Environmental Geology Spring 2009 Midterm Exam Study Guide

The Midterm Exam will be in 2 parts, the lab skills portion will be open book. You will be able to use your notes, conversion charts, answer keys, etc. to work on lab-style problems. Labs have largely focused on identifying features on maps and photos, and thinking about geologic hazards in relation to human populations.

The second part of the exam will be closed book, and consist of long-answer essay questions and short-answer terminology. Be prepared to make sketches of diagrams to illustrate your answers.

I would spend a minimum of studying 8-10 hours total for this exam, to assure maximum success. Use the keyword and concept list below as a check list for studying.

Key Words

Introduction

Environmental Geology
- natural hazards
- environmental quality
  - water
  - soil
  - waste
- management
- natural resources
  - water
  - energy
  - mineral

Geologic Hazards
fluvial
mass wasting
coastal
karst
seismic
volcanic
coastal
death / destruction
anthropogenic
urbanization
hazard vs. risk
contaminants
health effects
environmental fate
industrial waste
biological waste
pollution

nature vs. humans
humans vs. nature

Introductory Video Exercise

Loma Prieta earthquake
"World Series" Earthquake
Earthquake damage examples
Liquefaction
Bay Area earthquake prediction
Bay Area earthquake prevention
Hanford Site
Radiation
Groundwater
Nuclear reactor
Plutonium waste
Soil/water contamination
K-reaction
Reactor fuel rods
Site Remediation

Oregon Natural Hazards Overview

seismic / earthquake
subduction zone earthquake
intraplate earthquake
landslide
coastal erosion
volcanic activity
- ash zone
- lahar

tsunami
flood
stream bank erosion
quake-slide
quake-tsunami
flood-coastal erosion

Earthquake Overview

earthquake
focus
epicenter
faults
volcanic
normal fault
revers fault
strike-slip fault
fault trace
fault zone
fault segment
fault-line scarp
fault offset
sag pond
faceted spur
rock deformation
- ductile
- elastic
- brittle

stress
strength
faulting
stick-slip
aftershock
P-wave
S-wave
Surface-wave
Rayleigh wave
Love wave
Seismic velocity
Seismograph
Seismogram
First-break
Arrival time
Magnitude
Richter scale
Isoseismal map

Intensity
Seismic acceleration
fault creep
intraplate quakes
plate bound quakes
earthquake intensity vs.
earthquake magnitude
fault slip rate
fault scarp
surface deformation
fault displacement
earthquake recurrence
paleoseismology
seismicity
fault offset
Hazard Variables
    intensity
    duration
    building design
    foundation materials
    written record
    geologic records
Earthquake Hazards Mapping
liquefaction potential
amplification potential
landslide potential
earthquake prediction
magnitude-frequency
recurrence interval
seismic record
seismic upgrade

Oregon Seismic Hazards
Plate convergence
Juan de Fuca plate
Oblique subduction
Plate locking
Accretionary tectonics
Aseismic slip
Seismic slip
intraplate quakes
interpolate quakes
crustal quakes
Cascadia subduction zone
megathrust
Deep intraplate
shallow crustal
paleoseismic record
tsunami
groundshaking
hazard mapping

Volcanic Hazards
magma
lava
subduction zone volcanism
craters
hillslopes
Cascade volcanic arc
dormant/active/extinct
shield volcano
fissure eruptions
cinder cones
composite volcano
stratovolcano
volcanic dome
magma composition
  basaltic (<SiO2, >Fe,Mg)
  andesitic
  rhyolitic (>SiO2, <Fe,Mg)
controls on style of volc.
    viscosity
    silica content
    temp. of magma
    gas content
    phreatic state
explosive vs. quiescent
lateral blasts
phreatic eruptions
hydrothermal fluids
hydrothermal alteration
eruptive products
    lavas
    pyroclastics
        ash
        lapilli
        blocks
        bombs
    gases
Cascade Hazards
    tephra
    ballistics
    pyroclastic flow
    lahar
    lava flow
    volc. gases
    lateral blasts
    glacial outburst floods
volcanic landslides
debris flows/lahars
pyroclastic flow
dome collapse
co-seismic eruption
hazard zone
volcanic risk map
lahar warning system
noxious gas monitoring
eruptive recurrence
magnitude-frequency

