Spring 2-1-2004

GEOL 595.01: Theories and Models of Landscape Evolution

Unknown
University of Montana - Missoula

Geology 595
Theories and Models of Landscape Evolution

Why do landscapes look the way they do? The sudden availability of digital elevation data and high-powered desktop computers have led many to explore landform analysis and the rules that might control morphology. Practical concerns about large-scale hydrologic modelling, sediment routing, and resource management demand a process-based analysis of landscapes.

This seminar is intended to provide an overview, through reading of classic and recent literature, of the various and evolving approaches to the problem of landscape evolution. We will begin by reading some of the earliest works on landscape evolution, in which the authors were just beginning to formulate general theories on how landscapes change over time. These papers will then be followed by early attempts at converting conceptual models of landscape evolution into numerical models. We will then end by reading about some of the most recent models in which the authors attempt to fully couple tectonic and climatic processes with surface processes. The underlying theme of the class will be to answer the following questions:

1) Are the conceptual models accurate descriptions of what we observe in the real world?
2) Do the numerical models faithfully represent the conceptual models?

Each class participant will present at least one paper and will actively contribute each week to the discussion of the other papers – always come to class prepared to ask questions about the paper. Things to include in your presentation:

1) Place the paper within the larger context of the field,
2) Highlight key assumptions (stated and unstated), and
3) Describe how the results are limited/determined by the methods used (particularly important with the numerical models).

The papers will be put on reserve in the library – you will need to make your own copies. I haven't yet hammered out the full schedule but here's what I have so far:

Date	Paper
Jan 26	Introduction
Feb 2	*Report on the Geology of the Henry Mountains,* GK Gilbert, 1877 *The convexity of hilltops*, GK Gilbert, 1909
Feb 9	*The Geographical Cycle*, WM Davis, 1899
Feb 16	Holiday
Feb 23	*Erosional development of streams and their drainage basins*, RE Horton, 1945
Mar 1	*Morphological Analysis of Landforms,* W Penck, 1953
Mar 8	*Interpretation of erosional topography in humid temperate regions*, JT Hack, 1960
Mar 15	*Hillslope process-response models*, MJ Kirkby, 1971

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Mar 15	*Hillslope process-response models*, MJ Kirkby, 1971
Mar 22	*Topographic Evolution of Collisional Mountain Belts ,* PO Koons, 1989
Mar 29	Holiday
April 5	*Evolution of the Santa Cruz Mountains*, RS Anderson
April 12	*Hillslope processes, drainage density, and landscape morphology*, G Tucker, RL Bras
	Results from a new model of river basin evolution, G Willgoose, 1991
April 19	Gilchrist & Summerfield, Tucker and Slingerland
April 26	Beaumont, Kooi, Willet
May 3	Willet

Tucker
Kooi and Beaumont
Willet

Kooi, H. and C. Beaumont (1994) Escarpment evolution on high-elevation rifted margins; Insights derived from a surface-processes model that combines diffusion, advection and reaction, *J. Geoph. Res.*, **99**, 12,191- 12,209

Beaumont, C., Kooi, H. and Willett, S., 1999. Coupled tectonic-surface process models with applications to rifted margins and collisional orogens, in: *Geomorphology and Global Tectonics*, ed. M.A. Summerfield, 29-55, John Wiley and Sons Ltd.