

### Session title

Evolving from Tóth's Gravitational Systems of Groundwater Flow to Integrated Basin-Scale Fluid Systems for Addressing 21st-Century Challenges

### Description

This session explores how Tóth's foundational concept of gravitationally driven groundwater flow is evolving into a broader framework for understanding subsurface fluid systems. While Tóth's hierarchy of local, intermediate, and regional flow patterns unveiled deep structural connections within the subsurface, contemporary research expands these ideas to encompass the circulation of water, heat, solutes, and gases across entire sedimentary basins and diverse terrestrial environments. Modern interpretations highlight how these interconnected fluid pathways respond to shifting climate conditions, land use pressures, and emerging environmental stresses such as groundwater depletion, declining water quality, resource extraction and ecosystem vulnerability. We invite contributions that revisit or refine classical flow system theory and practice, offer new conceptual developments, or demonstrate its relevance to present day basin scale challenges. The aim is to show how the scientific legacy of the Hungarian born Canadian hydrogeologist József Tóth continues to shape an integrated and dynamic understanding of subsurface processes in the 21st century.

### Keywords

regional flow system approach, basin-scale groundwater flow, numerical modelling, climate change, water crisis

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