

## **Climate Change and Scenario modelling in Catchments with SWAT (SWAT lab. course)**

### **ECTS credits:**

2 ECTS

### **Course parameters:**

Language: English

Level of course: PhD course

Time of year: May 2019

No. of contact hours/hours in total incl. preparation + assignment: 25 hours + 25 hours

Capacity limits: 9 participants including the Centre of Excellence project 'BIOWATER' PhD students

### **Objectives of the course:**

Simulation of catchment hydrology and water quality responses are increasingly used in watershed management and policy making for facing the challenge of future land use change and climate change. In response to a growing demand and new applications, the Aarhus University has designed and hosted a basic SWAT course of "Catchment modelling with SWAT" in May 2018. The course helped PhD students to gain a comprehensive basis for understanding and working with the Surface Water Assessment Tool (SWAT) that are most widespread applied in the world for simulation of catchment processes in particular related to topics such as land use and climate change assessments.

This course is a follow up of the basic SWAT modelling course and students therefore will acquire a working, state-of-the-art knowledge of the basic concepts and methods used in SWAT and have a working experience with SWAT model from their own catchment study. In this regard the objectives of the course are:

- To give students a thorough understanding of scenario analysis at catchment scale.
- To give the students a basic understanding of GCM RCP predictions.
- To learn students how to download and construct climate change scenarios considering dynamic downscaling of the climate change scenarios (RCPs) that is predicted by the General Circulation Models (GCMs)
- To learn students how to perform statistical evaluations of their calibration and validation runs with models.
- Problem solving related to set up, calibration and validation of the catchment model of students own study catchments.

### **Learning outcomes and competences:**

At the end of the course, the student **should be able to:**

- Use a catchment model to analyze effects of changes in a catchment (e.g. to run the land use or /and climate change scenarios).

- Gained knowledge on how to statistically assessing the outcome of SWAT calibration and validation runs.
- Apply a downscaling method of General (global) circulation models (GCMs) RCP predictions, on their own study catchment.
- Have a basic understanding on the concept of scenario and different ways for scenario design.

### **Compulsory programme:**

Reading of literature before the course, active participation in lectures and exercises and a final report with assessment of downloaded climate change data for their catchment.

### **Course contents:**

1. Problem solving for:
  - a. Setting up of SWAT model in Q-SWAT,
  - b. Calibration of SWAT model in SWAT-CUP and validation utilizing statistical methods,
  - c. Scenario Simulation in Q-SWAT
2. Dynamic downscaling of predicted climate change using different emission scenarios (RCPs) from different General Circulation Models (GCMs).
3. Concept of the scenarios and the use of scenario analysis for estimation of the effect of mitigation measures on reduction of diffuse water pollution

### **Prerequisites:**

Basic knowledge of GIS, have a basic knowledge on SWAT model and having done their own first SWAT model setup on a catchment.

### **Name of lecturers:**

NN. Guest lecturer from SMHI about Global Climate Modelling (GCMs) and Representative Concentration Pathways (RCPs).

Assistant Professor Eugenio Molina-Navarro, Department of Geology, Geography and Environment. University of Alcalá (Madrid, Spain). ( Lab. exercises),

Post Doc Fatemeh Hashemi, Bioscience, AU (Downscaling methods for GCM RCP's and scenario building in modelling)

Senior Scientist Hans E. Andersen, Bioscience, AU (Introduction to climate scenarios in SWAT and model calibration and validation assessment)

Professor Brian Kronvang, Bioscience, AU (PhD course responsible and introduction to ensemble model scenarios and downloading of GCM RCP data)

### **Type of course/teaching methods:**

Lectures, exercises and model lab exercises.

**Literature:**

Literature will be provided ahead of course start and is expected to be read by the participants as part of preparations for the course. The material will include 4-5 selected international papers and 3-4 selected book chapters.

**Course homepage:**

None

**Course assessment:**

A presentation of their own dynamic downscaling of RCP's from GCM's and their first climate scenario SWAT model results at the end of the course with an oral evaluation from teachers.

**Provider:**

Department of Bioscience, Aarhus University in collaboration with the Nordic Centre of Excellence project 'BIOWATER'.

**Special comments on this course:**

Participants are expected to bring with them their own initial calibrated SWAT setup for a catchment.

**Time:**

27-29<sup>th</sup> May 2019

**Place:**

Department of Bioscience, Aarhus University Campus, Aarhus

**Registration:**

Deadline for registration is 15. March 2019. Information regarding admission will be send out no later 1. April 2019.

If you have any questions, please contact Post Doc Fatemeh Hashemi, e-mail: fh@bios.au.dk or Professor Brian Kronvang, e-mail: bkr@bios.au.dk.