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# Local impacts of possible climatic modifications on micrometeorology and transpiration of maize canopy in Hungary

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The aim of the present study was to investigate the local effects of global warming on maize's microclimate (inside canopy air temperature, vapor pressure and transpiration) using the modeling tool. In our study we applied the Crop Micrometeorological Simulation Model (CMSM) of *Goudriaan* (1977) modified by *Chen* (1984). The basis of the functioning models follows the way of the incident solar radiation in the different layers of the canopy. The inputs of the model were collected at Keszthely Agrometeorological Research Station (Hungary). Our purpose was to get information about the response of locally grown maize to the possible future climate variation.

In the simulation four scenarios were applied. In the following description only those input parameters are mentioned that we have changed during the simulation runs.

- **Control**: it represents the present climatic conditions (average July day, average soil moisture content in this period, and 380 ppmv ambient $CO_2$ concentration. The value of LAI was 3.0, the characteristic mean for maize grown at Keszthely.
- **Scenario 1**: $CO_2$ concentration was doubled together with reduction of soil water content by 25%. In addition we reduced LAI to 2.3 and increased hourly temperature with 1.3˚C.
- **Scenario 2**: $CO_2$ concentration was elevated to 760 ppmv with reduction of soil water content by 35%. We reduced LAI to 2.0 and we rose the temperature by 2˚C.

- **Scenario 3**: $CO_2$ concentration was doubled to 760 ppmv with intense reduction of soil water content (50%). The reduction in LAI was strong, 1.8 and we increased the temperature by 3˚C.

Daily sum of transpirations were almost the same in the different scenarios. There were 3.93, 3.88, 4.06 and 3.9 mm/day in the control, in Scen. 1, 2 and 3 runs, respectively.

The deviance from the control in case of inside canopy air temperature was

- 1.58˚C in daily average (1-24 hours) and 1.15˚C in daytime mean (8-19 hours) in Scen. 1.,
- 2.07˚C in daily average (1-24 hours) and 1.5˚C in daytime mean (8-19 hours) in Scen. 2.
- and 2.55˚C in daily average (1-24 hours) and 2.8˚C in daytime mean (8-19 hours) in Scen. 3.

The difference from the control in case of inside canopy vapor pressure was

- 0.83 mbar in daily average (1-24 hours) and -0.82 mbar in daytime mean (8-19 hours) in Scen. 1.,
- 0.9 mbar in daily average (1-24 hours) and -1.12 mbar in daytime mean (8-19 hours) in Scen. 2.
- and 0.74 mbar in daily average (1-24 hours) and -1.04 mbar in daytime mean (8-19 hours) in Scen. 3.

At elevated CO2 concentration slight increase in ambient air temperature (1-3˚C) had no significant influence on daily water loss of maize, even at moderate decrease in soil moisture. Although the inside air temperature in maize rose, doubled CO2 moved the stomata to closure. Daytime decrease in vapor pressure inside the stand strengthened this assumption.