

Interactive comment on “Canopy temperature and heat stress are increased by compound high air temperature and water stress, and reduced by irrigation – A modeling analysis” by Xiangyu Luan and Giulia Vico

Anonymous Referee #1

Received and published: 4 December 2020

The manuscript presents a new model analysis of the combined effect of water and heat stress. The results are based on the parametrization of wheat during anthesis. The manuscript is well written and structured. The new model formulation and results are relevant to a broad audience. The supplementary describes the model formulation and assumptions in great detail with appropriate references.

The major points to reconsider are the hydrology of the model and the irrigation. The results suggest that the temperature difference ($T_c - T_a$) is sensitive to the soil moisture value. The main nonlinearity seems to be at around 0.33 (Fig. S2).

C1

The drainage and runoff are handled by removing instantly all water above the s_1 value. Is this a good assumption during all the different precipitation scenarios and irrigation? It may be that discarding instantly runoff and drainage and not including any ponding may not be realistic in the high precipitation case ($P=1100$ mm) for 30 cm root-zone depth. What was the ratio of drainage and runoff to precipitation in the different simulations? Have the authors considered modeling the drainage using for example hourly time step when soil moisture exceeds the field capacity? Or some other more explicit approach that might increase the time soil stays wet? Could a more explicit approach to drainage, runoff and ponding result in a larger difference in the results between the soil textures? Allowing drainage and runoff to operate for a longer time may be important when analyzing the 21 day period.

The irrigation is triggered whenever soil water potential reached the intervention point which is just above the water stress point of wheat. It would be nice to know what was the resulting average irrigation frequency with this strategy? Is this frequency similar to the typical wheat irrigation frequency? Was the target soil water potential for irrigation optimized to result in typical wheat irrigation frequency? Report also the amount of irrigation and its ratio to precipitation in the result section.

Specific comments:

L45: "are directly affected high air temperature"

L98: Should you rephrase this question? The results and discussion seem to only report that irrigation cannot completely remove the heat stress but there seems to be no quantification of this effect?

L127: In what sense superficial? Perhaps, surface runoff?

L166: What is the basis of the precipitation parameters? Is intermittent case based on some estimate for some region?

L298: Reference missing.

C2

