

The Chinese University of Hong Kong
Department of Geography and Resource Management

will present a seminar

by

Dr. RAN Lishan

Assistant Professor
Department of Geography
The University of Hong Kong



Hydrologic Controls on Riverine Export of Water, Sediment and Carbon in the Arid to Semiarid Wuding River on the Chinese Loess Plateau

Abstract:

Riverine export of water, sediment and carbon (C) is controlled by catchment hydrology, yet the role of infrequent flood events has rarely been explored. Based on high-frequency sampling dependent on hydrologic regime, we determined the export of water, sediment and C in the arid to semiarid Wuding River catchment on the Chinese Loess Plateau. With groundwater as an important contributor to runoff all year round, floods were relatively less efficient in water export. In comparison, large floods played a disproportionately important role in exporting sediment and C. During the study period, the three largest floods collectively transported 53.6–97.3% and 41.4–77% of annual sediment and C fluxes, respectively. An extreme flood in 2017 alone contributed 94.6% and 73.1% of the annual sediment and C fluxes, respectively, in just 7 days. Stable carbon isotope ($\delta^{13}\text{C}$) analysis of particulate organic carbon indicated that terrestrial C3 plants were its primary source, especially during large floods when non-topsoil erosion processes were triggered. Furthermore, floods have greatly enhanced CO_2 degassing due to elevated gas transfer velocity, although stream water CO_2 partial pressure ($p\text{CO}_2$) presented a negative relationship with flow changes. While this illustrates a dilution effect of increasing runoff on $p\text{CO}_2$, timing and magnitude of flood events are also critical controlling factors in determining the response of $p\text{CO}_2$ to flow dynamics. A continuous monitoring of a complete flood event in 2017 showed that the CO_2 efflux during the flood event ($2348 \text{ mg C m}^{-2} \text{ d}^{-1}$) was 3 times that in low flow conditions ($739 \text{ mg C m}^{-2} \text{ d}^{-1}$). Our study suggests that infrequent, heavy storm events that are predicted to increase under future climate change will remarkably alter the transport regimes of sediment and C. Such shifts could have important implications and consequences for sediment management, atmospheric C cycling and ecosystem health.

About the Speaker:

Lishan Ran is an Assistant Professor at the Department of Geography at the University of Hong Kong (HKU). His research interests reside in fluvial geomorphology, riverine carbon cycling, and greenhouse gas emissions from inland waters. Dr. Ran holds research grants from the Research Grant Council and the National Natural Science Foundation of China, which aim to holistically investigate sediment and carbon export dynamics in large East Asian rivers with special emphasis on the Yellow, Yangtze and the Pearl river basins.

Language: English

Date: 19 September 2019 (Thursday)

Time: 4:30-6:00pm

Venue: Room 221

Chen Kou Bun Building

Chung Chi College

~All are Welcome~

For any inquiries, please contact Prof. Harry Lee (Tel. 3943 8478 or Email: harrylee@cuhk.edu.hk).