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| **Protocol**  Meeting Bachelor Thesis, FS 2024 | | | | | | | | | | | |
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| **Protocol-No.:** | 06 | | | | | **Project name:** | Bachelor Thesis | | | | |
| **Meeting type:** | Discussion | | | | | **Location:** | GIUB, Bern | | | | |
| **Date / Time:** | 21.05.2024 / 15:00 | | | | |  |  | | | | |
| **Topic / Goals:** | Global Modelling | | | | | | | | | | |
| **Lead:** | Benjamin Stocker | | | | | **Logger:** | Patricia Gribi | | | | |
|  | | | | | | | | | | | |
| **Participants** | |  |  | | **E-mail** | | | **Present** | **Excused** | **Distribution** |
| Prof. Benjamin Stocker | |  | GECO-Group | | benjamin.stocker@unibe.ch | | | x |  |  |
| Patricia Gribi | |  | Unibe | | patricia.gribi@students.unibe.ch | | | x |  |  |
|  | | | | | | | | | | | |
| **Items discussed:** | | | | | | | | | | | |
| 1 global Modelling | | | | | | | | | | | |
| **Next meeting:** | | | | **Attachments:** | | | | | | | |
| * 29.05.22/15.00 | | | |  | | | | | | | |

| *(Legend for type: D = Decision, P = Pending, I = Information)* | Typ | Resp.: | Date: |
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| Modelling |  |  |  |
| * **Potential Evapotranspiration Calculation:** An alternative methodology involving the conversion of PET values into mass units was employed. This alternative approach utilizes the cwd::pet() function, as opposed to employing the function cwd::convert\_et(). * **pet():** will be calculated in the next step | I |  | 14.05 |
| * A parameter for the pet() function is **surface pressure**. Since the NetCDF files of the CMIP6ng data do not contain information about elevation or altitude, the pressure value cannot be provided as a parameter. To address this issue, the ETOPO1 digital elevation model was regridded to the model's grid, allowing the determination of height above sea level for each grid cell. Steps taken:   + Copied etopo\_NA\_NA to own folder. Tried to run proc\_etopo.sh but cdo is not installed. Then I tried to run proc\_etopo.R but the library(rbeni) is depreciated for the current R version.   + Therefore another method will be employed using the terra::raster function, the regridding should be possible | P |  | ASAP |
| * Installed all required packages and forked cwd\_global. | I |  | 14.05 |
| * **cwd\_global:** forked repo for the global cwd data and cloned it locally.   + **1.** **map2tidy:** The 'map2tidy' function is utilized to extract longitude "stripes" across the entire time-series dataset. It writes data to .rds files for each longitude index. Map2tidy returns the complete time series as nested data frames in column `data`. In the repository's 'analysis\_folder', the 'make\_tidy\_cmip6' function was updated to work for all variables. This way, tidy data frames are created for each longitude, covering the full time-series data.   + **2. apply\_cwd\_global:** Creates a tibble containing the indices of longitudinal points to be processed. Partitions this tibble across multiple cores for parallel processing using the multidplyr package. Applies the cwd\_byilon function to each longitudinal index in parallel, reading data from the input directory, processing it, and saving the results to the output directory with a specified file prefix.   + **3. cwd\_byilon:** adjusted function for all the needed variables. Adjusted file paths. CWD and PCWD are applied separately and written in specific directory.   + **2. cwd/pcwd function:** Should return in the end the cwd and pcwd timeseries as a nested dataframe: longitude/latitude should be in separate columns, while the gridcells in rows contain in another column the nested time-series. The daily values but also the annual maxima should be returned. | I |  | 14.05 |
| Literature |  |  |  |
| **Overview about this work:**   * When the roots are deep, they can compensate for a greater water deficit. The soil texture defines the water-holding capacity, and together with the root-depth these two parameters constitute the water root zone storage capacity (S0) (see Chapter 3.8.1 in LES). * CWD is a unit that can be directly associated with measurable quantities and is expressed in millimeters. It corresponds to the storage of water in the root zone and can therefore be linked to the root depth and soil texture. * We use model simulations to examine how CWD changes. Other metrics that measure the water balance could also be considered. The reason we focus on CWD is that it measures the effect of precipitation timing. Understanding the annual average amount of precipitation alone is insufficient to comprehend CWD increases. It is essential to know when the precipitation occurs and how the days with precipitation align with radiation. * In summary, CWD is a useful index that combines all these effects: the timing and total amount of precipitation, radiation, and temperature effects, quantified in millimeters. This can then be measured in ecosystems, considering root depth and soil texture. * PCWD is not dependent on the actual amount of water that evaporates but rather on how much could potentially evaporate. It is purely a meteorological measurement and does not depend on vegetation behavior (therefore considered as atmospheric forcing). If there is a trend in PCWD, it indicates a trend in meteorological droughts. * There are models that account for limited root depth, which show drying in large parts of the world. This means that an increase in PCWD in these regions does not necessarily correspond to an increase in CWD. CWD cannot increase further because it is already dry. It would be interesting to observe the regional differences between CWD and PCWD. | I |  | 21.05 |
| * **Addition Introduction:** Research the overlaps with other indices that measure drought and the added value that CWD and PCWD provide. | P |  |  |
| * Read the Chapter Ecohydrology to get an overview about the topic | P |  |  |
| Workflow |  |  |  |
| * I have two different functions for cwd and pcwd | I |  | 19.05 |
| * **Test:** To verify the functionality of the workflow, the code should initially be executed for a single longitudinal band. | P |  |  |