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Hydrology and Earth System Sciences Discussions

Interactive comment on "Irrigation enhances precipitation at the mountains downwind" *by* J. Jódar et al.

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Specific comments

- P2, L 7 to 17, the comment that all AGCMs agree on increase precipitation because of irrigation is argued by some researchers. Despite the fact that far more studies and model experiments support positive moisture feedback, there exist some studies concluding opposite results, or at least do not support positive moisture climate feedback. Giorgi et al. (1996) in their numerical experiments over the Central Unites States for the two climatic extremes (1988 drought and 1993 flood) found that the effect of local recycling of evaporated moisture is not important as compared to the large-scale moisture fluxes and synoptic cyclonic activity. It is even concluded that a dry initial soil con-

dition provides increased sensible heat flux, causing greater air buoyancy, enhancing convective systems and hence providing more precipitation (i.e., a negative moisture feedback process). Author's Response: We understand the point and will rephrase the paragraph to take into account the different studies addressed to investigate the positive and negative feedbacks between soil moisture and precipitation.

- Could the increase of precipitation be attributed to climate change? The analysis could have been stronger if such cc effects were first singled out.

Author's Response: We do not think so. We included the reference stations precisely to address this issue. We point in the paper that rainfall has decreased significantly overall in both basins. This is confirmed by the reference stations. Rainfall decreases in all of them. This observation is consistent with long term GCM model predictions, which consistently yield significant rainfall reductions in Southern Spain. While we are not expert to tell whether the reduction in reference stations does reflect cc, it is clear that cc would not produce an increase in the stations located in the mountains downwind of irrigated areas. We expand a bit the discussion in the revised version of the paper.

- The discussion of the results could have been more interesting if the statistical result is supported by analysis of the feedback mechanisms, i.e. what actually happened? Is the increased precipitation attributed to more atmospheric moisture as supplied by evapotranspiration from irrigation field? How much is this compared to oceanic moisture flowing in the area? is it caused by changes occurred to the thermodynamic of the water column, i.e., more ET implies more energy to atmospheric boundary layer, and hence more chance for convective precipitation?

Author's Response: We agree that the point would have been stronger. We suspect it is mostly the latter effect. Unfortunately, we are not experts in atmospheric science and cannot tell for sure. We hope that the reviewer suggestion will be taken up by some atmospheric modeler. We will add a paragraph with speculations in the discussion

section and pointing for the need to address this issue..

Typing errors P5, L19, Let consider change to Consider P6, L4, H0 respect to ...change to H0 with respect to ....

Author's Response: We will correct this

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