PSU Posters

"Analysis of Pleistocene Loess Thickness in the Coastal Dune Sheets around Newport, Oregon" Keith Olson

Loess
Dune fields
Isopach map
Core samples

"Andesites/Dacites of the Oceanic Narcondam Volcano, Andaman Sea: Modification of Tholeiitic Arc Basalts by Crustal Contamination and Amphibole-Dominated Fractionation" Aspen Gillam

Petrology
Geochemical analysis
Rock composition
Magma composition
Trace element analysis
Major element analysis

"Coarse-grained overgrowths - an indication of shock effects in stony meteorites" Niina Jamsja and Alex Ruzicka (PSU)

Stony meteorites
Mineralogy
Geochemical analysis
Shock texture
Mineral overgrowths

"Do modern soil carbonates reflect local meteoric water in the Argentine Andes?" Kendra Williams (PSU)

Soil
Carbonate
Caliche
K-horizon
Oxygen isotopes
O16/O18 ratio
Meteoric water
Isotope fractionation

"Digging up earthquakes and slip rates along the Coyote Creek Fault, southern San Jacinto Fault Zone, California" Danielle Verdugo (SDSU)

Fault scarp
Fault trenching
Cross-sectional profile
Cross-cutting relations
C-14 dating
Slip recurrence interval
Seismic magnitude
Paleoseismic reconstruction
San Andreas fault zone
San Jacinto Fault zone
Strike-slip faulting

"GIS Applications in Watershed Analysis: A Case Study from the Sixes River Basin, Curry County, Oregon" Matthew Buche and Ryan Stanley (WOU)

Sixes River
DEM
GIS
Drainage density
Morphometry
Watershed
Drainage network
Bedrock lithology

"Numerical Model investigation of Crane Glacier response to collapse of the Larsen B ice shelf, Antarctic Peninsula" Adam Campbell (PSU)

Numerical model
Climate model
Ice shelf collapse
Basal sliding
Ablation
Model parameters
Model calibration

"Numerical modeling of heat transfer: Potential application for the study of differentiated asteroids" Niina Jamsja (PSU)

Weird stuff nobody knew about

"Occurrence and Distribution of Rhyolitic Magma Types during John Day Time, Northeastern Oregon" Christopher Ricker (PSU)

Magma
Petrology
Rock composition
Trace element analysis
Major element analysis
Magma composition
Magma evolution

"Relative Dating of Soils within the Bridge of the Gods Landslide Complex, Skamania County, Washington" Serin Duplantis and Kate Mickelson (PSU)

Bridge of the Gods
Landslide
Columbia River
Soil development
Colluvium

Mass Wasting Hazards

Potential energy
Kinetic energy
Force
Weight
Acceleration due to gravity
Newton
Joule
Stress
Shear strength
Shear stress
Angle of internal friction
Cohesion
Clay cohesion
Water cohesion
Weathering
Regolith
Colluvium
Landslide deposit
Bedrock
Controls
  Vegetation
  Root strength
   Slope
   Gradient
   Angle of repose
   Cohesion
   Pore pressure
   Friction
  Human activity
Earth
Debris
Rock
Fall
Topple
Slide
Slump
Rotational slide
Translational slide
Flow
Creep
Debris flow
lahar
Earth flow
Rock fall
Rock slide
Rock block slide
Debris slide
Scarp
Toe slope
Hummocky topography
Deranged contour patterns
Slow-moving landslide
Rapidly moving landslide
Cut slope
 Fill slope
Landslide hazard mapping
Source region
Run-out zone

