Modeling Land Biogeochemistry

**Term**  
Spring 2016

**Meeting Time**  
Tuesday Period 4-5 (10:40am – 12:35pm); MCCB 3086 (Computer Lab)  
Thursday Period 4 (10:40am – 11:30 pm); MCCB 3086 (Computer Lab)

**Instructor**  
Stefan Gerber  
3179 McCarty Hall  
Phone: 352-294-3174  
sgerber@ufl.edu

**Office hours**  
Thursday 12:30pm to 2:30 pm or by appointment

**Course Description**  
Dynamic land models are widely used as part of Earth system models and serve to represent exchange of energy (heat radiation momentum), water, carbon, and nutrients between land and the atmosphere ocean system. We will investigate how biological processes are formulated mathematically to capture the broad range of plant functioning on a regional to global scale. We will particularly address how such processes are represented and resolved in a model code. We will then make use of a land surface model to explore effects global environmental change on vegetation and land surface dynamics.

**Objectives**  
By the end of this course, students will be able to  
- Describe processes represented in a dynamic global land model  
- Apply and evaluate global land models for global change and biogeochemistry research  
- Describe linkages between land carbon cycles, water cycles, and climate  
- Assess restrictions and limitations of mechanistic land surface model.

**Course Format**  
3 credit course where contact hours are divided into a two hour and one hour period per week. The weight of lecture, computer lab and discussion shifts during the semester with focus on lectures initially, and moving towards labs and discussion with the progression of the semester.

**Course text:**  
Reading assignments will be available on the course website https://lss.at.ufl.edu/ in form of scientific papers. Optional, further reading include the following titles  
- Climate Change 2013 - The Physical Science Basis Contribution of Working Group I to the Fifth Assessment Report of the IPCC (available online www.ipcc.ch)  
- Jacobson M.C. et al., 2000, Earth System Science from Biogeochemical Cycles to Global Change
**Course Parts**

*Introduction into mathematical representation of processes*
- Plant photosynthesis
- Soil water dynamics
- Plant carbon allocation
- Mortality and fire
- Decomposition
- Vegetation Dynamics

*Modeling land surface processes*
- Introduction in modeling structures and concepts
- Numerical representation of land surface processes
- Application of a dynamic global land model

*Project: Application of a global dynamic land model to investigate land surface dynamics*
- Project development execution and analysis in consultation with instructor
- Discussion of individual/group projects in class

**Grading System**

Grading consists of individual assignments, group work and an individual final project. Throughout the semester, students will work on individual modeling lab assignments. Additional graded assignments are group projects, where students will explore model features. Important: Grading will *not* focus on specific model outcome but the student’s work will be evaluated based on critical examination of model formulation, and discussion of model behavior and results. Therefore, active participation and willingness to experiment is a must.

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<td>Individual Assignments</td>
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<td>A-</td>
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<td>Modeling League Assignments</td>
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<td>B+</td>
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<td>Final Project/Report</td>
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**Course Requirements:** A minimal proficiency of calculus (e.g. MAC 2233: Survey of Calculus 1; PHY 2048 Physics with Calculus 1, or similar), as well as some programming experience in a basic computer language such as C or FORTRAN (e.g. COP3272: Programming using C) is advantageous but not a requirement.
**Class Attendance:** Not necessary, but omitting substantial portions of the class will hamper the student’s ability to complete the required assignments in a satisfactory manner and will affect the grade.

**Class Demeanor and Etiquette:** Students are expected to be considerate and respectful towards fellow students, teaching assistants, instructors, and guest lecturers. This includes a behavior that is not disruptive to class such as punctual attendance, the silencing of cell phones and similar electronic devices, and avoiding private conversations.

**Academic Honesty:**
All students are required to abide by the Academic Honesty Guidelines which have been accepted by the University (http://www.dso.ufl.edu/studentguide/studentrights.php)

**Software Use:** All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

**Campus Helping Resources** Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- **University Counseling & Wellness Center,** 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/) (Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library Training Programs, Community Provider Database)

- **Career Resource Center,** First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)

**Students with Disabilities** The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)