ES322 Geomorphology Fall 2009 Final Study Guide

NOTE: The final exam is scheduled to start 12:00 PM on Tuesday Dec. 8.

Study Tips

- complete all labs and worksheets before exam
- use study guide in combination with notes and online powerpoint slide shows
- go back through the in class / lab exercises, make sure you can work the math / units
- spend a couple days studying, the exam will be short answer / essay and there is much material.
- don't wait until the last minute!
- carefully go through the notes, some of the material we briefly discussed, but did not spend much time on in class... but the notes will give you the detail.

Exam Procedures

(1) Final exam will be 120 points.
(2) Part 1 – Closed book, short answer/essay questions, focusing mainly on material since mid-term, but we have been building a cumulative vocabulary throughout the term. See key-word/review recommendations below.
(3) Part 2 Open Book- lab-style quantitative questions, map questions, air photo questions, identification of fluvial, coastal landforms, identification of basic climatic / tectonic / geomorphic features; association of landforms with processes, association of landform photos with processes and concepts. Bring a calculator.

Keywords and Concepts Since the Mid-Term

Fluvial

Hydrologic Cycle / Water Budget
Discharge
precipitation
infiltration
intensity
recurrence interval
width/depth ratio
channel area
wetted perimeter
hydraulic radius
gradient
interception
evapotranspiration
soil porosity
soil permeability
runoff
rain splash
suspended load
bed load
sheet erosion
rill erosion
gully erosion
channel flow
stream erosion
    shear
    abrasion (tools)
    corrosion
Q=VA
V=L/T
A=wd
P=2d + w
velocity profiles
discharge calculations
manning equation
R.I. / probability
energy expenditure
roughness coefficient
stream rating curve
gauging station
saltation
flotation load
magnitude-frequency relations
velocity-depth relations
viscosity
laminar flow
turbulent flow
reynolds number
froude number
tranquil flow
rapid flow
boundary condition
slope-discarge relations
stream power calculation
depth-velocity relations
width-velocity relations
sediment load
stream competence
stream capacity
vegetative effect on sed. load
dissolved load
bernoulli principle
    "fluid lift force"

turbulent flow
laminar flow
channel morphology
straight
meandering
braided
anastomosed
meander sinuosity
width/depth ratio vs. channel bank grain size relations
gradient vs. stream type
sed. load vs. stream type
meanders
point bar
cut bank
levee
floodplain
terrace
oxbow lake
oxbow cutoff process
pool-riffle sequences
overbank sedimentation
bankfull discharge vs. flood discharge
meander scrolls
centrifugal force
braid gravel bars
river base level
local base level
regional base level
graded profile
Fluvial System Factors
- slope
- base level
- climate
- discharge
- velocity
- sed. supply
- sed. load

aggradation conditions
degradation conditions
river entrenchment
knickpoints
knickpoint retreat
terraces / incision
drainage patterns
dendritic - flat rocks
trellis - folded rocks
rectangular - fractured rocks
radial - volcanoe
tectonic uplift vs. climate relations
terrace tread
terrace scarp
paleohydrology
slackwater deposits
paleoflood evidence in field
imbricated boulders
fan deposit
fan lobe
gradient decrease
flow expansion
deposition
arid fans
humid fans

Glacial Processes and Landforms

Glacier
Snowfield
Snow-firn-ice
Ice stratification/accumulation
Ice deformation
- Plastic vs. brittle

Plastic = internal flow
Brittle = crevasses/fracture
Ice Flow Mechanisms
- Basal sliding
- Internal deformation
- Plastic deformation
- Crevassing

Glacial surging
Glacial meltwater
Ice-water mixture
Glaciers as aquifers
Temperate glaciers = wet
Polar glaciers = dry
Alpine vs. Continental glaciers
Glacial advance
Glacial retreat
Ablation/melting
Zone of accumulation
Zone of ablation
Glacial erosion
- Plucking
- Abrasion
- Subglacial water flow

Glacial Deposits
- Drift
- Till
- Outwash
- Erratics
- Diamicton

Alpine Erosional Landforms
- Cirque
- Tarn
- Arete
- Cols/Horn
- U-shape valley
- Hanging valley
- Fjords
- Roche Moutonee
- Striated pavement

Alpine Depositional Landforms
- Moraine
- End Moraine
- Lateral Moraine
- Medial moraine
- Terminal moraine

Continental Landforms
- Drumlin
- Esker
- Kame
- Kettle
- Outwash Plain

Quaternary Climate Change

Pleistocene Ice Ages
Glacial/Interglacial Climates
Solar-Geothermal Exchange
Global climate change
Greenhouse effect
Greenhouse gases
Carbon Cycle
Quaternary Sea Level Curve
Evidence of Past Glaciation
- Continental Landforms
- Continental Deposits
- Marine Record
- Oxygen Isotopes
- Fossil Evidence
- Paleoclimatology

Laurentide Ice Sheet
Cordilleran Ice Sheet
Sea-Level Fluctuation
Global Sea Level Change