OSU SEMINAR - LIDAR

LIDAR
Laser
Laser pulse
EM spectra
Speed of light
Wavelength
Frequency
Reflection
Absorption
Two-wave travel time
Laser source
Pulse detector
kHz – kilohertz
first-returns
second-returns
last returns
bare-earth model
digital elevation model
DEM
1-m resolution
Point density
Pulse intensity
Post-processing algorithm
Aerial surveys
Laser swath mapping
Land classification
Vegetative structure
Ground cover
Flight lines
Overlap
Sidelap
Flight plan
TIN
GRID

DEM
Data correction
Roll-yaw-pitch
GPS – positioning systems
Errot correction
Urban modeling
Watershed modeling
Topographic analysis
Resolution
Positional accuracy
Pulse rate
Point density
Altitude
Field of view
Multiple-return lidar
Near-infrared
Water absorption
Fog-rain-absorption
Point cloud
Laser altimetry
First-return model

floodplain management
flood hazard mitigation
flood hazard assessment
floodplain zoning
risk assessment
hazard vs. risk
urbanization
floodplain storage
dam - flood retention
climatic vs. geologic causes of flooding

Intro to Flood Hazards

Hydrologic cycle
Infiltration
Runoff
flood
discharge
continuity equation
Q=AV
bankfull discharge
magnitude-frequency
discharge-time
river stage
hydrograph
flood peak
flood peak lag
peak annual discharge
recurrence interval
runoff
infiltration
floodplain storage
drainage basin
watershed
drainage divide
drainage network
channel
floodplain
100-yr floodplain

Possible essay questions and other concepts

What is the difference between geologic hazard and risk?

List and discuss anthropogenic vs. natural environmental geology problems. How does these relate to the introductory video examples given for the Loma Prieta Earthquake and the Hanford Nuclear Reservation?

List and discuss the types of environmental hazards (natural and manmade) in Oregon / PNW.

List and discuss the types of earthquakes associated with the Pacific Northwest

Discuss the concept of paleoseismology, it's application to hazards mitigation, and the types of records that contribute to the paleoseismic data set for Oregon.

Discuss the types of hazards associated with seismic events in the PNW.

What are the volcanic hazards in Oregon?

Why do we have volcanic and seismic hazards in Oregon?

What re the ultimate energy sources for tectonic and climactic hazards?

List and discuss anthropogenic vs. natural environmental geology problems.

List and discuss the types of environmental hazards (natural and manmade) in Oregon / PNW.

List, discuss, describe the mass wasting classification.

What is the difference between a slump and slide?
What is the difference between a debris flow and lahar? And mudflow?

What is the difference between bedrock and regolith?

Discuss flood hazards in western Oregon vs. eastern Oregon

What is a flood hydrograph and rating curve? How are they used to assess flood hazards.

What types of meteorological events trigger landslides, floods, and debris flow hazards in Oregon?

Provide a summary of the talks field trips that you attended at PSU and OSU thus far.

List and discuss the mass wasting classification system, with sketch examples of each type.

How are magnitude-frequency concepts applied to geologic hazards? How do these concepts relate to floods, earthquakes, and volcanic eruptions?

What is LIDAR? How is it acquired? What is it used for?

Discuss flood hazards in western Oregon vs. eastern Oregon; what types of conditions lead to floods?

What are the significant climatic events in western Oregon that lead to flooding? What time of year? What processes?

How is the 100-yr floodplain determined and mapped out?

What is a rating curve? How do you calculate recurrence interval and probability of occurrence?

What is a flood hydrograph and how does it look when comparing a forested area to an urbanized area?

What types of meteorological events trigger landslides, floods, and debris flow hazards in Oregon?

Homework / Lab Exercise Skills

Map reading, photo observation, and process interpretation.
Can you conduct basic calculations of map scale, and unit conversions?
Can you draw a profile and make basic map observations?
Can you read a topographic map?
Can you identify mass wasting and volcanic hazard zones on a topographic map?
Can you interpret a basic seismogram and isoseismal map?