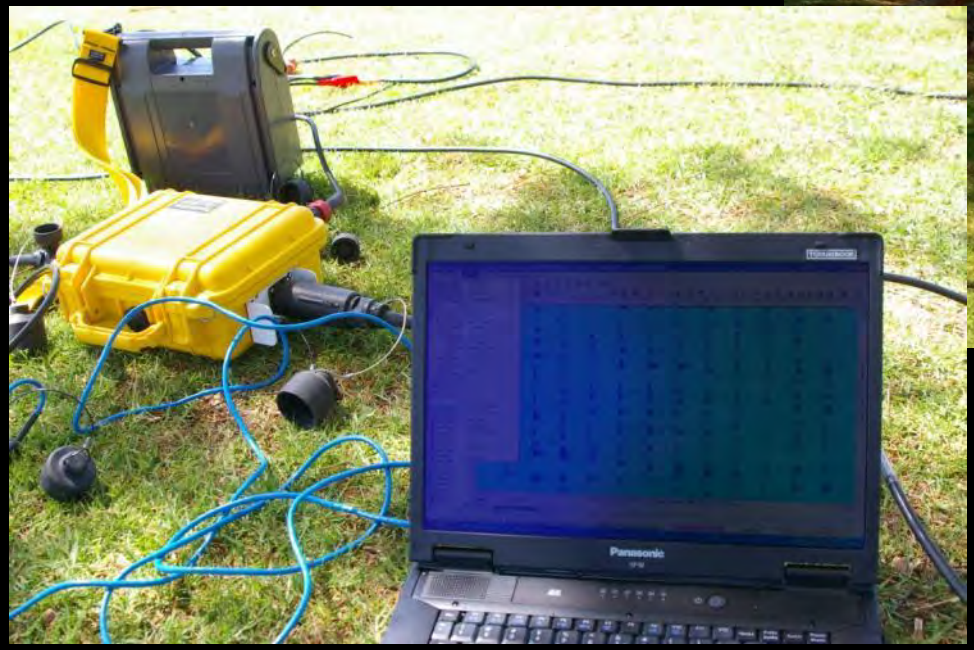
and predict how high the tsunami waves in the ocean may be that follow these earthquakes



