Water stress and irrigation

Gunther Krauss

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Objective

Run a model with and without water stress. Compare the annual yields and try to compensate yield loss by irrigation. The yearly yields should always be more than 90% of the potential yearly yields.

Calculate the overall water use efficiency (sum of yields divided by sum of irrigation amounts) and try to maximize it by varying amounts and irrigation dates. Consider only those simulations as valid, where the yearly yields are at least 90% of the potential ones.

Materials

Use the modeling framework Simplace to run the crop model **Lintul2** together with the soilwater model **Slim**. Data and solutions are provided by us. Soil parameters are for a typical sandy loam soil, weather data is from the NUTS2 region AT11 (Burgenland, Austria).

The data is provided in the zip file `waterstress.zip`. Please unpack the file and copy the whole folder `waterstress` into the folder `SIMPLACE_WORK\sim`. The `SIMPLACE_WORK` folder is normally located in your home directory `C:\Users\`*your_username*`\`.

The simulation outputs (csv files) are written to the folder `SIMPLACE_WORK\output\sim\waterstress`.

Methods

There are three different solutions you can run in the framework

- `NoWaterstress` - to calculate the potential yield without water stress
- `Waterstress` - to calculate yield under water stress condition and irrigation on two days per year. Irrigation days and amount are the same for all years.
- `WaterstressIrrigYearly` - to calculate yield under water stress condition and irrigation on two days per year. Irrigation days and amount can be chosen individually for each year. You can change the days and amount in the file `...\waterstress\data\irrigation.csv`.

Hints

- Don't use simple guessing (brute force) to find the optimal days and amounts for irrigation. Look at related outputs (water content, water stress etc.) to get a hint when irrigation might be useful.
- Do more than one iteration - once you found an irrigation setting, that gives you good yields, try if you can get even better by using less water. If you can't reduce the water amount anymore, try to vary the irrigation days.