

Vulnerability of groundwater resources to irrigation under climate change in the Mediterranean: an assessment for Portugal and Morocco

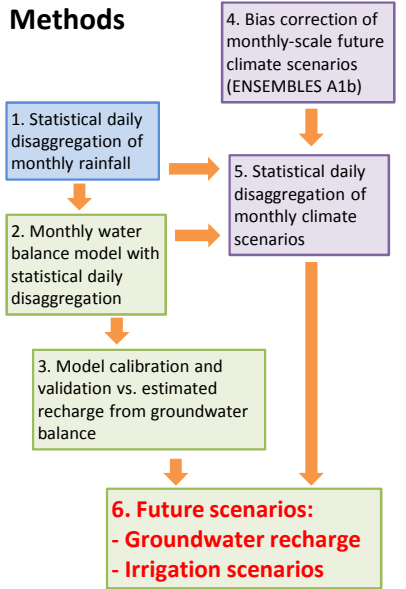
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Introduction

Groundwater is an important resource for irrigation in dry Mediterranean regions; however, it is often under pressure from both over-exploitation and the regular occurrence of drought years. Global climate change could threaten this resource due to higher temperatures and lower rainfall rates, which could increase irrigation needs and lower groundwater recharge, threatening the sustainability of agriculture activities which depend on this resource.

Methods



Study sites

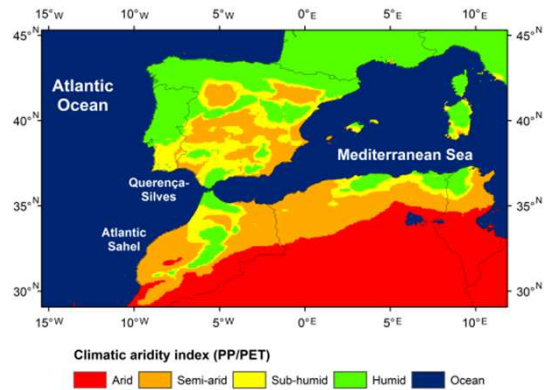
Querença-Silves

Dry sub-humid climate
Permanent cultures (orange trees) requiring irrigation each year.

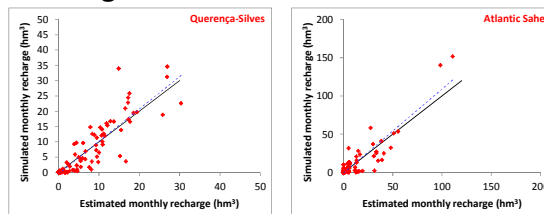


Atlantic Sahel

Semi-arid climate
Irrigated cultures (vegetable gardens, corn) changing according to annual rainfall

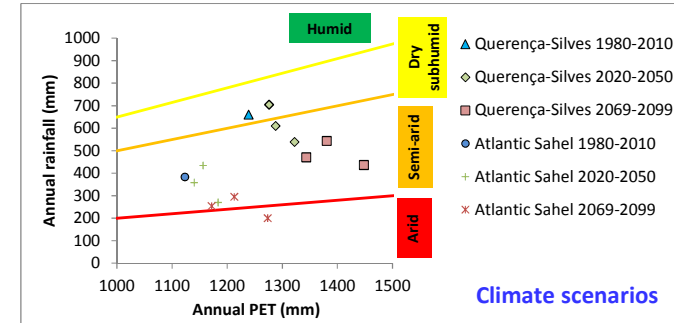


Recharge Model Calibration

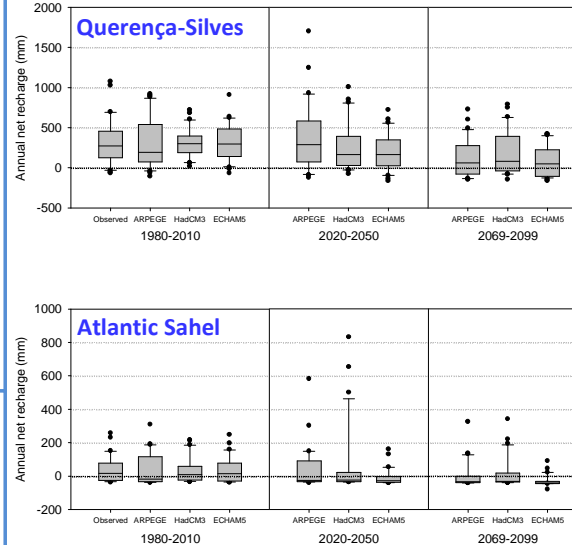


Results

Climate scenarios tend to show little change in rainfall by 2020-2050 which, coupled with higher temperatures, still leads to higher Potential Evapotranspiration (PET) and slightly higher climatic aridity. By 2069-2099, however, scenarios show a larger decrease in rainfall and higher increase in PET, with important shifts toward climatic aridity in both sites.



Net Recharge (recharge – irrigation)



The higher climatic aridity leads to lower rainfall and higher irrigation demands, lowering net recharge and increasing the number of years with negative recharge. This increases water exploitation (irrigation/recharge) in both sites. The Atlantic Sahel is already close to extreme water stress; the most severe scenarios would lead to water scarcity. The Portuguese site could reach water stress situations but would not go beyond the over-exploitation limit. However, the Moroccan site might be more resilient to climate change, since a drought adaptation process is already in place. The tree crops on the Portuguese site, depend on permanent irrigation and could be threatened by more frequent years with negative recharge.

More information:
www.cesam.ua.pt/jpcn