Geophysical Field Work

Geophysical Field Work

Geophysical Field Work

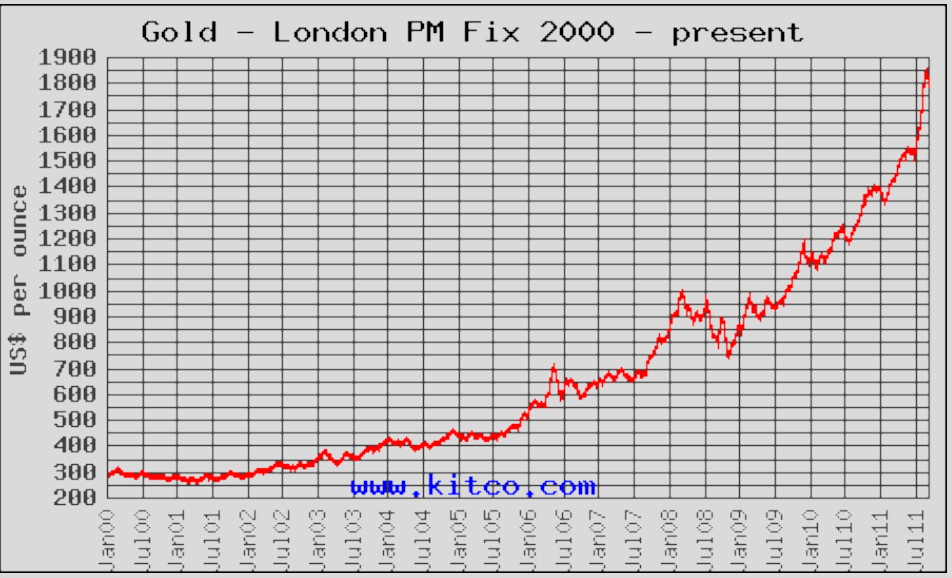


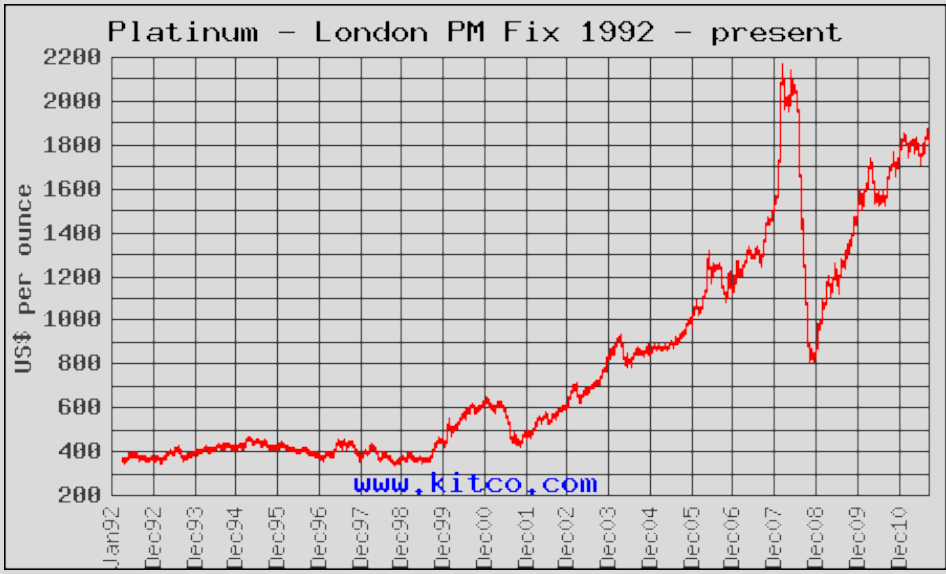
Geophysical Field Work

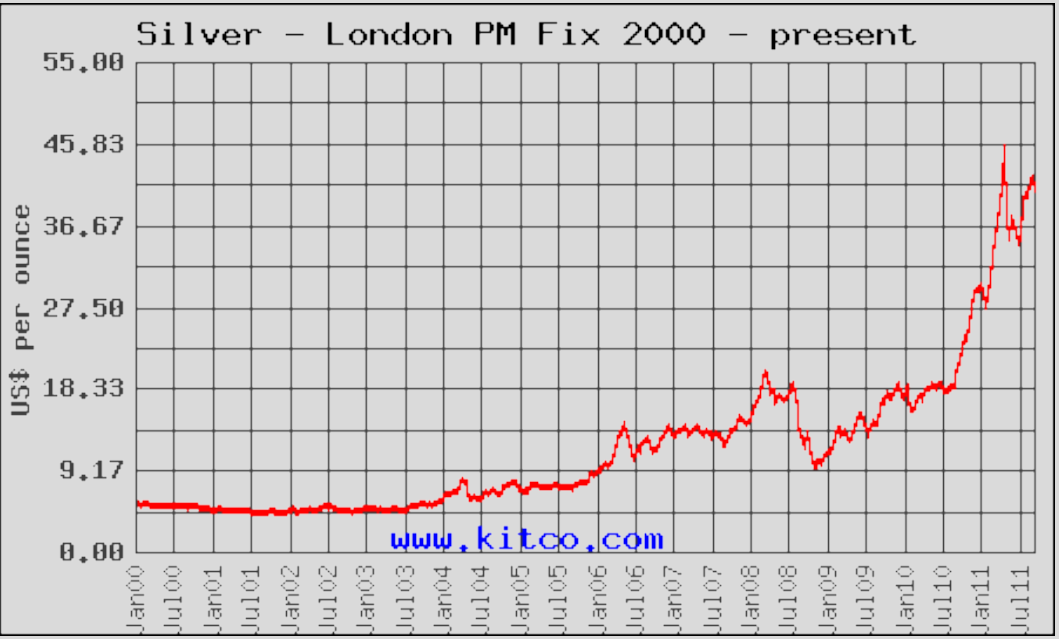
Mining Geology (Drs. Jessey and Nourse)

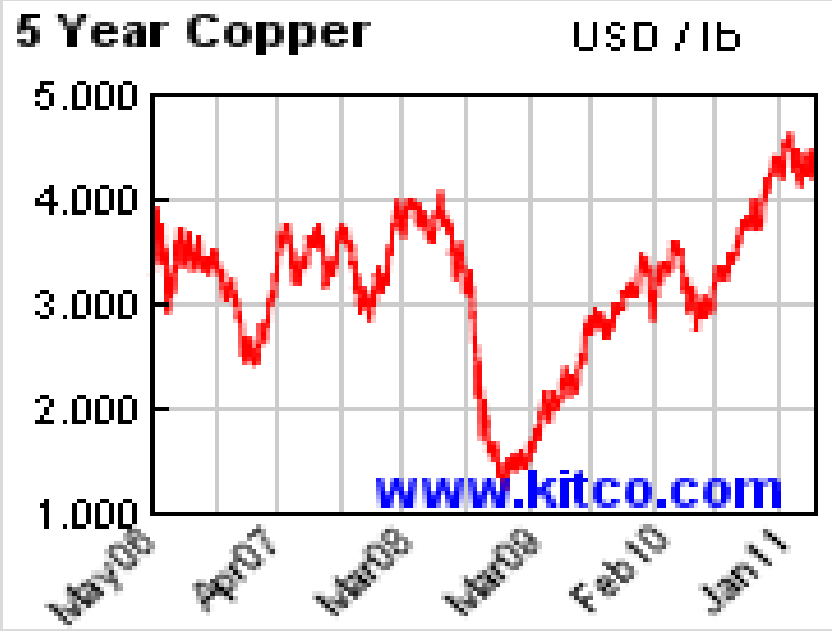
- Mineral exploration
- Gold and Copper are hot today!!
- Diamond core drilling
- Core logging
- Mine mapping
- Reserve calculations
- Mine-site engineering
- Reclamation planning

Global Metals Prices:









