The construction for monitoring network of the Critical Zone at basin scale-a case study of the central Yangtze River

TENG MA[1*], YAMIN DENG[2], ZHIQIANG WANG[1], SHUAI SHEN[1], JUNQI LI

[1]School of Environmental Studies, China University of Geosciences, Wuhan, 430074, China
[2] Geological Survey, China University of Geosciences, Wuhan, 430074, China
(*correspondence: mateng@cug.edu.cn, yamin.deng@cug.edu.cn, cugwangzq@126.com, shuaishen0317@163.com, 1119442616@qq.com)

With climate change and intensive human activities, the critical zone science has become a powerful tool for human to understand or handle the regional eco-environmental problems. The scale of critical zone researches can be divided into global scale, plate scale, regional scale, basin scale and bore scale. Among them, a Critical Zone monitoring network at basin scale is the foundation of the global network. Based on Critical Zone monitoring and survey for almost 4 years of Jianghan Plain in the middle reaches of Yangtze river, we proposed the research framework of Critical Zone at basin scale including 3 steps: (1) Construct 6-dimensions environmental gradients matrix. Identify main environmental gradients in terms of 4 spheres and 6 dimension based on the ecological and environmental issues at basin scale; (2) Focus on main eco-environmental issues and determine sensitive area or spots in upper, middle, lower reaches; (3) Dynamic monitoring of characteristic environment variable of sensitive spots and areas according to the interface of atmosphere/vegetation, surface/underground, vadose zone/saturated water zone, aquifer/aquiclude, pore aquifer/bedrock. Based on the aforementioned methods, aiming at the evolution of rivers and lakes in the Jianghan Plain, we considered the effect of large-scale hydraulic project (Three Gorge Project and South-to-North Water Transfer Project) and human activities (such as reclaimation land from a lake), and established a monitoring network of the Critical Zone in central Yangtze River which covered an area of about 4 000 km2 and included more than 6 monitoring sections, 65 monitoring wells, 10 monitoring depths and 4 environment variables. This work provides the big data support for “the Great Protection of the Yangtze River” and a powerful reference for the design of the global monitoring network of the Critical Zone.