

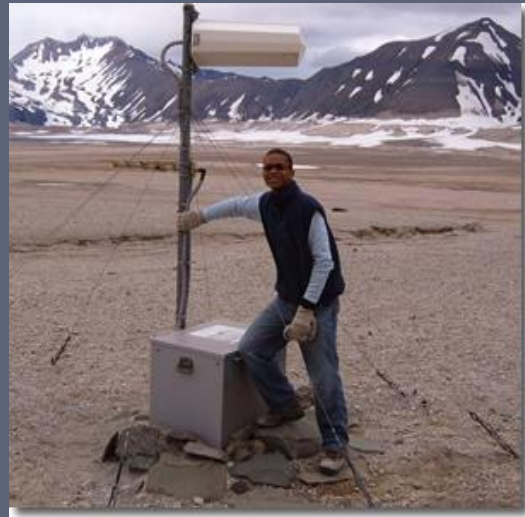
# Have you ever considered being a seismologist?

*Justin R. Brown, Incorporated Research Institutions in Seismology*



# Geophysicists

Measure,  
examine, model,  
and explore the  
physical properties  
of Earth and other  
planetary objects,  
from the depths of  
the ocean to the  
tops of volcanoes,  
from Earth's core  
to the edges of  
space and beyond.



# Geophysics specialties

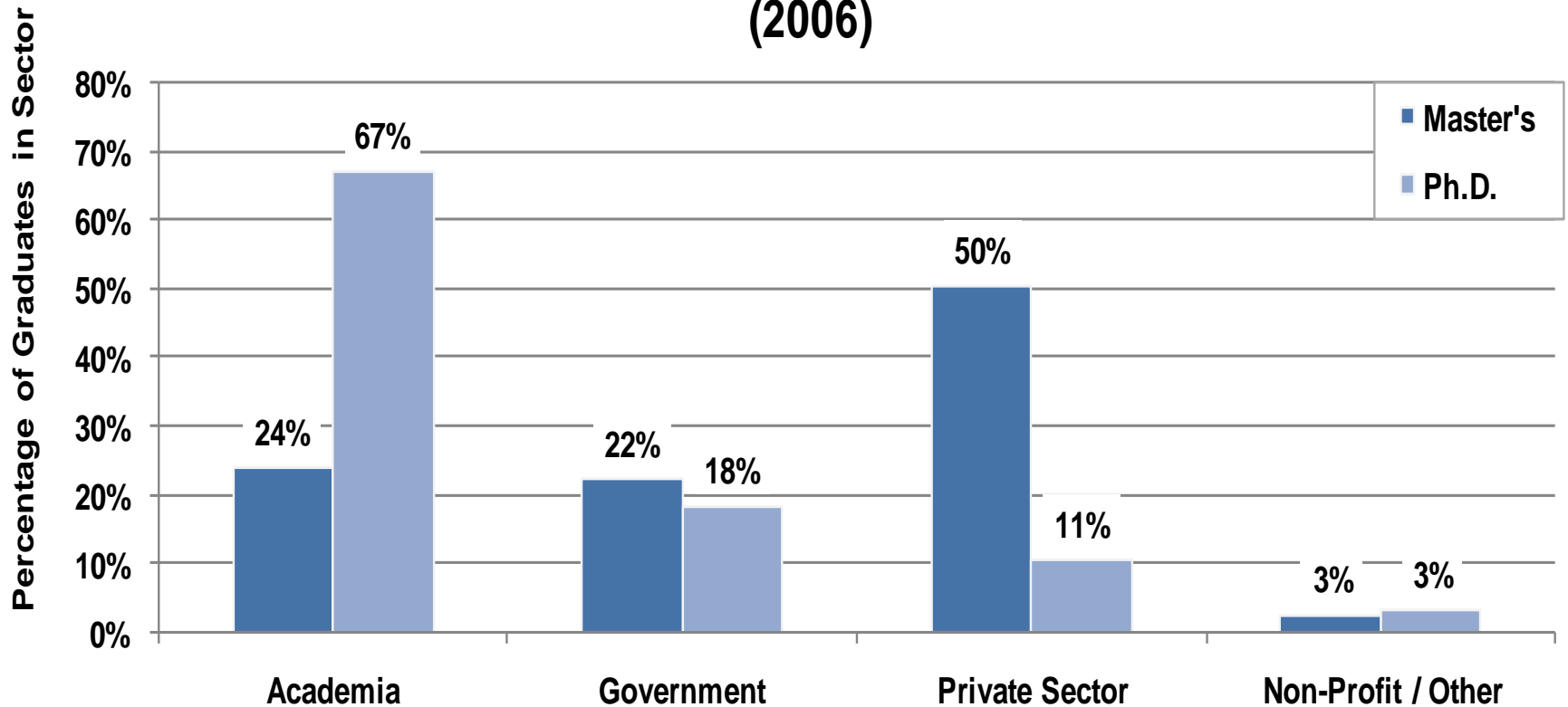
- Seismologist - study of earthquakes and the propagation of elastic waves through Earth or through other planet-like bodies.
- Geodesist – study earth's shape, gravity field, and rotation
- Marine geophysicist
- Petroleum geophysicist
- Mining geophysicist
- Environmental geophysicist
- Exploration geophysicist

