Water use efficiency (WUE) is defined as the ratio between gross primary production (GPP) and evapotranspiration (ET) at ecosystem scale, which can help understand the mechanism between water consumption and crop production in guiding field water management. Water consumption control is important in precision agriculture development. Mapping WUE at field scale using remote sensing data could provide crop water use status at high resolution and acquire the WUE spatial distribution.

In this study we proposed a method to estimate field-scale maize WUE with Sentinel-2 data. The GPP of maize is estimated by a light use efficiency model with RS observed albedo, sunshine radiation, fraction of photosynthetically active radiation ($f_{\text{par}}$) fitted using in site observation. Maize ET is modelled using FAO-PM model with crop coefficient simulated using vegetation indexes acquired from Sentinel-2 bands.

## Data

### Site Information
- **EC Site**: Huailai
- **Location**: 40.35° N, 115.79° E
- **Data acquisition period**: 2017/1/1-2017/12/31

### Maize Phenology

### Satellite data

<table>
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<th>Satellite</th>
<th>Blue</th>
<th>Green</th>
<th>Red</th>
<th>NIR</th>
<th>SWIR1</th>
<th>SWIR2</th>
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<td>Band 2</td>
<td>Band 3</td>
<td>Band 4</td>
<td>Band 8A</td>
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</table>

## Method

1. **Combining the phenology development of maize**, the temporal characteristics of maize WUE change is associated with phenology. WUE was low after sowing, then increased during Elongation stage. Maize WUE peaked at Heading and Grouting period and decreased in Maturation stage.
2. Our WUE estimation method with high resolution could guide adopting various irrigation strategies based on different WUE conditions at field scale. This research could help shed light on the future WUE development under climate change background and improve our knowledge of precise water management.

## Conclusions