CEE GRADUATE SEMINAR SERIES

ADSORPTION AND REMOVAL OF INSENSITIVE HIGH EXPLOSIVES IN CONTRASTING FRESH-WATER SYSTEMS

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On-Campus Location: CKB 204

Webex Link: Click here

About the Speaker

Thivanka Ariyarathna is an environmental geochemist and is interested in conducting research to evaluate both natural and anthropogenic processes in aquatic environments. She completed undergraduate degree in Geology from the University of Peradeniya in Sri Lanka and moved to University of Connecticut, Avery Point to pursue PhD in Oceanography. Dr. Ariyarathna worked as a postdoctoral research scientist at University of Connecticut, Avery Point and University of Massachusetts, Amherst before she started her position at Rowan university in Fall, 2022. She studies origin, distribution, fate, and transport of environmental pollutants in different aquatic environments from small freshwater tributaries to coastal marine ecosystems. Dr. Ariyarathna evaluates removal of pollutants from aquatic systems via adsorption onto sediment and microbial degradation. Moreover, she studies bioaccumulation of these pollutants in ecosystem food web structure and my research utilizes stable isotopes as a tool. In addition to pollutant research, she uses sedimentary biomarkers to evaluate human-induced changes in natural biogeochemical cycles and to reconstruct paleoclimatic conditions.

Seminar Abstract

Environmental release of Insensitive high explosive (IHE) compounds dinitroanisole (DNAN) and nitrotriazolone (NTO) is of great concern due to their high polarity and associated higher potential for offsite migration in surface water environments. The goal of this study is to evaluate and quantify adsorption and microbial removal of these compounds in freshwater sediments with different total organic carbon (TOC) content and grain size. Our abiotic and biotic bench-top sediment slurry incubations carried out at 230C, 150C and 40C showed contrasting adsorption and microbial removal kinetics of DNAN and NTO depending on the sediment type and the temperature. We extended our benchtop incubations to aquaria-scale experiments to further investigate microbial removal in terms of complete mineralization in freshwater-sediment systems. In these aquaria, we used isotopically dual labelled (13C and 15N) DNAN and NTO to track and quantify the production of inorganic nitrogen and carbon species from these compounds in distinct freshwater sediment systems. Our experiments are not limited to evaluating the natural attenuation of DNAN and NTO but conducted under bio-stimulated conditions by mixing organic matter (leaf litter and algae) with sediment. We observed the highest rates of IHE loss and mineralization in the organic matter addition experiments compared to all other natural treatments. Resulting comparative estimates of mineralization and adsorption kinetics of DNAN and NTO from our study have the potential to aid in parameterization of fate and transport models and contaminant management schemes.