

<b>Title MSc project:</b> How crops respond to climate extremes in Europe?	
<b>Assignment number</b> 22.24	<b>Internal project</b>
<b>Head graduation committee</b> Dr. ir. Martijn Booij	<b>Daily supervision</b> Dr. Han Su
<b>Required courses</b> Water and Climate or Water Footprint Assessment	
<b>Involved organisations</b> UT-MWM	<b>Start of the project</b> flexible
<b>Short description project aim and motive</b>	
<p>Extreme climate events, e.g., droughts, heatwaves, and floods, will become more frequent as projected by current climate models. These events may have severe consequences for crop production, which threaten our food security and resilience. One way to assess the impacts of climate extremes on crop production is the use of a crop model. However, the reliability of these crop models to assess impacts of climate extremes has been questioned recently. Most of the crop models were developed decades ago, where the focus was on crop growth and yield production under normal climate conditions rather than extreme events. Some evidence has shown that most of the current crop models underestimate the impact of climate extremes on crop production. Crop models included so far are process-based and more complicated than empirical-based and more simplified models. Considering the tight climate agenda, it is becoming more and more unrealistic to develop new crop models within years for impacts of climate extremes. There are a few simplified empirical crop models that can reflect a certain level of climate extremes, but how well these models can describe the impact of climate extremes is unclear.</p>	
<b>Research objective</b>	
<p>The objective of this assignment is to test the ability of two crop models (AquaCrop (process based) and AEZ (more simplified crop model)) to assess the impact of different climate extremes on one or two crops in Europe.</p>	
<b>Data availability</b>	
<p>AquaCrop and AEZ are available online. The candidate can start from the default crop parameters. Observations on crop yield are also available from a public database.</p>	
<b>Approach</b>	
<ol style="list-style-type: none"> <li>1. Get familiar with AquaCrop and AEZ crop model, choose crops and regions to be simulated;</li> <li>2. Use historical climate data, to identify climatic extreme events (droughts, heatwaves, and floods);</li> <li>3. Simulate crop yield under climate extreme events using the two crop models;</li> <li>4. Compare simulations with observations; conclude on the ability of these two models in describing impacts of climate extremes;</li> <li>5. Write thesis</li> </ol>	
<b>References</b>	
<p>Schewe, J., Gosling, S.N., Reyer, C. et al. State-of-the-art global models underestimate impacts from climate extremes. Nat Commun 10, 1005 (2019). <a href="https://doi.org/10.1038/s41467-019-08745-6">https://doi.org/10.1038/s41467-019-08745-6</a>  Official website of AquaCrop: <a href="https://www.fao.org/aquacrop/en/">https://www.fao.org/aquacrop/en/</a>  Official website of AEZ model: <a href="https://gaez.fao.org/">https://gaez.fao.org/</a></p>	