Exploration and sampling of old mine workings

Diamond core drilling

High-grade Molybdenum in drill core

Studying drill core

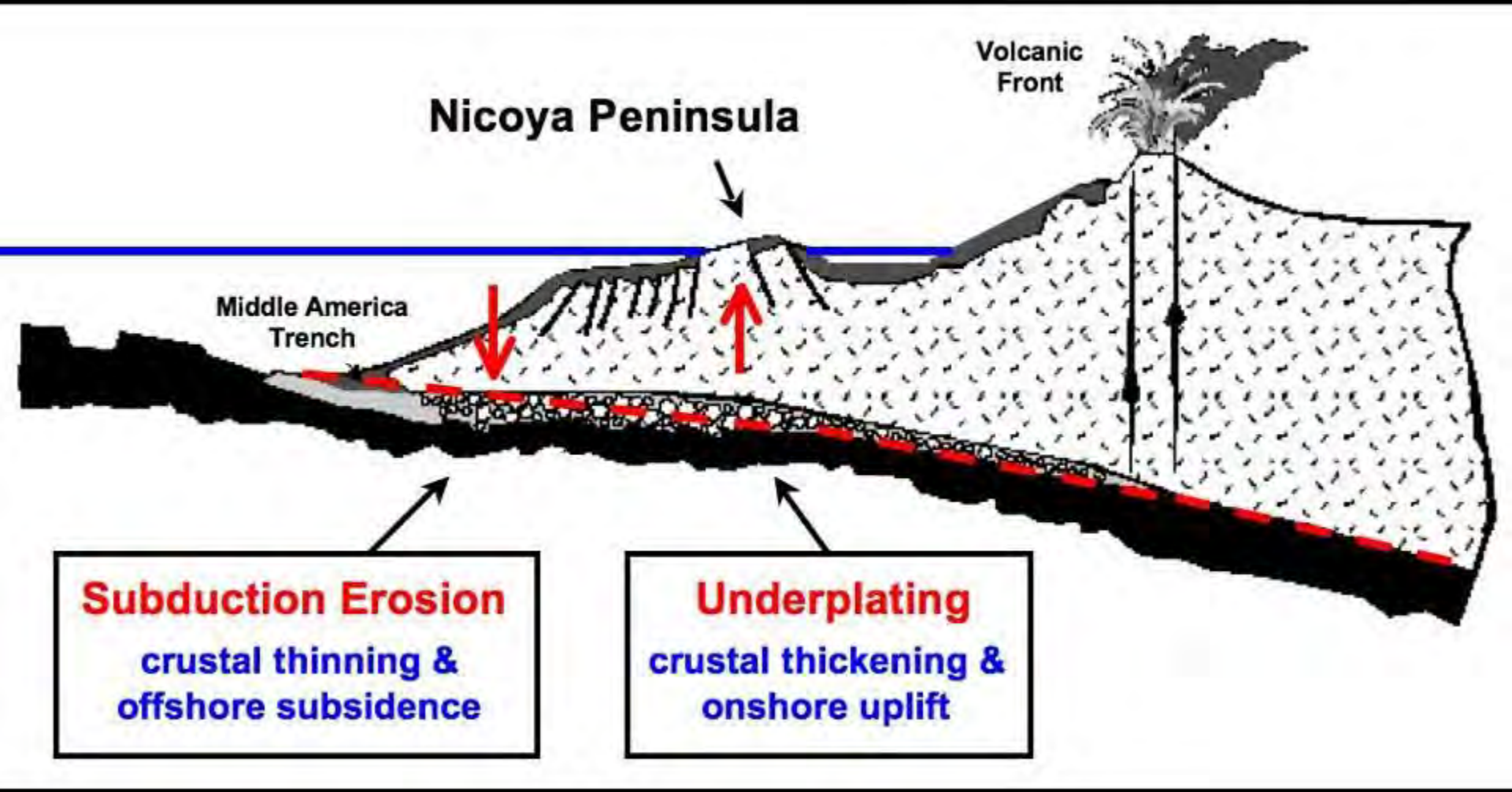
Sawing the core

Final split for laboratory analysis

Dr. Marshall's Field Courses

Anchorage, Alaska

Field Work in Costa Rica



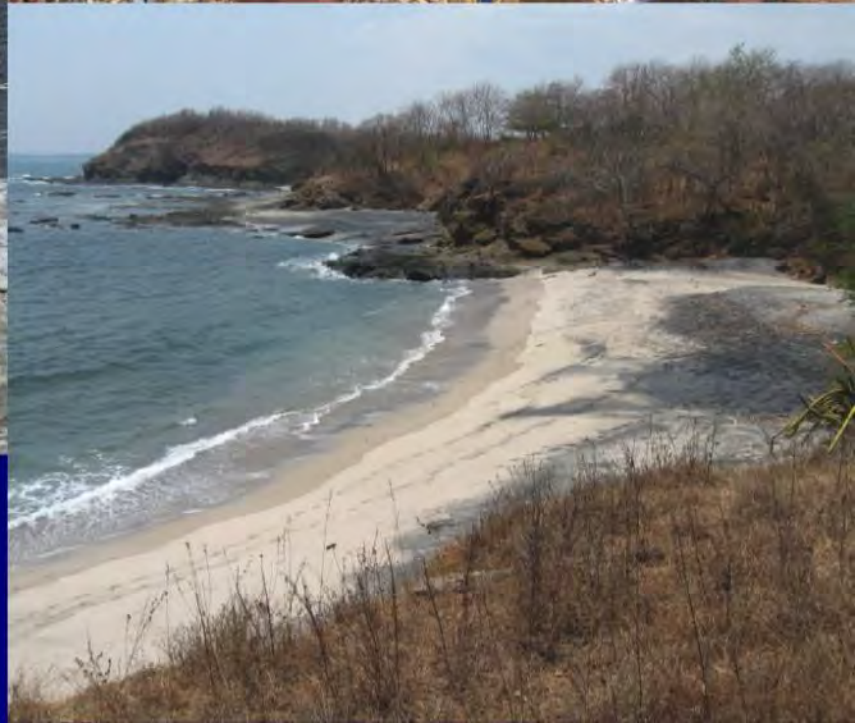
The main theme

Quaternary Terrace Mapping & Surveying

Marine Terraces

Fluvial Terraces

2010 Fieldwork: Site 1



Playa Carbón, Tamarindo

2010 Fieldwork: Site 3

Playa Pleito, San Juanillo

2010 Fieldwork: Site 6

Playa Caletas, Puerto Coyote

Isotopic Dating of Terrace Deposits

Radiocarbon (^{14}C)

Holocene Beachrock

Optically Stimulated Luminescence (OSL)

Pleistocene River Sediments

Costa Rica Field Trip, Spring Break 2008

Paos volcano

Mapping folded strata on Cobano beach platform

Quantifying uplift rate of southern California shorelines

Measurement techniques

Some of Our Lab Equipment!

