

ES322 Geomorphology Fall 2008 Final Study Guide

NOTE: The final exam is scheduled to start 12:00 PM on Tuesday Dec. 9.

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

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

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
Nebraskan-Kansan-Illinoian-Wisconsinan

Sea-Level Fluctuation	global correlation	dip
Global Sea Level Change	radiometric dating	strike
Pluvial Lakes	orbital forcing	dip slope
Great Lakes	general circulation model	scarp slope
Missoula Floods	Milankovitch Theory	anti-dip slope
Ice Cores	obliquity	grabens
Glacial maximum	eccentricity	horst
Oxygen isotope stages	precession	fault-block mountains
Ice-Ocean Isotope Exchange	angle of earth tilt	half-graben
Ocean cores	orbital path	lithologic resistance to erosion
Ice cores	plane of ecliptic	sandstone-shale example
100,000-43,000-20,000	Global Warming	differential erosion
Stable Isotope Analysis	Industrial Carbon Flux	hog back
Oxygen18/Oxygen16		resistant bedrock
Global ice budget	<i>Tectonic Geomorphology</i>	non-resistant bedrock
Global ocean budget	convergent boundary	law of v-shape patterns
isotopic fractionation	divergent boundary	joint-fault erosion
"heavy water"	transform boundary	lineaments
"light water"	mountain front	active mountain front
glacial climate	anticline	inactive mountain front
interglacial climate	syncline	mountain front sinuosity
ice sheet	mountain building	soils-fault relations
evaporation	normal fault	Steens Mtn example
late Wisconsinan ice	reverse fault	fault scarp
global sea level	strike slip fault	butte / mesa
eustatic sea level	plunging fold	cap rock
deep sea drilling	non-plunging fold	fault scarp degradation
O18 stratigraphy	joints	zig-zag mountains
O18/O16 ratio		differential erosion

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
coastal geomorphic hazards
 beach erosion
 cliff erosion
 slope failure
 earthquakes
 flooding
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 Words from First Exam and Worksheet

resisting framework
 lithology
 rock structure
resistant vs. non-resistant
lithologies
isostasy
isostatic rebound
crustal uplift / isostasy
rates of crustal uplift
rates of crustal denudation
bedrock
regolith
residuum
colluvium
alluvium
diamicton
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

 recurrence 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?

-could you identify stream drainage types (dendritic, trellis, radial, etc.) 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.