## Data used....

- Active seismic
- Electrical resistivity
- Electromagnetics
- GPS
- Gravity
- Infrasound
- Magnetics
- Passive seismic

# Well-positioned for a GEOphysics career...

## Employment Sectors of Recent Geoscience Master's & Ph.D. Graduates (2006)



Source: AGI Geoscience Workforce Program, data derived from AGI/AGU Survey of New Geoscience Ph.D.'s (2006); AGI/AGU Survey of New Geoscience Master's (2006).



# Well-paying career options with or without a PhD

## Physicist

- \$105,430 (2010 Median)
- Entry degree = PhD
- Job outlook = ↑14% by 2020 (~ average)

## Geologist (GEOphysicist)

- \$82,500 (2010 Median)
- Entry degree = B.S (M.S)
- Job outlook = ↑21% by 2020 (faster than average)

## Electrical Engineer

- \$87,180 (2010 Median)
- Entry degree = B.S
- Job outlook = ↑6% by 2020 (slower than average)

## Geologist (GEOphysicist)

- \$82,500 (2010 Median)
- Entry degree = B.S (M.S)
- Job outlook = ↑21% by 2020 (faster than average)



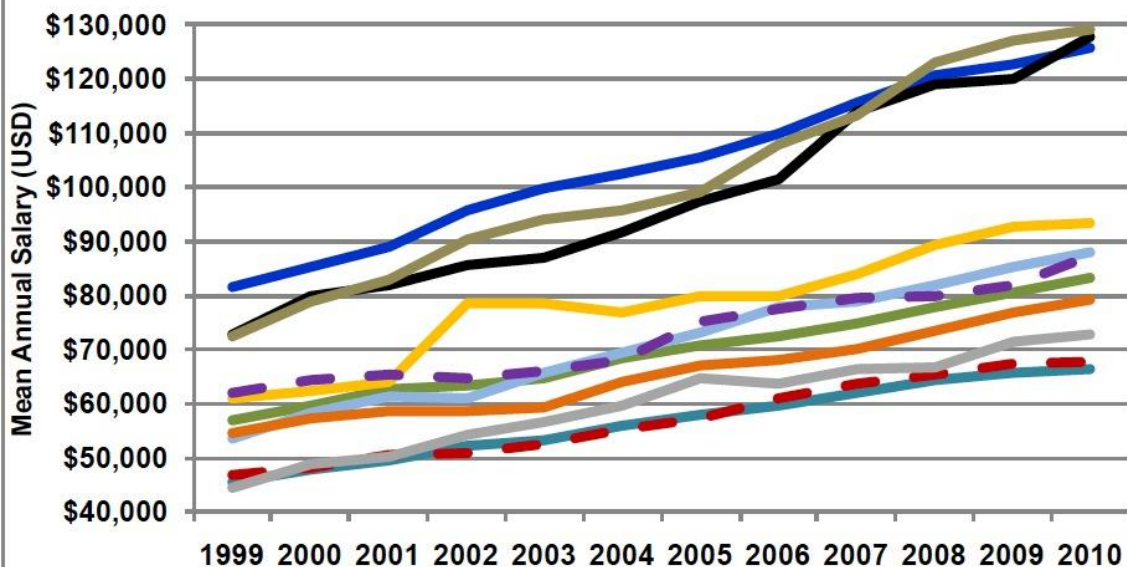
## Civil Engineer

- \$77,560 (2010 Median)
- Entry degree = B.S
- Job outlook = ↑19%  
(slightly above average)

