EXTERNAL SEMINAR
AARHUS UNIVERSITY
DEPARTMENT OF ENVIRONMENTAL SCIENCE
FREDERIKSBORGVEJ 399, 4000 ROSKILDE

21 April 2017, 10.15 – 11.00
Venue: ENVS – THE PAVILION

Title: Virus Retention and Transport in Soils

Speaker: Prof Jie Zhuang
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Abstract: Viruses generally survive longer than enteric bacteria in the natural environment. They have been found to be more resistant to disinfection during wastewater treatment processes. Viruses are capable of traveling greater distances in the subsurface. Many environmental factors have been found to influence virus survival and transport in the subsurface, such as temperature and solution chemistry. Soil properties (e.g., CEC, SOC, metal oxides) also affect virus behavior. This research focuses on the effect of water content. Studies have shown that viruses are usually removed more extensively during unsaturated transport than during saturated transport. It's been postulated that both electrostatic and hydrophobic interactions are responsible for the removal. Another probable mechanism is sorption and/or inactivation at the air-water interface, which is unique to an unsaturated system. We used reactive sand (water-washed sand) and non-reactive sand (metal oxide-removed sand) to isolate the effect of the solid-water interface from the effect of the air-water interface. Experiments were run at three water contents. Significant virus removal was observed at all water contents in the water-washed sand and lower water content led to removal of more viruses. However, water-content effect was much less significant in oxide-removed soil, suggesting that the enhanced interaction at the solid-water interface was the main mechanism for increased virus removal under unsaturated conditions. We further tested five sandy soil materials under saturated and unsaturated flow conditions. Significant difference between saturated and unsaturated experiments for both viruses was observed in two Delaware soils. MS-2 (relatively hydrophobic) was removed more extensively than φX174 (relatively hydrophilic). However, no significant difference in virus removal was observed in the soils collected from California, Arizona, and Georgia between saturated and unsaturated transport. It is not clear what caused the lack of water content effect in these three soils. Our results showed that colloids and dissolved organic matter might facilitate the virus transport and offset the water content effect.

Host: Professor Kai Bester, MITO (Environmental Chemistry and Toxicology)

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