

## 基于GLASS的西北内陆区生态系统水分利用效率研究

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- ❖ 西北内陆区水资源短缺，开发程度超限。
- ❖ 变化环境下生态治理的水文效应，在水资源视角下能否可持续？
- ❖ 生态系统的水分利用效率状况、影响因素及驱动机制亟待厘清。

### 研究方法

$$\Delta WUE = \frac{\partial WUE}{\partial GPP} \Delta GPP + \frac{\partial WUE}{\partial ET_a} \Delta ET_a$$

$$= \Delta WUE_c + \Delta WUE_{CO_2} + \Delta WUE_s = \overline{WUE_v} - \overline{WUE_r}$$

$$\Delta GPP = \Delta GPP_c + \Delta GPP_{CO_2} + \Delta GPP_s = \overline{GPP_v} - \overline{GPP_r}$$

$$\Delta ET_a = \Delta ET_{a_c} + \Delta ET_{a_{CO_2}} + \Delta ET_{a_s} = \overline{ET_{a_v}} - \overline{ET_{a_r}}$$

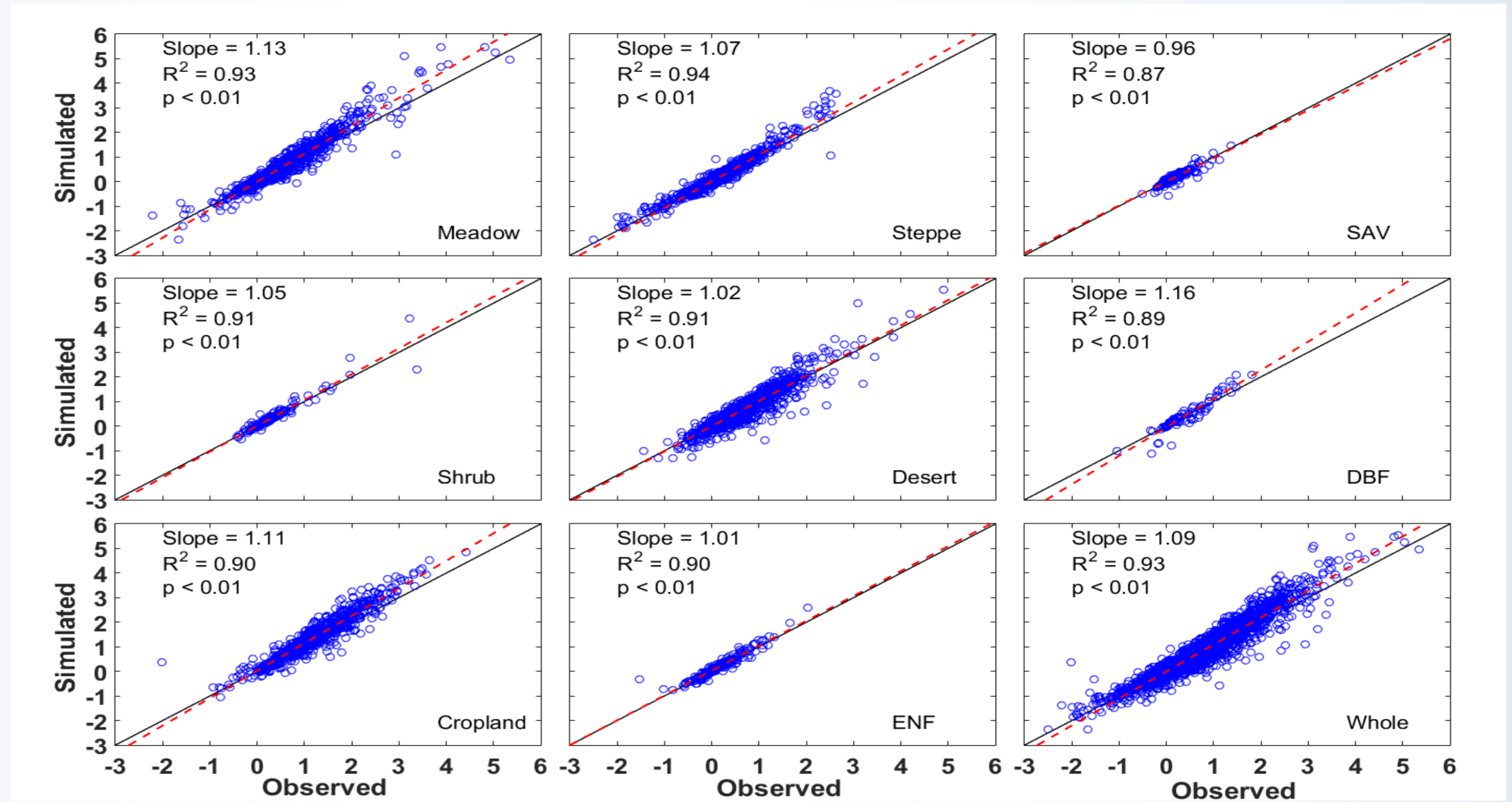
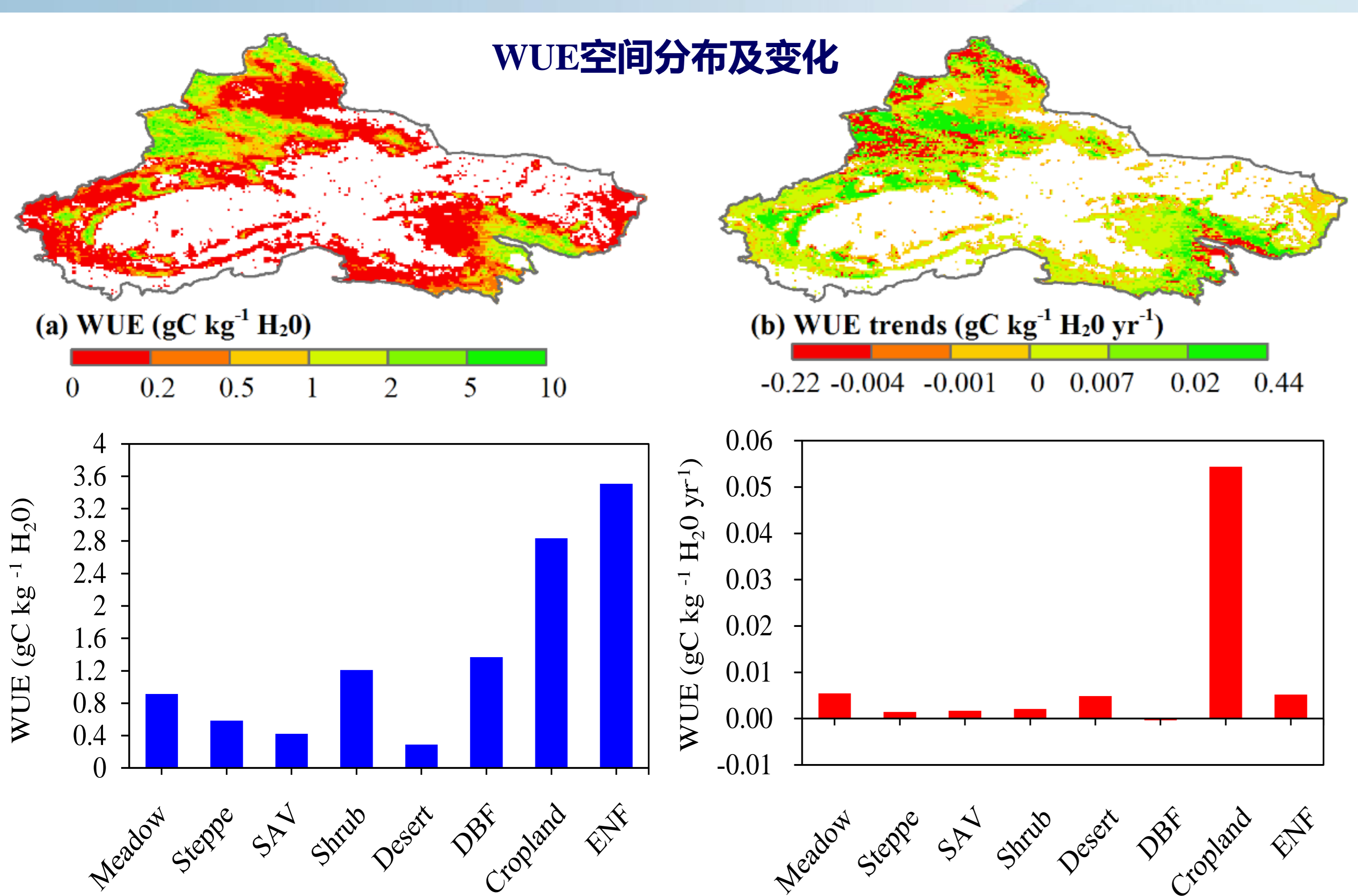
$$\Delta ET_a = \left( \sum \varepsilon_{X_i} \frac{\Delta X_i}{X_i} \right) ET_a \rightarrow \varepsilon_{X,Y} = \frac{\bar{X} \sum (X_i - \bar{X})(Q_i - \bar{Q})}{\sum (X_i - \bar{X})^2} = \rho_{X,Y} \frac{C_Y}{C_X}$$