## Geologist (GEOphysicist)

- \$82,500 (2010 Median)
- Entry degree = B.S  
(M.S)
- Job outlook = ↑21% by  
2020 (faster than  
average)

## Mean Annual Salaries of Geoscience Professions (1999-2010)



Life, Physical, and Social Science Occupations

### Geoscience-Related Occupations

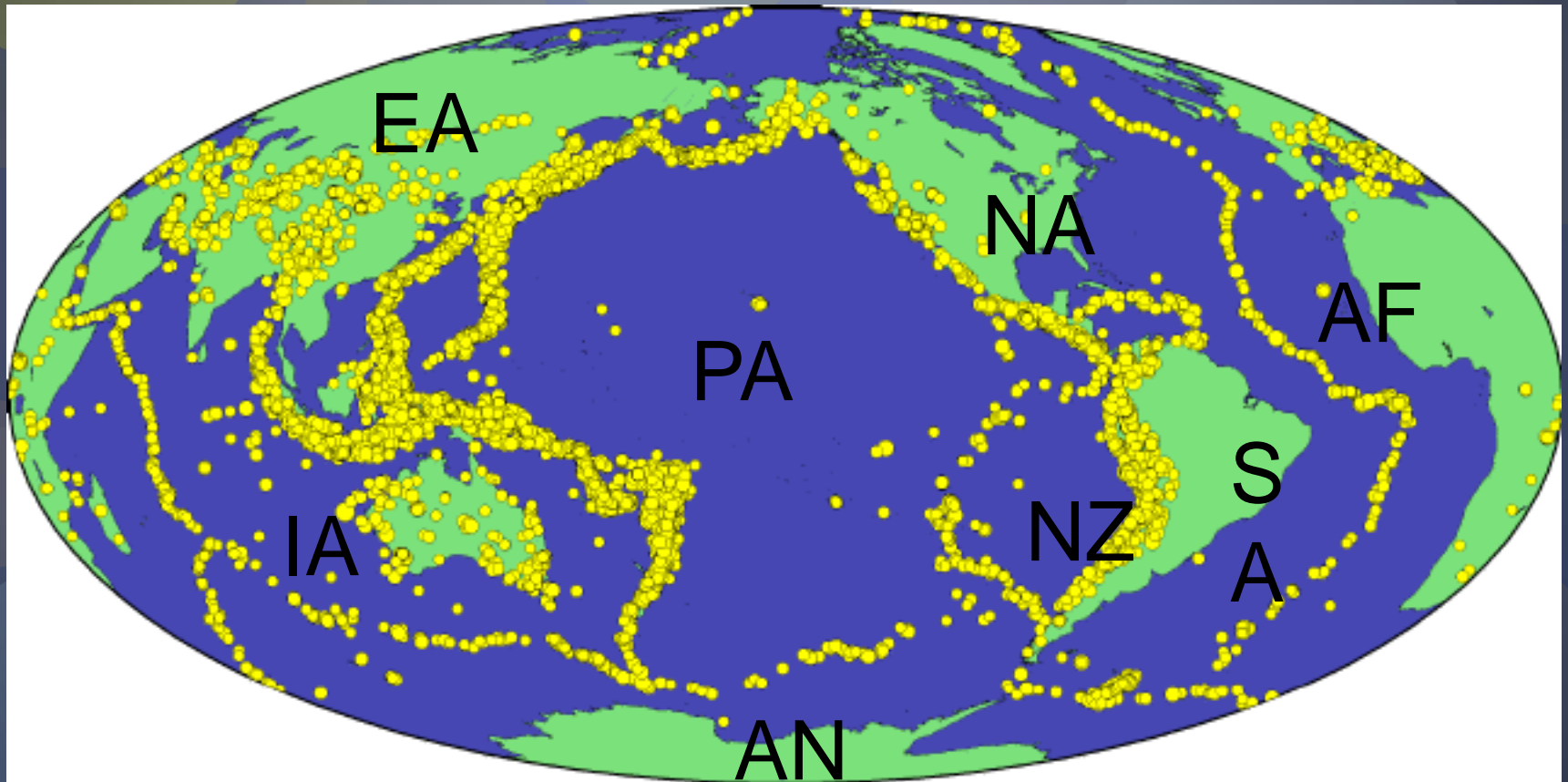
- Natural Science Managers
- Engineering Managers
- Petroleum Engineers
- Geoscientists
- Atmospheric and Space Scientists
- Mining and Geological Engineers
- Environmental Engineers
- Hydrologists
- Geographers
- Environmental Scientists

