ES322 Geomorphology Fall 2012 Final Study Guide

NOTE: The final exam is scheduled to start 12:00 PM on Tuesday Dec. 4.

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; review your map skills
- 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 125 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, glacial 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

Aerial Photographs

air photo
electromagnetic spectrum
visible light ROYGBIV
infrared
UV
Long wavelength
Short wavelength
wavelength
frequency
speed of light
reflected light
c = waveL x Freq
stereo pair
stereoscope
altitude / camera height
focal length
photo scale
relief displacement
principal point
vertical exaggeration
orthophoto
texture, color, patterns, shading
photo interpretation

Fluvial

Hydrologic Cycle /
Water Budget
Discharge
precipitation
infiltration
intensity
recurrence interval
width/depth ratio
channel area
wetted perimeter
hydraulic radius
gradient
channel flow
stream erosion
    shear
    abrasion (tools)
    corrosion
Q=VA
V=L/T
A=wd
P=2d + w
Wetted perimeter
velocity profiles
discharge calculations
manning equation
recurrence / probability
energy expenditure
roughness coefficient
stream rating curve
gauging station
magnitude-frequency
    relations
velocity-depth relations
slope-discharge relations
stream power calculation
depth-velocity relations
width-velocity relations
sediment load

stream competence
stream capacity
suspended load
bed load
saltation
flotation load
bernoulli principle
    "fluid lift force"
channel morphology
straight
meandering
braided
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
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
vegetative effect on sed. load
dissolved load
radial - volcano
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 / Law of V's
non-plunging fold
joints
dip
strike
dip slope
scarp slope
anti-dip slope
lithologic resistance to erosion
sandstone-shale example
differential erosion
hog back / cuesta
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

Glacier Key Word Worksheet

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"

River Key Word Search Worksheet

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)

Landform Keyword Worksheet

Alluvial Fan
Meandering River
Delta
Arroyo
Pocket Beach
Braided River
Moraine
Cirque
Cinder Cone
Fluvial Terrace
Wave-Cut Terrace
Debris Fan
Fault Scarp
Moraine
Incised Channel
Sea Stack
Drumlin
Pothole
Boulder Field
Scree Slope
Spit
Transverse Dune
Stratovolcano
Triangular Facet
Hogback
Braided Stream
Meander Scroll
Kame
Esker

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
- discharge
- unit conversions

determine stream gradient
channel profiles
river discharge measurements in field

-be able to identify fold and fault 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

- 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.

Process Rate Calculations

Basic map reading / landform identification from a topographic map.

From a topographic map, caculate hillslope gradient (in degrees, in percent, in ratio form)

Draw a topographic profile from a topographic map.

determine slope stability; calculate gradient and slope angle in degrees and percent

air photo scale calculations, other air photo calculations as in lab

identification of basic landforms and geomorphic process by examining aerial imagery

calculating the slope of stream channel or hillslope from a topographic map (in degrees and percent)

Aerial photography calculations: photo scale, height-displacement calculations, photo distortion principles, 3-d viewing of landforms.