Divergent effects of climate change on future groundwater availability in key mid-latitude aquifers

*Min-Hui Lo[1], Wen-Ying Wu

1. National Taiwan University

Groundwater provides critical freshwater supply, particularly in dry regions where surface water availability is relatively limited. Climate change impacts on groundwater storage could affect the availability and sustainability of freshwater resources. Here, we used a fully-coupled climate model to investigate changes in groundwater storage over seven critical aquifers that have been identified as significantly distressed by satellite observations. We assessed the potential climate-driven impacts on groundwater storage changes throughout the 21st century under the business-as-usual scenario (RCP8.5). Results show that the climate-driven impacts on GWS (groundwater storage) changes do not necessarily reflect the long-term trend in precipitation; instead, the trend may result from changes in transpiration, enhancement of evaporation, and reduction in snowmelt, which collectively lead to divergent responses of GWS across different aquifers. While two of them (the Southern Plains and the Middle East) are projected to become more stressed with climate change, our results also suggest the potential for enhanced future groundwater use in some of the currently most overstressed aquifers. Finally, we compare the climate-driven and anthropogenic pumping impacts. The reduction in GWSs is mainly due to the combined impacts of over-pumping and climate effects; however, the contribution of pumping could easily far exceed the natural replenishment.

Keywords: groundwater withdrawal, natural climate variability