Note, salary data is derived from the U.S. Bureau of Labor Statistics, and is displayed by BLS Occupational coding. See AGI's 2011 Status of the Geoscience Workforce report, Appendix A for full explanation of geoscience occupational categories.

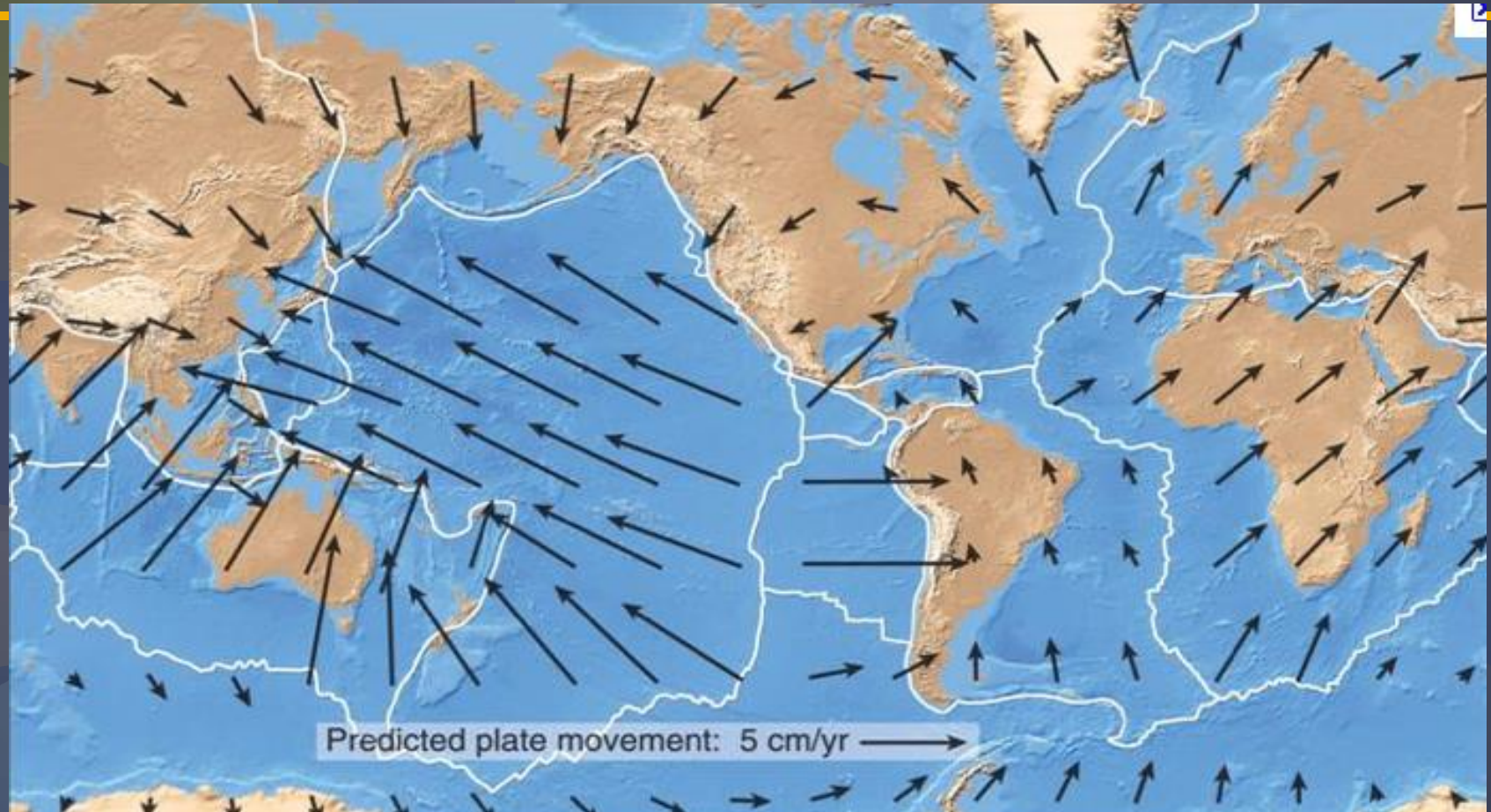
Source: AGI Geoscience Workforce Program, data derived from the U.S. Bureau of Labor Statistics, National Occupational Employment and Wage Estimates