### 数据来源

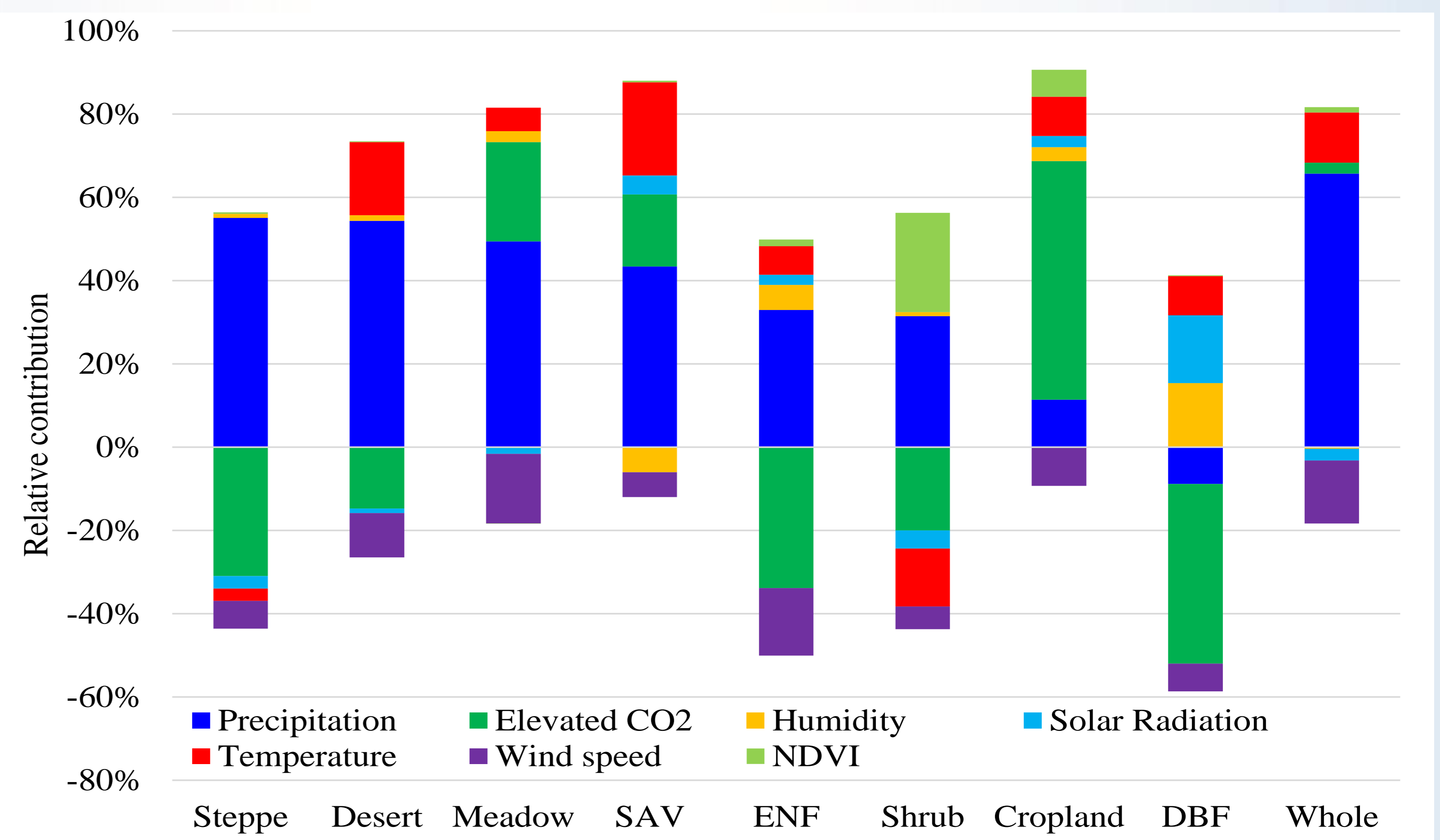
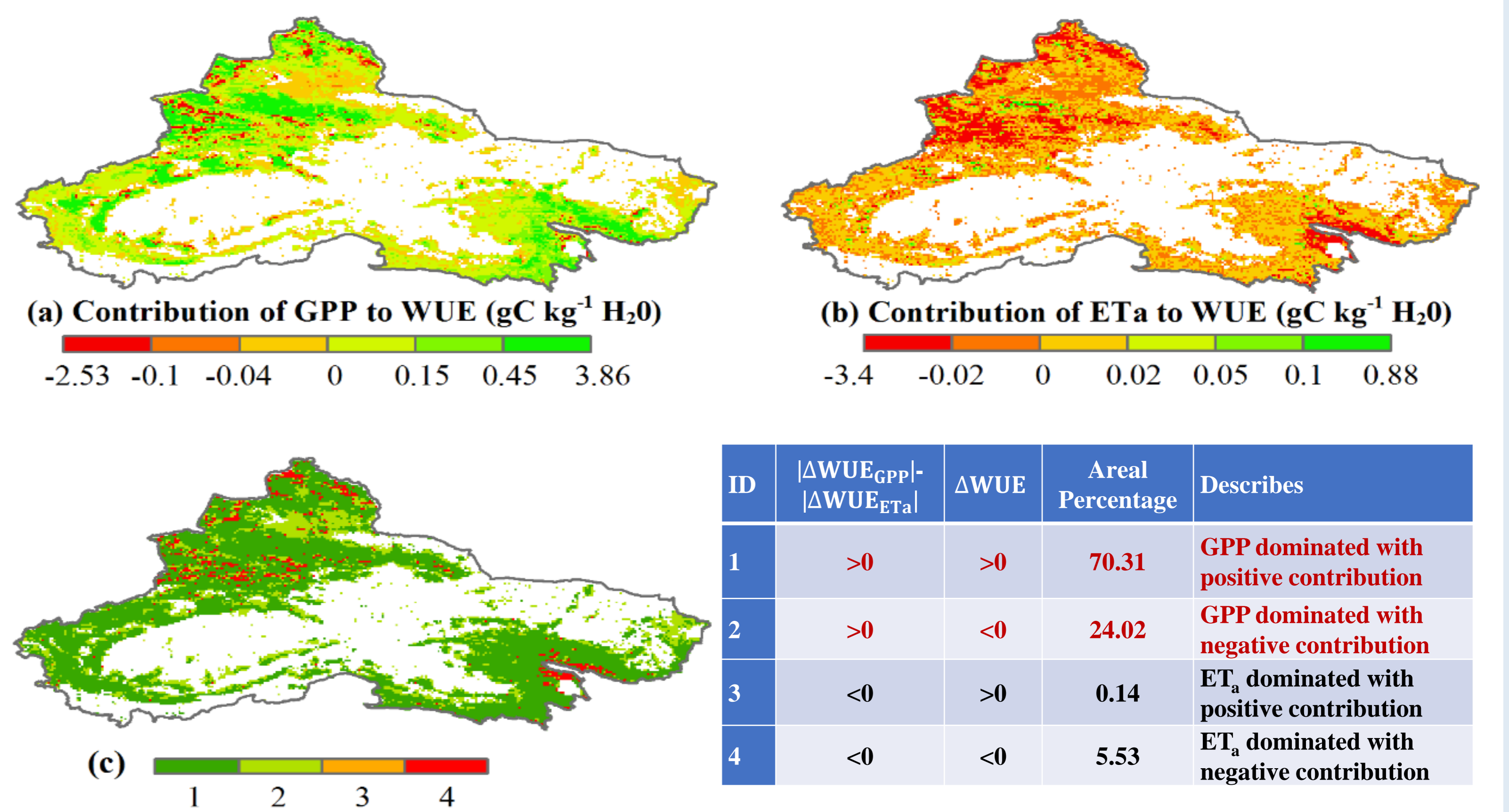
- ◆ **气象数据**: China Meteorological Forcing Dataset (CMFD), 0.1°, 3 h, 包括气温、降水、辐射、风速、湿度、气压 (<http://westdc.westgis.ac.cn/>);
- ◆ **GPP数据**: Global Land Surface Satellite (GLASS), 0.1°, 16 day, (<http://www.geodata.cn/>);
- ◆ **植被覆盖数据**: MODIS Collection 5 Land Cover Type product (MCD12Q1), 500 m (<https://lpdaac.usgs.gov/>);
- ◆ **NDVI数据**: GIMMS 1981-2015, 8 km resolution, NDVI3g 数据集;
- ◆ **蒸散发数据**:

