ESCI 4XXX: Coupling Geomorphic Processes, Part 1

Class Information

Topic: Coupling Geomorphic Processes, Part 1
Location: Tate Hall XXX
Week: 10a
Time: T 10:00am - 11:15am

Goal and Student Learning Objectives

The main goal for today is to understand how to couple geomorphic processes to create a landscape evolution model. By the end of this course you will be able to:

- Describe the role of fluvial, hillslope, and tectonic processes in landscape evolution
- Compare the spatial and temporal scale effects of each process on landscape evolution
- Experiment with the fully coupled interactive landscape evolution model
- Define dynamic equilibrium in the context of landscape evolution

Key Idea: Fluvial erosion carves valleys, hillslope diffusion erodes hilltops and fills valleys, and tectonic uplift generates landscape relief. Together they create realistic-looking landscapes.

Pre-Class Learning Activities

Have students read and familiarize themselves with the lesson's notes before class. In class, we will review over these notes and use the website to complete our in-class activities.

Class Schedule

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Time	Topic	Activity + Classroom Assessment Technique
10:00am - 10:05am	Welcome and Check-in	
10:05am - 10:10am	Mini-Lecture on Tectonics (Geomorphic Process 1)	
10:10am - 10:15am	Mini-Lecture on Fluvial Erosion (Geomorphic Process 2)	
10:15am - 10:25am	Fluvial Erosion Parameters	Interactive Model 1: Advection + Muddiest Point + Group Discussion
10:25am - 10:30am	Mini-Lecture on Hillslope Transport (Geomorphic Process 3)	
10:30am - 10:40am	Hillslope Transport Parameters	Interactive Model 2: Diffusion + Focused Listing + Group Discussion
10:40am - 10:45am	Mini-Lecture on Interactive Landscape Evolution Model	
10:45am - 11:05am	Coupling Geomorphic Processes	Interactive Model 3: Landscape Evolution + Minute Paper + Group Discussion
11:05am - 11:15am	Summary + Next Steps	Question Time + Discussion

In-Class Activities + Assessments of Learning

Throughout this class, students and their neighbor(s) will complete the following in class activities that are centered around three interactive numerical models. In addition, have students discuss the following questions corresponding to each in-class activity.

- Interactive Model 1 (Advection), **Muddiest Point**: It is important that the students understand how they are expected to interact and learn from the interactive models. Before moving to the next activities, have students answer the following question: "What was the muddiest point in ?" We will use the answers to this question to direct the discussion about the first interactive model.
    - Discussion Q1: What is the unit of celerity; what is its significance?
    - Discussion Q2: Where is the celerity term greatest; where is it the smallest?
- Interactive Model 2 (Diffusion), **Focused Listing**: Before covering the natural processes that contribute to hillslope diffusion; have each student group create a list of as many processes that they can think of that can drive hillslope diffusion. Give gophers (Goldy!) as an example (bioturbation). The goal of this activity to have students connect physical processes to the mathematical expressions.
    - Discussion Q3: Where does the landscape experience erosion; where does it experience deposition?
    - Discussion Q4: What happens to the landscape after hillslope diffusion is applied over a long period of time?
- Interactive Model 3 (Landscape Evolution), **Minute Paper**: Hand students half a sheet of paper and have them answer the following questions: "What is the most important point you learned today?"; and, "What point remains least clear to you?" Use the responses, to reemphasize important points and clear up misconceptions during the Summary + Next Step parts of the class.
    - Discussion Q5: What is the role of each geomorphic process in landscape evolution?
    - Discussion Q6: How does the landscape configure itself after long-periods of evolution?