# Global Seismicity Map, [www.quakes.uq.edu.au](http://www.quakes.uq.edu.au)



# Plate Motions



# 2010- A year of seismic hazard wake-up calls

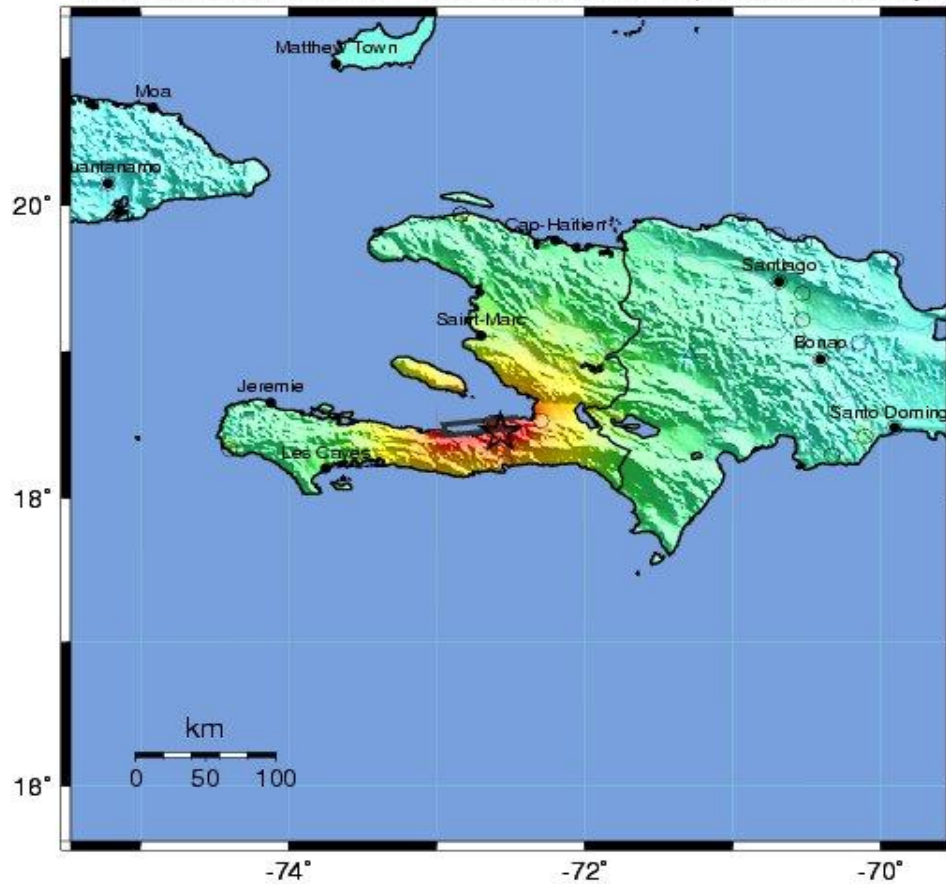
Jan. 12 M 7.0 Haiti vs. Feb. 27 M 8.8 Chile