Microscopes/Fluid Inclusion Stage

Computer Lab

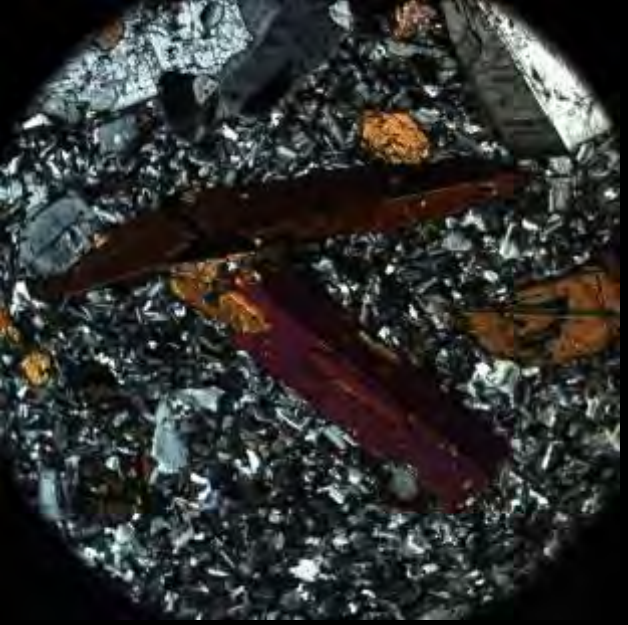
X-ray Florescence Spectrometer

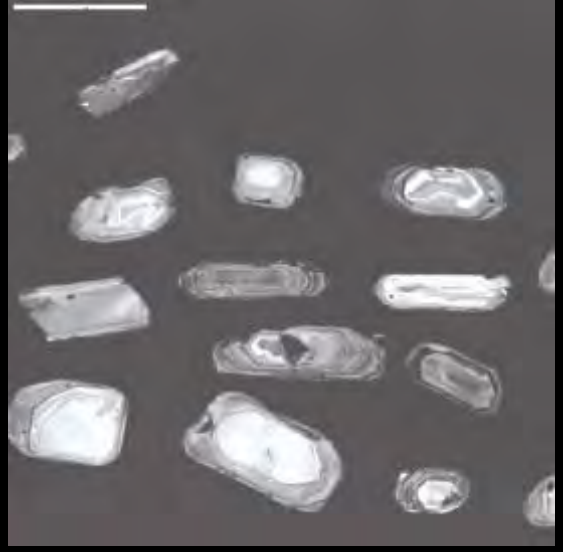
X-ray Diffraction

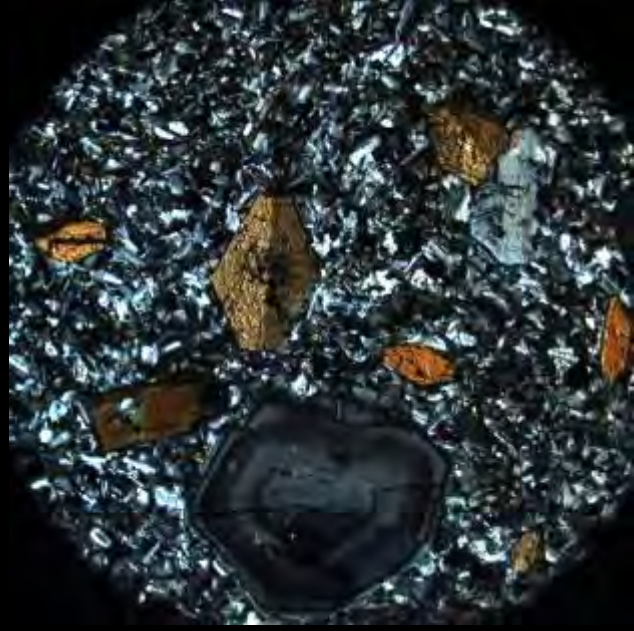
Nikon Total Station for Precise Surveying

