Regional Hydrologic Modeling

BRE 549 – 3 Credits CRN 36921 Winter 2018 MWF 4-5:00, Graf 210

Instructor: Kellie Vache

Office: Gilmore 232

Office Hours: By appointment

Objectives

Develop fundamentals of modeling concepts, model calibration and error/uncertainty analysis applied to watershed scale and incorporating representations of land surface and hydrologic processes. Applications of *remote sensing*, *digital elevation models* (*DEMs*), other distributed databases (e.g. *NDVI* for vegetation and *STATSGO* for soils) within geographic information systems (*GIS*) to hydrologic modeling. Demonstrations and "hands-on" experience with watershed modeling procedures including *HBV-Light* (Univ. of Zurich), *TOPMODEL* (Univ. of Lancaster), Soil Water Assessment Tool (SWAT, UT), Envision (OSU), and depending upon timing and interest, Hydrologic Modeling System (*HEC-HMS*) (Hydrologic Engineering Center, USACE), Distributed Hydrology Soil Vegetation Model (*DHSVM*) (PNNL, U. of WA), *MIKE SHE* (Danish Hydraulics Institute), as well as other watershed models.

The overall goals are to (1) provide an opportunity to understand the types of watershed-scale hydrology models available to engineers and scientists and (2) gain experience in setting up models and interpreting results from these types of models.

Organization

The class will focus more on computer modeling labs, project work, and readings – less on lectures. There will be approximately 1 model-based lab each week, with a brief report turned in for each. Each student will also develop an independent modeling project, described below.

Assignments (50%)

Weekly or bi-weekly assignments based on exercises with a particular simulation model. We will also include period reading assignments based on relevant papers. Assignments will be turned in as pdf files through Canvas with a 10% penalty if late (and not pre-arranged).

Term Project (50%)

The term project will focus on the application of a hydrological model to instrumented watershed. The particular model will be selected by the student, based on their own needs and interests. The project will include definition of model setup including boundary and initial conditions, model calibration and error analysis. Each student will present a written (10 pages maximum) and oral (15-min presentation including Questions / Answers) report. The oral reports will be given to the class during the last week of the quarter. In addition to the final paper and oral report, 2 progress reports will also be turned in. See Project2018.doc for additional details.

Schedule (Subject to some modification during the quarter)

Week	Date	Topic	Notes
1	1/8/2018	Introduction.	
	1/10/2018	HBV – A simple lumped rainfall-runoff model	
	1/12/2018	HBV – A simple lumped rainfall-runoff model	
2	1/15/2018	No Class - MLK Holiday	
	1/17/2018	HBV lab	Topic Review 1 due
	1/19/2018	HBV lab	
3	1/22/2018	DEM and Spatial Analysis. Guest Lecturer: Jason Kelley, BEE	Exercise 1 AND Model paper review due
	1/24/2018	DEM and Spatial Analysis lab	
	1/26/2018	DEM and Spatial Analysis lab	
4	1/29/2018	Monte Carlo Analysis Toolkit (MCAT) – Model error and uncertainty analysis	Exercise 2 AND Topic Review 2 due
	1/31/2018	MCAT Continued	
	2/2/2018	MCAT Continued	
5	2/5/2018	Water Evaluation and Planning System (WEAP) – A model focused on Integrated Water Resource Management (IWRM)	Exercise 3 AND model objectives due
	2/7/2018	WEAP continued…	
	2/9/2018	WEAP continued…	
6	2/12/2018	METRIC	Exercise 4 due
	2/14/2018	METRIC continued…	
	2/16/2018	METRIC continued…	Topic Review 3 due
7	2/19/2018	Soil Water Assessment Tool (SWAT) – GIS-focused watershed modeling with some emphasis on water quality SWAT continued…	Exercise 5 due
	2/21/2018	SWAT continued…	
	2/23/2018	SWAT continued…	
8	2/26/2018	QUAL-2kw. A river temperature and water quality model	Exercise 6 due
	2/28/2018	QUAL-2kw continued…	
	3/2/2018	QUAL-2kw continued…	
9	3/5/2018	Envision – Agent-based simulation of landscape change with plugin models characterizing regional hydrology.	Exercise 7 due
	3/7/2018	Envision continued…	
	3/9/2018	Envision continued…	
10	3/12/2018	Project Presentations	Exercise 8 due
	3/14/2018	Project Presentations	
	3/16/2018	Project Presentations	Final project report due

Some Key references – not required, but might be useful

Beven, K. J. (editor). 1997. *Distributed Hydrological Modelling*. Advances in Hydrological Processes, John Wiley & Sons, Chichester, UK. 348 pp.

Singh, V. P. and D. K. Frevert (editors). 2002. *Mathematical Models of Large Watershed Hydrology and Applications*. Water Resources Publications, Highlands Ranch, Colorado. 891 pp.

Singh, V. P. and D. K. Frevert (editors). 2002. *Mathematical Models of Small Watershed Hydrology*. Water Resources Publications, Highlands Ranch, Colorado. 950 pp.

Beven, Keith. J. 2002. *Rainfall-Runoff Modelling – The Primer*. John Wiley and Sons, Chichester, UK.

A word on accommodations for students with disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu (Links to an external site.). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.