

Information on the supplementary Matlab script “CARVE—CAtchment-scale enviRonmental Variable Extraction.m”

Introduction

The script goes with the manuscript “**A global temperature control of silicate weathering intensity**” by Deng et al. (2022, *Nature Communications*).

The script was written in the Matlab release R2020a by Dr. Kai Deng. You are allowed to redistribute the script under the condition of giving appropriate credit, meaning citing the paper of Deng et al. (2022) and this code file (via DOI).

This script provides a template for extracting river basin outlines and basin-scale environmental variables, including several topographic metrics and mean annual temperature (MAT) as some examples. Please note that this script relies heavily on multiple functions provided by the Matlab-based software TopoToolBox 2 (Schwanghart and Scherler, 2014).

Input variables

“Sample”: the sample name. Example: “Example”.

“Loc”: the geographic location of a sediment sample ([longitude latitude]). Example: [121.2502 28.7533]

How to run the script

1. Download Matlab code package TopoToolBox 2 (available at <https://github.com/wschwanghart/topotoolbox>) and the grid dataset of MAT (available at <https://www.worldclim.org/data/worldclim21.html>, “Bioclimatic variables- bio 30s-wc2.1_30s_bio_1.tif”). The path of both files should be indicated in the script using function “addpath”. Rename the MAT grid data file as “MAT.tif”. The downloading process may take e.g. half an hour due to the large file size.
2. A good internet connection is required when running the script (for downloading DEM data).
3. Replace both input variables (Sample and Loc) with your own sample data.

4. Run the whole script.
5. Output files will be saved in the folder “Results”.

Output files

1. A .pdf file. A figure indicating the river network and the sampling point will show up at last and will be saved as a .pdf file.
2. A .xlsx file. The excel file includes the following information: sample name, longitude (deg), latitude (deg), centroid longitude (deg), centroid latitude (deg), flow length (km), drainage area (km²), mean elevation (m), mean local slope (deg), max. relief (m) and mean annual temperature (deg).

Expected run time

For normal desktop computer, it takes several minutes to process one sample.

Example

We use the geographic information on sample JiaoJiang_SPM_1 as an example (provided in the .m file). This sample is included in Supplementary Table 3 from Deng et al. (2022, *Nature Communications*). The output files including Example.pdf and Example.xlsx are provided.

Reference

Schwanghart, W., Scherler, D., 2014. Short Communication: TopoToolbox 2 – MATLAB-based software for topographic analysis and modeling in Earth surface sciences. *Earth Surf. Dynam.* 2, 1-7.