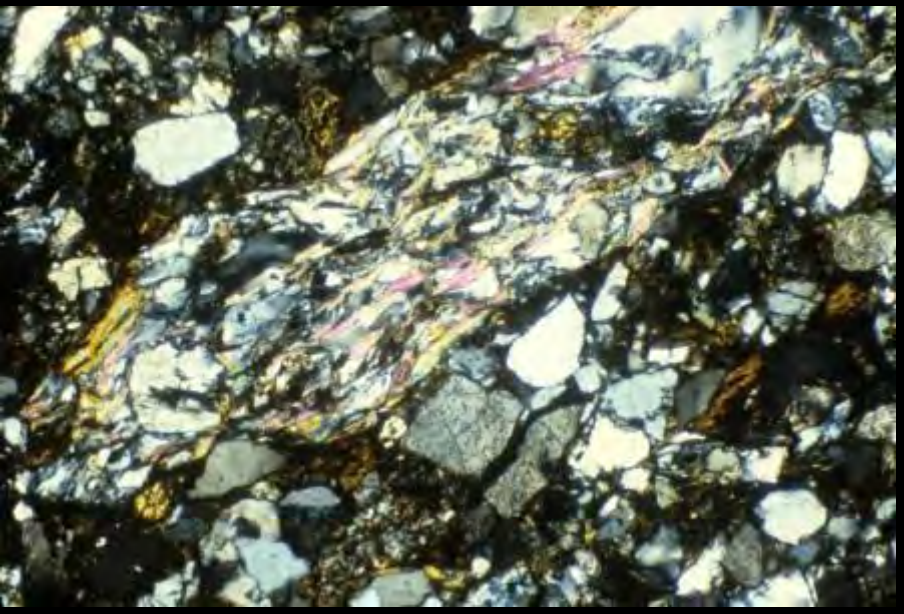
Long-distance target prism

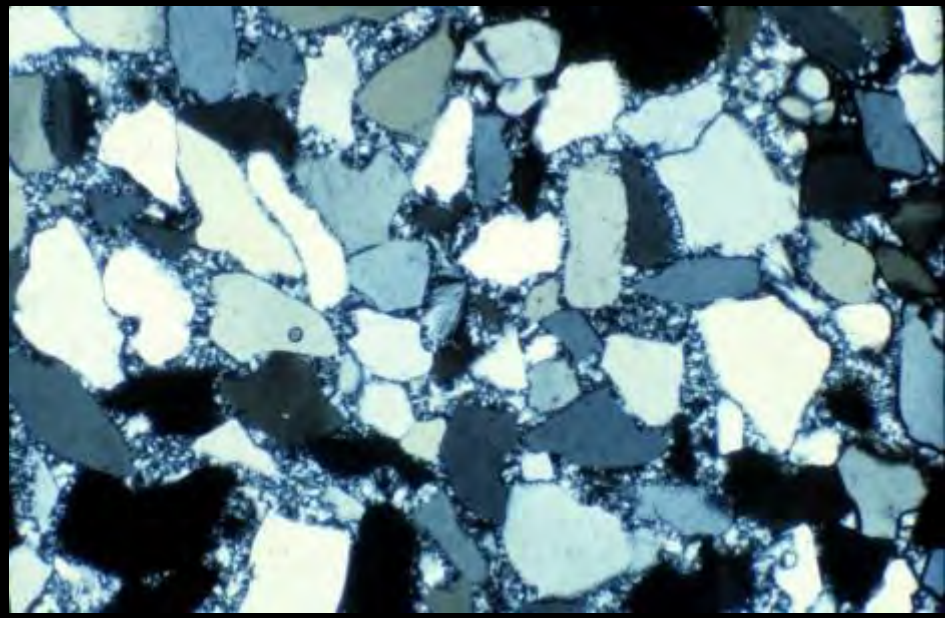
La Coste-Romberg Gravimeter



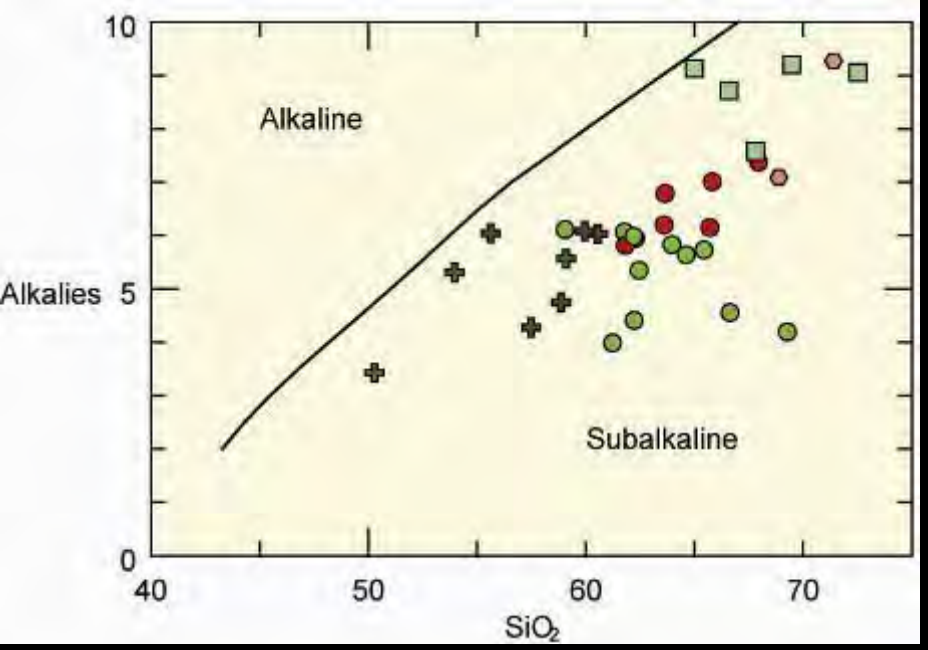


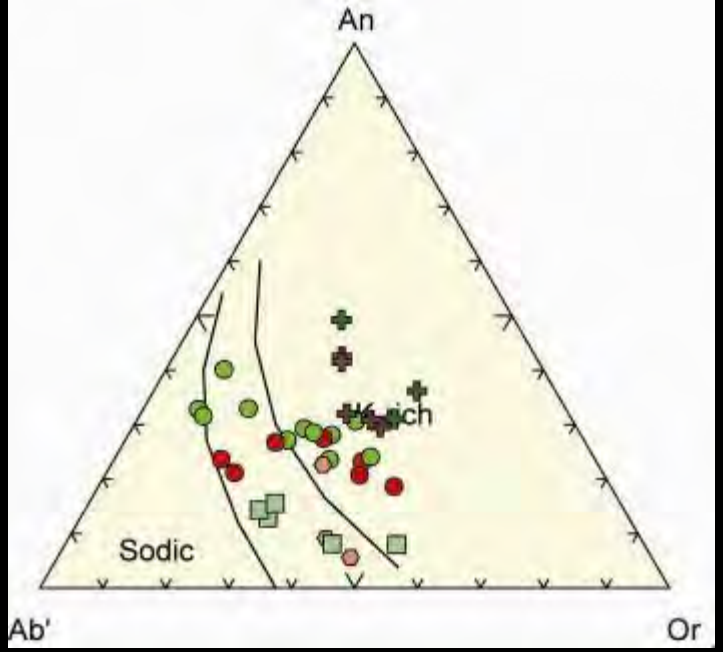


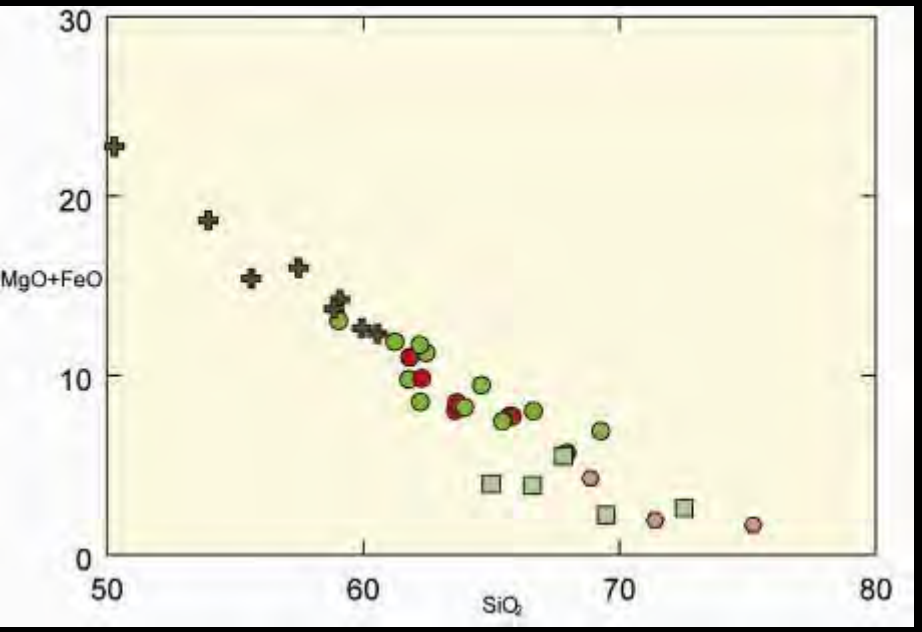


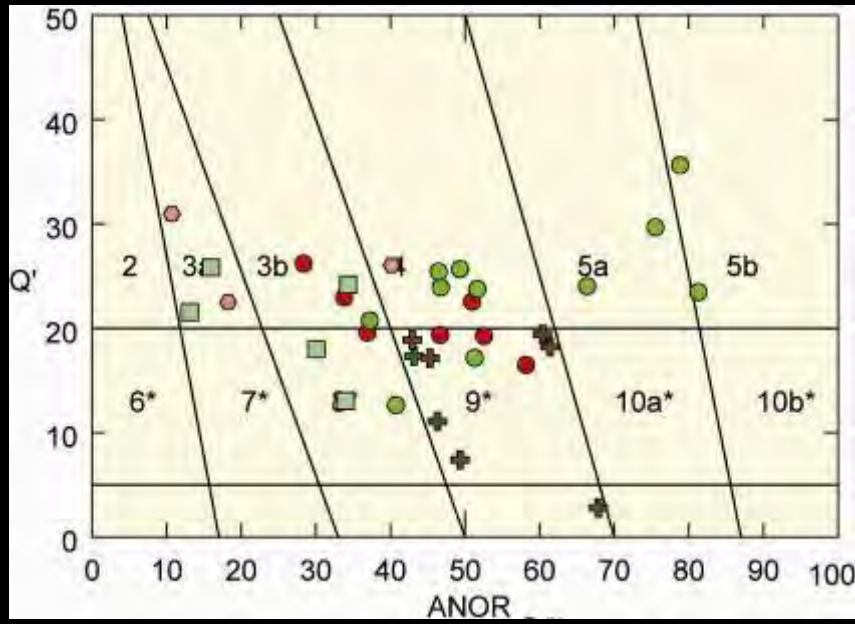


Photomicrographs from our Optical Mineralogy Laboratory





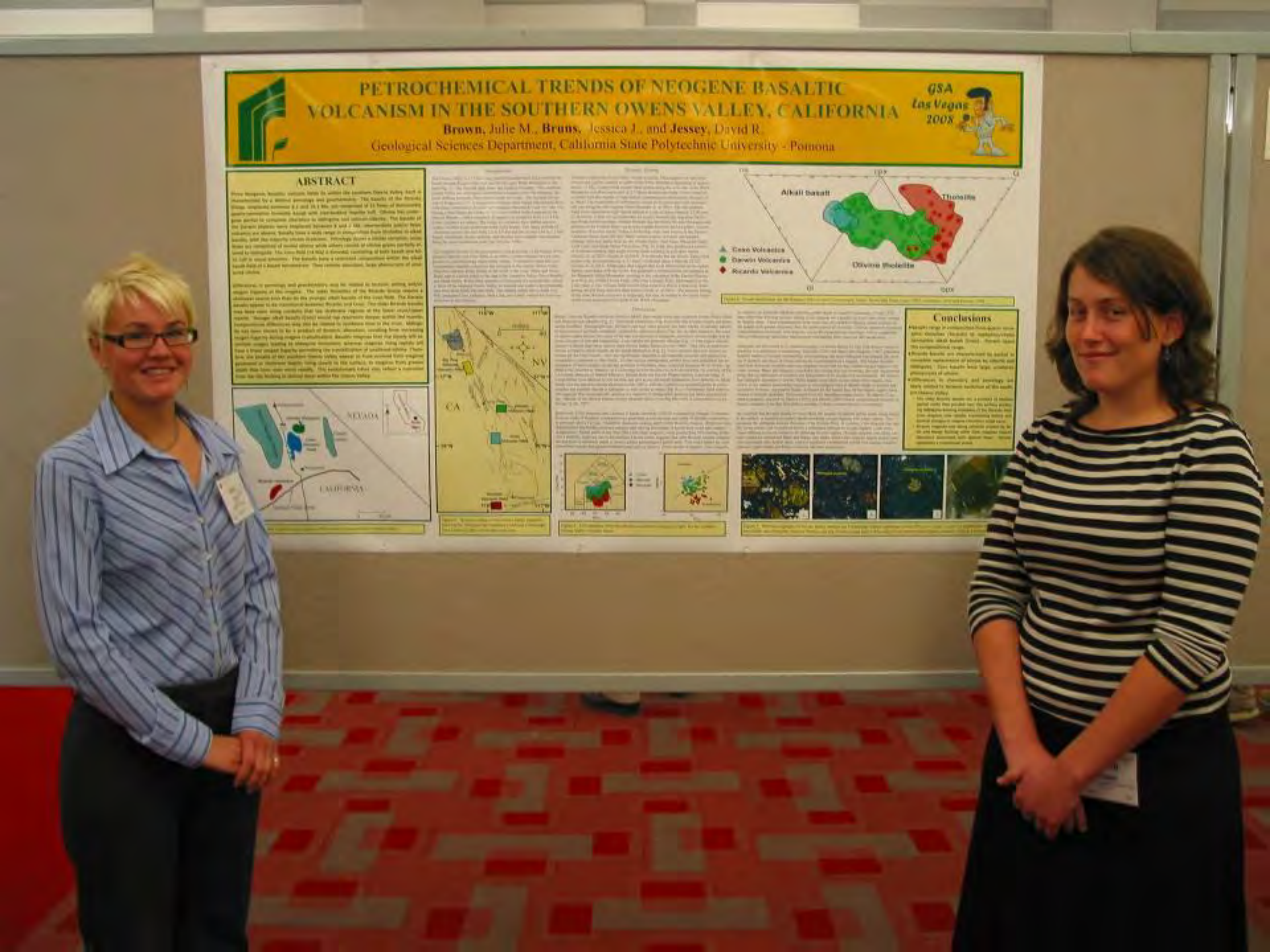




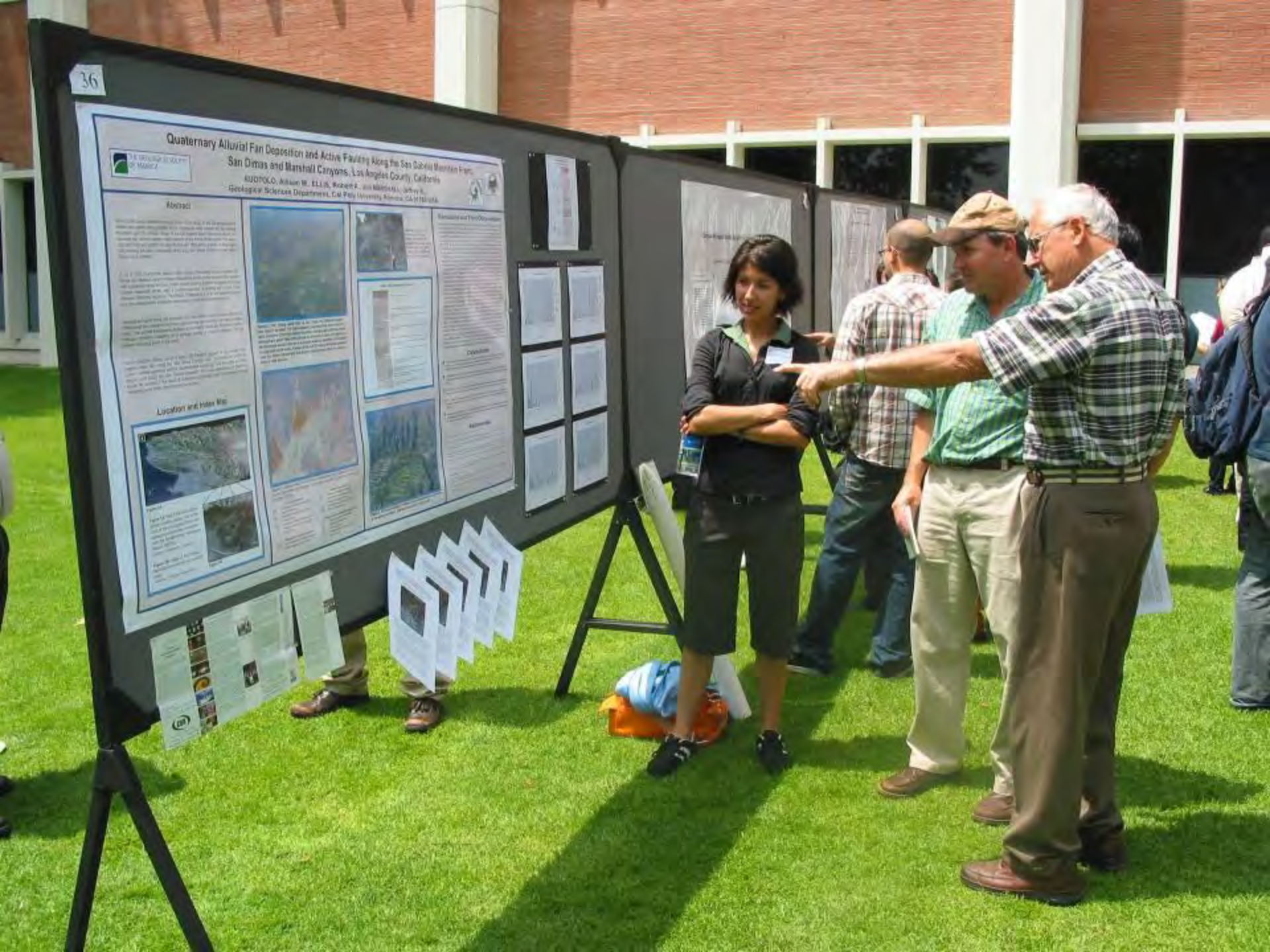
Products from X-Ray Florescence Laboratory (Heaton, 2008)

Student Presentations


Tectonic Geomorphology and Clast Provenance of Uplifted Alluvial Fan Gravels, San Gabriel Mountain Foothills,
Eastern Los Angeles County, California



PETROCHEMICAL TRENDS OF NEOGENE BASALTIC
VOLCANISM IN THE SOUTHERN OWENS VALLEY, CALIFORNIA
Brown, Julie M., Bruns, Jessica J., and Jessey, David R.
