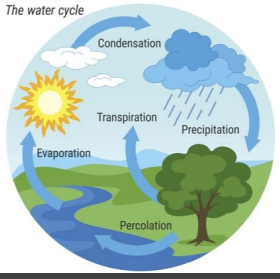
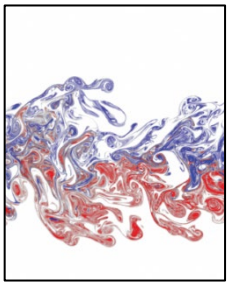
Boase Seminar Series in Hydrology and Water Resources Engineering

Department of Civil, Environmental and Architectural Engineering





Is offshore fresh groundwater a resource for the future? Exploring hydrogeologic connections through the continental shelf

Prof. Holly Michael

Director, Delaware Environmental Institute

Department of Earth Sciences

University of Delaware, Newark, DE

Wednesday, March 9, 2022 | 11:30 AM | ECCE 1B41 &

Zoom: https://cuboulder.zoom.us/j/95668504496

(passcode: water)

Abstract:

Recent advances have expanded our understanding of offshore freshened groundwater systems and highlighted their potential as a resource along coastlines worldwide. Evidence suggests that offshore freshwater was emplaced within continental shelves during previous sea-level lowstands, but its persistence may reflect a land-sea disconnect which results in disequilibrium with present-day sea level, an active land-sea connection with fresh discharge offshore, or some combination of the two. This functioning – the nature of the land-sea hydrologic connection – is a critical factor in understanding the potential future use of the resource. Using numerical simulations of variable-density groundwater flow and salt transport through aquifers extending from onshore to offshore, we explore the functioning of onshore-offshore groundwater systems and explore their potential for exploitation. We show that preferential flow through connected high-permeability subsurface conduits results in freshened groundwater tens of kilometers offshore in some cases. These systems host active discharge of both fresh and saline groundwater, the latter of which is enhanced in the presence of heterogeneity. Incorporation of onshore and offshore pumping shows that geologic connectedness is a critical factor in assessing and managing the potential use of the resource, which may be vulnerable due to unpredictable hydrogeologic connections. We suggest that understanding the nature of the onshore-offshore connections is a critical frontier in exploration of offshore freshened groundwater systems.

Speaker Bio: Holly Michael is the Unidel Fraser Russell Chair in the Environment and Professor in the Departments of Earth Sciences and Civil and Environmental Engineering at the University of Delaware. She is also Director of the Delaware Environmental Institute. She holds a BS in Civil Engineering from the University of Notre Dame and a PhD in Hydrology from the Massachusetts Institute of Technology. She is an Associate Editor of *Water Resources Research* and recently served as the Geological Society of America James B. Thompson, Jr. International Distinguished Lecturer. Her research interests include water resource management, contaminant hydrology, coastal hydrogeology, groundwater-surface water interactions, and geostatistics. Some of her current projects include investigating groundwater flow into estuaries, modeling groundwater salinization due to climate change, evaluating sustainability of arsenic-safe groundwater in Bangladesh, and application of experimental economics to groundwater resources.

Engineering UNIVERSITY OF COLORADO BOULDER | Civil, Environmental, and Architectural Engineering UNIVERSITY OF COLORADO BOULDER | Be Boulder.