Texas Tech University, Plant and Soil Science Spring Seminar 2024

Title: Understanding Climate-Groundwater Feedbacks Using Data Driven and Integrated Hydrologic Modeling Approaches

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Location: MCOM 83 (Texas Tech University campus)

Date/Time: Wednesday, April 3rd / 1200:1:00 PM

Abstract

Groundwater supports one-third of the world's population and provides 42% of the agricultural water supply. Global groundwater depletion has accelerated in recent decades, reducing our resilience to severe and prolonged droughts. Despite the importance of groundwater in the terrestrial hydrologic cycle, our understanding of groundwater response time and recovery from meteorological droughts is limited. To address this knowledge gap, we utilized groundwater level and streamflow observations across the Continental US to quantify groundwater and baseflow lag time and recovery during droughts and identify processes that control those responses. In mountain-valley aquifer systems where mountains provide more than 50% of the water supply for downstream users, increases in the severity of snow droughts will likely have large influences on the sustainability of valley-fill aquifers. Therefore, characterizing groundwater recharge in high-elevation mountainous critical zones, where mountain-valley aquifer connectivity is poorly understood, is challenging. Analyses of hydrometric and geochemical observations from the Kaweah River Watershed in the Southern Sierra Nevada shows that mountain block recharge contributes to 31-53% of recharge, indicating greater connectivity between the Sierra Nevada and the valley aquifer than previously thought. Hence, the integration of multiple types of observations with integrated hydrologic modeling is essential for understanding the complex role of climate and agricultural water management practices on future water supply.