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IAPME Seminar

Cascade Relationships Among Karst Critical Zone Structure, Hydrological Processes and Ecological Functions and Their Implications for Ecological Restoration

6 February 2026

Prof. Xianli XU
Chinese Academy of Sciences
Venue: N23-1004b
Time: 10:30 – 11:30
Hosted by: Prof. Guoxing SUN

Abstract

Southwest China's karst region, characterized by a subtropical humid climate with abundant rainfall, suffers from severe vegetation degradation and rocky desertification due to shallow soils and highly fractured bedrock, which lead to rapid hydrological processes and extremely low water-holding capacity—hindering sustainable socio-economic development. Based on long-term field observations and critical zone ecohydrological modeling, this study reveals a cascade relationship among the physical structure, hydrological processes, and ecological functions of the karst critical zone. Findings show that the unique subsurface structure promotes rapid water leakage, resulting in less plant-available water and generally poorer vegetation growth compared to non-karst areas. Accordingly, we propose a scientific restoration strategy: "restructure–regulate–enhance"—emphasizing that ecological restoration should go beyond increasing vegetation cover and instead optimize species selection based on plant hydraulic traits, while leveraging vegetation recovery to improve soil quality and thickness. This integrated approach enhances the critical zone's capacity for water retention and soil conservation, supporting watershed-scale ecological restoration and high-quality development.

Biography

Prof. Xianli XU is a researcher, Doctoral Supervisor, Director of the Department of Science and Technology Management and Planning at the Institute of Subtropical Agriculture, Chinese Academy of Sciences With long-term research focus on eco-hydrology and soil and water conservation, landscape ecology and ecological restoration, he has presided over more than 10 important projects including the National Key R&D Program and key projects of the National Natural Science Foundation of China, published over 100 academic papers, and won the First Prize of Science and Technology Award of the Soil and Water Conservation Society of China (ranked first). He has also been honored with the "Zhu Liyuehua Excellent Teacher Award" of the University of the Chinese Academy of Sciences, "Excellent Graduate Supervisor of Guangzhou Education Base" of the Guangzhou Branch of the Chinese Academy of Sciences, Expert with Special Government Allowance of the State Council, Talent Program of the Chinese Academy of Sciences, and Leading Talent in Scientific and Technological Innovation of Hunan Province.