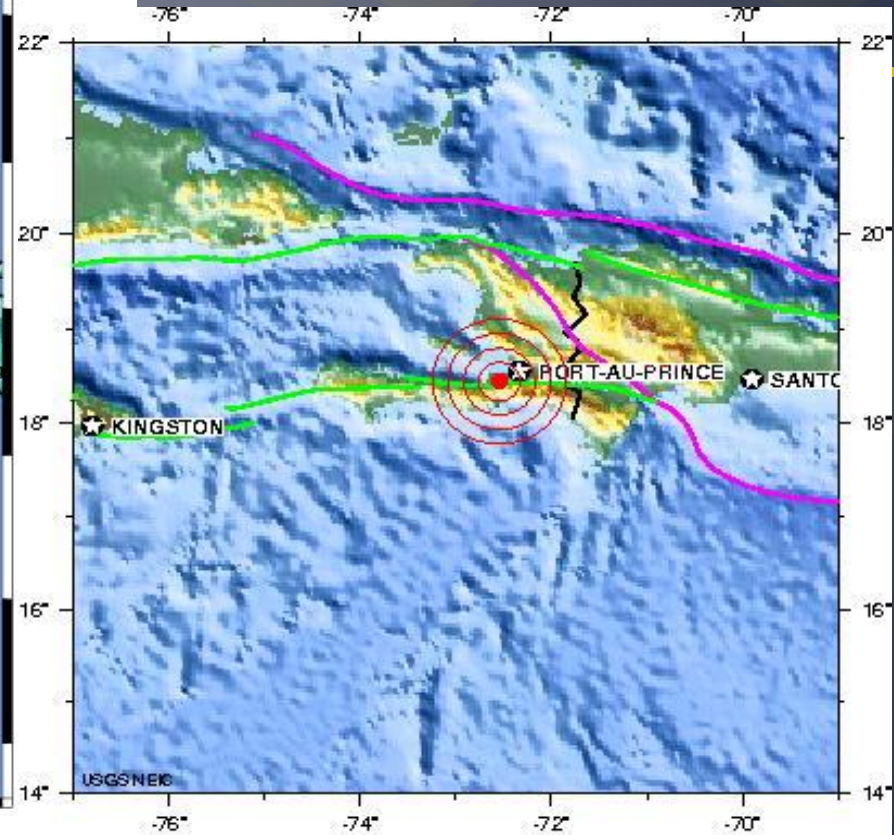
# USGS ShakeMap : HAITI REGION

Tue Jan 12, 2010 21:53:10 GMT M 7.0 N18.45 W72.57 Depth: 13.0km ID:2010rja6



Map Version 10 Processed Thu Mar 4, 2010 04:10:14 PM MST – NOT REVIEWED BY HUMAN

| 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    | 8.1-18 | 18-31       | 31-60          | 60-116  | >116       |
| INSTRUMENTAL INTENSITY | I        | II-III  | IV      | V          | VI     | VII         | VIII           | IX      | X+         |



## HAITI REGION

2010 01 12 21:53:10 UTC 18.44N 72.54W Depth: 13 km, Magnitude: 7.0

Earthquake Location

USGS,  
2010

# Haiti Quick Facts

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January 12, 2010, M 7.0 Earthquake

