In 1961, in the wake of emerging geotechnical problems under unsaturated conditions, the British Royal Society held a conference on effective stress principle. Much of the debate were stemmed from pressing needs to go beyond Terzaghi's effective stress for saturated porous media and encountered issues with Bishop's effective stress for unsaturated soils. The next 3 decades witnessed a great deal of expansion in research on the state of stress in variably saturated porous media, yet little consensuses had been reached. In the past decade or so, much new insightful knowledge have been gained in better defining effective stress in several disciplines such as soil and rock mechanics, vadose zone hydrology, and granular mechanics. After over a half century, a milestone is recently reached when leading researchers around the world on effective stress in porous media gathered together in Utrecht in August 2012. Many advances have been made along the fronts of theory, experiment, and application of effective stress principle in porous media. This special issue “Principle of Effective Stress in Variably Saturated Porous Media,” we intend to collect and disseminate the latest developments on effective stress principle from micromechanics to thermodynamics, from theories to numerical formulations, and to rich applications in multiple disciplines of science and engineering. We invite contributions on fundamental and applied studies in different disciplines, including vadose zone hydrology, soil and rock mechanics, granular physics and mechanics, applied mathematics, and computational mechanics. We specifically invite papers on conceptualization, micromechanical formulation, thermodynamic formulations, and experimental validation of effective stress, unifications of effective stress with soil water retention and hydraulic conductivity characteristics, and applications of effective stress principles in various engineering and science problems.

Deadline for manuscript submission: May 31, 2013