Pluvial Lakes
Great Lakes
Missoula Floods
Ice Cores
Glacial maximum
Oxygen isotope stages
Ice-Ocean Isotope Exchange
Ocean cores
Ice cores
100,000-43,000-20,000
Stable Isotope Analysis
Oxygen18/Oxygen16
Global ice budget
Global ocean budget
isotopic fractionation
"heavy water"
"light water"
glacial climate
interglacial climate
ice sheet
evaporation
late Wisconsinan ice
global sea level
eustatic sea level
deep sea drilling
O18 stratigraphy
O18/O16 ratio

global correlation
radiometric dating
orbital forcing
general circulation model
Milankovitch Theory
obliquity
eccentricity
precession
angle of earth tilt
orbital path
plane of ecliptic
Global Warming

Tectonic Geomorphology

convergent boundary
divergent boundary
transform boundary
mountain front
anticline
syncline
mountain building
normal fault
reverse fault
strike slip fault
plunging fold
non-plunging fold

joints
dip
strike
dip slope
scarp slope
anti-dip slope
lithologic resistance to erosion
sandstone-shale example
differential erosion
hog back
resistant bedrock
non-resistant bedrock
law of v-shape patterns
joint-fault erosion
lineaments
active mountain front
inactive mountain front
mountain front sinuosity
soils-fault relations
Steens Mtn example
fault scarp
butte / mesa
cap rock
fault scarp degradation
zig-zag mountains
differential erosion

Newberry Volcano Case Study
Lava flows
Pyroclastic debris
Ash-blocks-bombs
Lava vs. magma
Basaltic vs. rhyolitic
Cinder cone
Shield volcano
Cinder cone morphology
Height-width ratio
Cone relief
Cone slope
Cone degradation
Cone alignment
Brothers Fault zone
Tumalo Fault Zone
Walker Rim Fault Zone
Newberry caldera
East Lake
Paulina Lake
Cascade arc

Coastal Process and Neotectonics

coast
beach
tectonics
waves
tides
tsunami
storm surge
longshore drift
rip current
tides
gravity
pocket beach
marine terrace
wave-cut notch
wave-cut terrace
emergent coasts
submergent coasts
erosional coasts
depositional coasts
headlands
sea cliff
sea stacks
sea arches
wave-cut platform
uplifted coasts
sea level change
global sea level rise /fall
global climate cycles
interglacial / glacial
PNW tectonic setting
convergent
subductions
neotectonic uplift
relative sea level change
uplift vs. SL change
subsidence vs. SL change
global warming
density currents
thermal expansion of water
re-leveling surveys
tide-gage surveys
tectonic vs. sea level changes
seasonal wave activity in OR
winter vs. summer beaches
rock headlands
pocket beaches
littoral cell
heavy mineral / provenance
estuaries

Key Word Worksheets

glacier
alpine glacier
ice sheet
temperate glacier
polar glacier
snow-firn-ice
glacier ice budget – advance – retreat (explain)
brittle ice
visco-plastic deformation
basal sliding vs. internal deformation
zone of accumulation
zone of ablation
crevasse
abrasion and striation
quarrying or plucking
Cirque
Arête
horn
fjord
non-stratified drift
stratified drift
till
outwash
moraine
lateral moraine
end moraine
esker
drumlin
loess
kettle
bonus term: “pingo”
bonus term: “rock glacier”
Drainage Basin
Drainage Divide
Runoff (provide sketch)
Infiltration
Overland flow
Base flow
Flood hydrograph
Recurrence interval
Strahler Stream Order .
Drainage density
Channel gradient
Hydraulic radius
Discharge
Suspended load
Bedload
Dissolved load
Sediment yield
Laminar flow
Turbulent flow
Mannings Equation
Stream power
Abrasion
Denudation
Aggradation
Meandering channel
Vertical accretion
Braided channel
Floodplain (provide photo)
Levee (provide photo)
River terrace (provide photo)
Strath terrace (provide sketch)
Fill terrace (provide sketch)
Alluvial fan (provide photo)
Pediment (provide photo)
Delta (provide photo)

Other Lab skills / Concepts

Topographic Maps
landform identification
stream gradient calculation
hillslope gradient calculation
elevation / relief
topographic profiles
scale / vertical exaggeration
Air Photo Interpretation
3-D stereo view
landform identification
climate interpretation
scale determination
Fluvial Lab
work key equations:
- mannings
- continuity
- stream power
- recurrrence interval
- probability
- discharge
- unit conversions

determine stream gradient
channel profiles
river discharge measurements in field

-be able to identify fold and fold features from topographic maps

-understand the relationships from the “fluvial balance” model of aggradation and degradation

-be able to interpret relationships between tectonic uplift and global sea level change, can you identify which process is affecting a given sea level record

-how has global sea level changed during the late Quaternary, and why?

-make sure you can calculate slopes and gradients from topographic maps

-can you plot a ternary diagram using soil texture data?
-can you determine the recurrence interval of a given flood discharge?

- how about solving hydraulic flow problems using Manning's Equation and the Continuity Equation?

-what is the relationship between river load, type of sediment, and river morphology?
-can you identify landforms / geologic processes from air photos?
-how about identifying other landforms: e.g. point bar, cut bank, alluvial fans, deltas, lava flows, volcanoes?

- make sure you understand all of the concepts associated with the coastal geomorph. lab, as they apply to the pacific northwest.