Assignment 7: Starting with the hydrological model CWatM

Due: Wednesday 13 March, 14:30 of Week 8

Instructions

Please form groups of maximum 3 persons to do the assignment this time. Please submit your report as a PDF file **individually** via Blackboard before the specified due date. To do this, navigate to the assignment, attach the PDF, and then click 'Submit'. If you encounter any difficulties in completing the assignment, first try to find solutions online (e.g., CWatM tutorials, documentation, and stack overflow), and then seek assistance from the instructor.

Background

Hydrological models are powerful tools to understand hydrological processes and water balance and support water management. In the coming weeks, we will use the Community Water Model (CWatM) as our hands-on tool to practice and understand hydrological processes, water balance components and to assess the impact of human activities on water resources. This week, we will download and set up CWatM for running on your laptop and we will conduct the first simulation with CWaM.

Part 1: Downloading and installing CWatM

1. Download CWatM from Github: https://github.com/iiasa/CWatM
2. Download relevant data from here: https://github.com/iiasa/CWatM-Earth-30min
3. Creating a new virtual environment specially for CWatM requirement
4. Installing required python libraries under this virtual environment
5. If you don't have them yet, we recommend downloading and using an advance text editor (notepad ++) and netCDF viewer (Panoply)

Tools helpful for review codes, text files and data

Text editor

CWatM configuration information (settingsfile) is stored in a text file, which can be read by Windows notepad. But we strongly recommend a better text editor (e.g., Notepad ++ here)! You can use any text editor you are familar with.

NetCDF viewer

CWatM data and output are often stored as netCDF files. It can be diffiuct to handle. To view input and output data on Windows, you can use the Panoply netCDF viewer: here

Part 2: Running CWatM for the first time

1. In Anaconda Prompt, navigate to where the first tutorial of the model
   cd /path/to/your/model/CWatM/Tutorials/01_Turn-ON
2. Make sure your virtual environment is active

3. Run the model for the first time:
   python ../../run_cwatm.py

Part 3: Running CWatM with a configuration file

1. Make a copy of the configuration file for exercise 01_Turn-ON (settings_Rhine-30min_Tutorial-1.ini)
2. Using your preferred text editor to view your copy of the settings file, and pay special attention to the components of
   a. [FILE_PATHS]
   b. [MASK_OUTLET]
   c. [TIME-RELATED_CONSTANTS]
   d. [OUTPUT]

For more information on this, please refer to the relevant section in the CWatM documentation: https://cwatm.iiasa.ac.at/setup.html

3. Run the model with this configuration file
   python ../../run_cwatm.py settings_Rhine-30min_Tutorial-1.ini –l
4. Check the output folder

Error handling if needed: https://cwatm.iiasa.ac.at/tutorial.html#test-the-python-model-version

Part 4: adjusting configuration file and running CWatM

1. Change the simulation period to at least 3 years (in total) of your choice (between 1961-2010) with one year spin-up
2. Add at least one more gauging station to get model output, e.g., 9.25 49.75
3. Plot the hydrographs at the two gauging stations and submit the figure (using Excel, Python or any other software of your choice)
4. Provide yearly total ET and runoff maps of the whole period. Please explain the units.
5. Check with available information (e.g., Google search, Google scholar) to verify and explain whether your values (for discharge, ET and/or runoff) make sense.
6. Calculate the water balance (without storage change ΔS) at any grid in the Basin.

Remember to change your output file name in [FILE_PATHS] section and create a corresponding new folder for new model run.

The final report should be in pdf format, including

- Name of your group members,
- Your simulation period (including the spin-up period) and the coordinates of the added gauging station(s),

- The plots of hydrographs with legend and unit,
- The maps for ET and runoff (e.g., export from Panoply, generate using matplotlib),
- Brief texts to reflect on whether the values make sense and
- Water balance without storage change (optional – bonus point).