Epicenter was 25 km WSW of Port-au-Prince

230,000 people killed

1.5 million homeless

Largest U.S. Urban Food Campaign in History

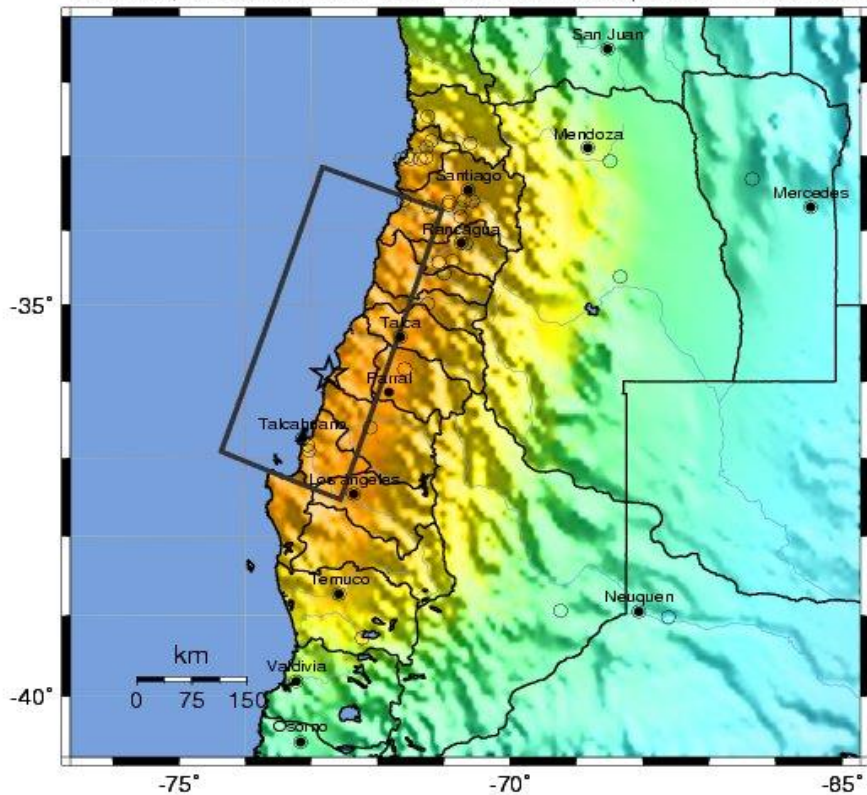






# USGS ShakeMap : OFFSHORE MAULE, CHILE

Sat Feb 27, 2010 06:34:14 GMT M 8.8 S35.91 W72.73 Depth: 35.0km ID:2010tfan



Map Version 7 Processed Fri Mar 5, 2010 03:00:13 AM MST -- NOT REVIEWED BY HUMAN

| 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.(%)           | <.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+         |



## OFFSHORE MAULE, CHILE

2010 02 27 06:34:14 UTC 35.99S 72.73W Depth: 35 km Magnitude: 8.8

Earthquake Location

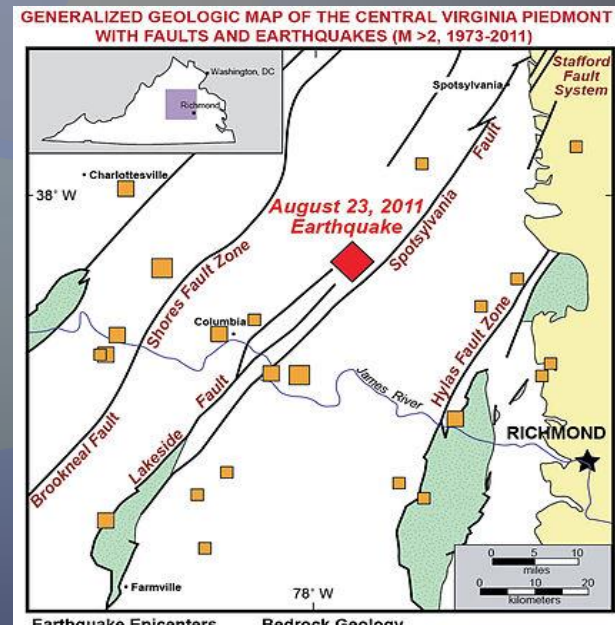
# Chile Quick Facts

February 27, 2010, M 8.8 Earthquake  
Epicenter was 335 km SW of Santiago  
521 people killed  
Over 3 minutes of groundshaking  
Tsunami Generated 1.29 meters high



# 2011- A year of seismic hazard wake-up calls

March. 11 M 9.0 Japan, Aug. 23 M 5.7 VA



# Geophysics math

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- Matrix Algebra
- ODEs and PDEs
- Complex Calculus and Vector Analysis
- Statistics
- Computational Physics



# Exploring (GEO)physics further

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- Attend Geoscience colloquium Take an elective from the Geoscience Dept.
- Participate in a summer internship experience!
  - IRIS Undergraduate Internships in Seismology
  - UNAVCO's Research Experiences in Solid Earth Sciences (RESESS)

# Internship Opportunities



- Flexible length - 9 to 14 weeks research placements
- Single year only
- Participants distributed both within the US and abroad
- Virtual communication among cohort emphasized
- Research projects include all specialties within seismology
- Travel and weekly stipend
- Full funding to present research at the Fall AGU conference in San Francisco, CA

RESEARCH EXPERIENCES IN SOLID EARTH SCIENCE FOR STUDENTS



- Multi-summer diversity-focused
- 11 weeks research placement/summer
- First year interns located in Boulder, CO (2<sup>nd</sup>-4<sup>th</sup> year interns anywhere)
- Research projects include a variety of solid Earth science topics
- Travel, lodging, and competitive monthly salary
- Academic year support:
  - Scholarships
  - GRE test fees
  - Funding for conference attendance
  - Graduate school application assistance

Deadline for both programs is February 1, 2014