Practice on drought indices calculation

PREPARATION STAGE

➤ Install FileZilla Client for data management of RHEAS.

Access RHEAS data by:

➤ File/Site Manager/New Site, then in the General tab type in:

Input Host: 203.170.246.170, pot: 21, User: ftpuser, and password: _ftpuser_

➤ In the Logon Type: choose Normal, then click on Connect

Now we can access all the RHEAS data. Please copy all necessary data for exercise to the desktop.

Add RHEAS Extension to ArcTool Box through ArcCataloque

➤ Copy the REAHS_Extension data to drive C
➤ Open ArcCatloque then click on ArcToolbox
➤ Right click on the ArcToolbox and select Add toolbox…to add extension
➤ Browse to the folder A_Source under RHEAS_Extension folder
➤ Then click on the file RHEAS_Extension_C.tbx, then click Open; RHEAS_Extension_C is added to the AcrToolbox with three sub tools including RHEAS_preprocessing, RHEAS_processing, and RHEAS_statistics

DROUGHT INDICES CALCULATION

• **SPI and SRI (the same case)**

In the folder of C_SPI_Calculation under RHEAS_Extension, the folder:

- CRainfall: cumulative rainfall
- Rainall: the estimated daily rainfall exactly as the days to be calculated for SPI
- SPI_MRC: folder for outputs
- SRainfall: all rainfall data (30 days of daily rainfall for SPI calculation); S means Source

Input data needed to fill in:

- SRainfall (all days over 30 days for SPI calculation): copy all daily rainfall to cover 30 days earlier for days of SPI we want to calculate
- Rainfall (daily rainfall for calculated days of SPI only): copy exactly the rainfall of the days we need to calculate for SPI

➤ Double click on 01_spi_mrc under the RHEAS_processing tool of the AcrToolbox to run SPI. Cumulative rainfall will be also calculated in the process.
➤ Repeat from the input data for SRI by following the same steps

- **SMDI**
  1) **Cumulated Soil Moisture (CSM)**

Input data needed to fill in:

- Sml1 (daily soil moisture data exactly the same as those we need to calculate SMDI): copy the data to this folder
- Ssml1 (all days over 7 days for SMDI calculation): copy all daily rainfall to cover 7 days earlier for days of SMDI we want to calculate

➢ Double click on soil_moisture_cumulated under the RHEAS_preprocessing tool of the AcrToolbox to calculate Cumulative Soil Moisture (CSM). CSM values have now been calculated.

  2) **Generate a 0 value of SDMI for the first starting week**

We need to generate the first week data of SDMI and assume it has 0 value for all pixel. We can do it by multiply any soil data with 0 through Map Algebra tool.

➢ Under Spatial Analysis Tools click on Map Algebra and Raster Calculater
➢ Multiply any raster let say CSM with 0
➢ Export the 0 value SMDI and name it smdi_2018_xxx for 1 week earlier and save it in the SMDI folder
➢ Copy for all 5 days for SMDI calculation and name them accordingly

  3) **Compute SMDI**
➢ Run 03_sdmi_mrc under RHEAS_processing tool of ArcToolbox
Now the SDMI values have been generated for the proposed days in the SDMI folder

- **CDI**
➢ Copy all SPI, SRI, and SDMI data which have recently computed to the folders respectively (make sure the files have consistent names especially the ending forecast or newcast with esp or nmme etc.)
➢ Run 04_cdi_mrc under RHEAS_processing tool of ArcToolbox
Now the CDI values have been generated for the proposed days in the CDI folder

- **Dry Spells and Drought Condition**
  The two indicators are calculated simultaneously.
  All CDI values which is < -1.5 is considered as dry day
  Dry Spell is the consecutive dry day period starting from 0 to 365 for one year calculation.

  Dry Condition:
  When Dry Spell is less than 15 days it is considered as short-term dry
  When Dry Spell is longer than 14 days it is considered as long-term dry

  To run:

➢ Copy CDI files to the folder G_Days_Calculation/CDI
➢ Copy one empty map to the folder Dry Spell and name the file ds_date of one day before the day of calculation for Dry Spells.
➢ Run 05_dryspells_mrc of the RHEAS_processing

Results of the Drought Condition:
- 0: no drought
- 1: short-term drought
- 2: long-term drought

- **Days without rainfall**
  This indicator calculates consecutive no rain days to show how many days there iss no rain for a particular area.
➢ Copy original rainfall data to the Rainfall folder of the H_RAIN_DAYS_Calculation
➢ Copy an empty map or previous day to the folder Days to start. It is considered as the starting day of calculation which is one day earlier. So name it dr_2018xxx 1 day before the date of calculation.
➢ Run 06_days_norain_mrc of the REHAS_processing