ET <sub>a</sub>	Methods	Resolution	Time Span	Resources
GLASS	Bayesian model averaging method with AVHRR	0.05°	1982 to 2017	Yao et al. (2014)
CR	Complementary Relationship with CMFD data	0.1°	1982 to 2015	Ma et al. (2019a)
GLEAM v3.3	Priestley and Taylor method with data assimilation scheme	0.25°	1980 to 2018	Martens et al. (2017)

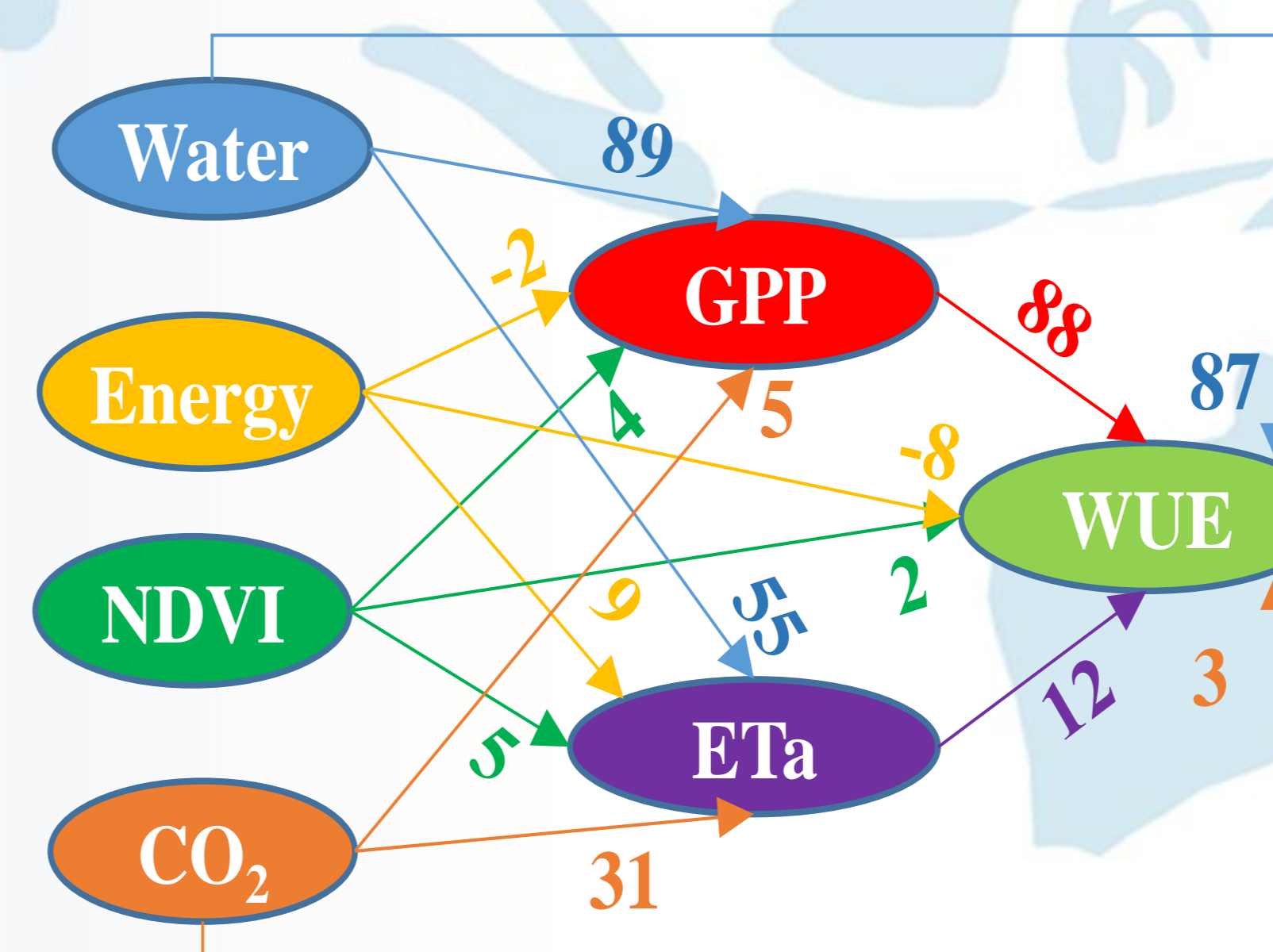
### 研究结果



栅格尺度上不同植被类型WUE变化计算对比



### WUE变化归因分析



### 参考文献:

- Linshan Yang, Qi Feng, et al. Variation in actual evapotranspiration and its ties to climate change and vegetation dynamics in northwest China. *Journal of Hydrology*, 2022, 607, 127533
- Linshan Yang, Qi Feng, et al. Contributions of climate, elevated atmospheric CO<sub>2</sub> concentration and land surface changes to variation in water use efficiency in Northwest China. *Catena*, 2022, 213, 106220

