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Presented By:
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Earth-Water-LIFE Seminar

Friday, March 24th, 2017
McDonnell Douglas Engineering Auditorium (MDEA)
1:30PM - 2:30PM

Advancing Food-Energy-Water Sustainability Through Critical Zone Science

Intensively managed landscapes in the glaciated mid-western landscapes present some of the most complex challenges associated with food, energy and water nexus. This talk will present insights gained towards this challenge from the efforts of the Intensively Managed Landscape Critical Zone Observatory. After the end of glaciation, rapid changes in soil and vegetation took place on these young landscapes as climate transitioned. Wind driven soils (loess) provided a backdrop for the establishment of pioneer vegetation species followed with nitrogen fixing plants leading to the eventual establishment of climax species, the prairies. Loess deposited over glacial drift supported rich environment for biodiversity through competition, mutualism and mosaicking. In areas impacted by Wisconsian episode (latest glacial episode), this happened about eight thousand years ago. Heterogeneity of vegetation, soil organic carbon, nitrogen, etc. arose from differentiated accumulation over till, which has high water holding capacity, and outwash, which has lower water holding capacity. Transformations and transport was dominated by large residence times over low gradient landscape. Since European settlement and the trajectory of large-scale adoption of industrial agriculture, these landscapes have been rapidly modified. Reduced residence time no longer mutes event scale response. Landscape has switched to transport dominated system due to anthropogenic modifications, which includes deployment of tile drains, ditching, and channel straightening. This amplifies event scale dynamics, changes dominant processes, and alters process connectivity across time and space with non-reversible, often threshold dominated, cascading effects. Annual tillage and nitrogen application alters the stocks and flows of carbon and nutrients through the soils and water bodies. Understanding the *deep couplings* between landscape evolution, climate change, and anthropogenically driven dis-equilibrium arising from the alterations of coupled water, carbon and nutrient cycles across scales remains a challenge.

Praveen Kumar holds a B.Tech. (Indian Institute of Technology, Bombay, India 1987), M.S. (Iowa State University 1989), and Ph.D. (University of Minnesota 1993), all in civil engineering. He has been on the faculty of the department of Civil and Environmental Engineering at the University of Illinois since 1995. Dr. Kumar's research deals with Hydrocomplexity, the quantitative understanding and prediction of emergent patterns of form and function that arise from complex non-linear multi-scale interactions between soil, water, climate, vegetation and human systems; and how this understanding can be used for innovative solutions to water and sustainability challenges. His research has been funded by federal agencies such as NSF, NASA, and NOAA. He presently serves as the Director of the Critical Zone Observatory for Intensively Managed Landscapes. He is also the lead on NSF supported EarthCube project on Geo-Semantics, and a co-lead on NSF supported SEAD and Brown Dog projects for the development of cyber-infrastructure for structured and unstructured long-tail data and models.

Questions? - cee@uci.edu - (949) 824-5333