Geological Sciences Department, California State Polytechnic University - Pomona
GSA
Las Vegas
2008
ABSTRACT
Alkali basalt
Tholeiite
Olivine tholeiite
Coso Volcanics
Darwin Volcanics
Ricardo Volcanics
Conclusions
NEVADA
CALIFORNIA
CA
NV


36
Quaternary Alluvial Fan Deposition and Active Faulting Along the San Gabriel Mountain Front,
San Dimas and Marshall Canyons, Los Angeles County, California
Abstract
Location and Index Map

Awards and Scholarships

$9000 in scholarships awarded in 2008

We offer a Bachelor of Science Degree in Geology

with the flexibility to choose from one of three Emphasis Areas or "Tracks":

- Geology
- Geophysics / Earth Exploration
- Environmental Resources

Required Core Courses for B.S. Degree in Geology

- Principles of Geology
- Earth, Time & Life
- Mineralogy
- Geomorphology
- Geochemistry
- Global Geophysics
- Groundwater Geology
- GIS Applications
- Structural Geology
- Field Methods
- Earth Science Seminar
- Senior Project or Senior Thesis

Required Support Courses for Geology Degree

- Calculus and Analytical Geometry
- General Chemistry
- College Physics or General Physics
- Life Science or Basic Biology

(Plus 68 units of required GE)

Technical Electives for the Geology Track (34 Units):

- Optical Mineralogy
- Igneous and Metamorphic Petrology
- Ore Deposits *or* Geotectonics
- Invertebrate Paleontology
- Sedimentary Geology
- Field Mapping or Summer Field Camp

Technical Electives for the Geophysics / Earth Exploration Track (34 Units):

- Astronomy or Oceanography
- Meteorology or Blue Planet
- Fortran or Intro to Computer Science
- Engineering Geology
- Shallow Subsurface Geophysics
- Seismology
- Advanced Engineering Geology
- Field Module
- + 4-7 units of choice in upper division Geology classes

Technical Electives for the Environmental Resources Track (choose 34 Units):

- GIS (Geographic Information Systems)
- Meteorology
- Studies of a Blue Planet
- Exploring Earth's Oceans
- Environment and Society
- California Water
- Water Resource Management
- Ethical Considerations in Engineering and Applied Science
- Climatology
- Shallow Subsurface Geophysics
- Environmental Resource Management
- Energy and Society
- Physical Oceanography
- Current Applications in Regenerative Studies
- Field Mapping Module

For Further Information Contact:

Geological Sciences Department

Cal Poly University—Pomona

Pomona, CA 91768

phone: (909) 869-3454

web: http//:geology.csupomona.edu

e-mail: janourse@csupomona.edu

jpolet@csupomona.edu

marshall@csupomona.edu

--Cal Poly Pomona's Application Deadline is November 30--

Drop by any time for a free tour of the Geology Department facilities!!