**An eco-hydrological model for grassland without historical measured data I: Downscaling expansion of evaporation based on refinement of sensitive parameters**

**Purpose:**

In the "sun-climate-water resource" system, meteorological elements have different lag periods for influence factors such as solar activity (SA), climate oscillation (CO) and geographical factors (GF) at different spatiotemporal scales. However, this phenomenon has been insufficiently investigated. It is unclear whether the strong interaction/lag behaviors of meteorological elements responses to SA/CO that were calculated, statistically true and realistically possible. There is also insufficient information regarding the reasons and their weights for lag variation in different regions. Moreover, the transmission mechanism of the lag is also unclear. To overcome this knowledge gap, we studied temperature (T) and precipitation (P) data collected over 121 years from 3,836 grid stations across China. The spatial distribution of T and P, strong interaction periodic distribution responses to SA and CO, and hysteresis distribution were studied under six periodic scales (0–5, 5–10, 10–30, 30–60, 60–90, and 90–120 a). The weight distribution of lag influencing factors was plotted using false color RGB to represent SA, GF, and CO; a multivariate hysteresis decomposition model was proposed to simulate and quantitatively decompose the periodic lag considering the factors of the earth’s revolution.

All generated methods used in this study can be downloaded from https://github.com/myli1993/MYEH\_Downscaling-expansion-of-evaporation-based-on-refinement-of-sensitive-parameters. And generated data can be downloaded from https://pan.baidu.com/s/1b64StoFNrZVMKPIFAz\_VhA and the extract code is MYEH.

**Reference**:

**Programming instructions:**

[input\_1dy,output\_1dy,input\_3hr]=ehm\_Evap\_prepare:

**Data:**

In the eva\_result.mat, we provide the input data and output data. We're going to talk about what all the variables mean.

**Input set:**

A: Scope of study area, 1 for study area, 0 for non-study area.

input\_1dy: Input data for training stage. There are 26 Variables in the dataset. We define them in **Table 2. Input and output variables of MYEH-Eva module evaporation simulation module during training stage**. You can find it in the research. The interval for each variable is 1dy.

input\_3hr: Input data for simulation stage. There are 26 Variables in the dataset. We define them in **Table 2. Input and output variables of MYEH-Eva module evaporation simulation module during training stage**. You can find it in the research. The interval for each variable is 3hr.

output\_1dy: Output data for training stage. There are 7 Variables in the dataset. We define them in **Table 2. Input and output variables of MYEH-Eva module evaporation simulation module during training stage**. You can find it in the research. The interval for each variable is 1dy.

**output set:**

Evap\_1dy: Simulate evapotranspiration. There are 7 Variables in the dataset. The eighth column is the value calculated according to formula 1 of the original text. We define them in **Table 2. Input and output variables of MYEH-Eva module evaporation simulation module during training stage**. You can find it in the research. The interval for each variable is 1dy.

Evap\_3hr: Simulate evapotranspiration. There are 7 Variables in the dataset. The eighth column is the value calculated according to formula 1 of the original text. We define them in **Table 2. Input and output variables of MYEH-Eva module evaporation simulation module during training stage**. You can find it in the research. The interval for each variable is 3hr.

net: MYEH model Eva module. You can find all parameters in the net.

result: Simulation result. We use 6 evaluation indices to compare the simulation value and observed value.

snowjudge: Naive Bayes model results.

**Statement:**