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Advances in computational models of subsurface media: Past, Present and Future

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The development of subsurface media models and their applications to real-world problems has evolved significantly since 1970's. This talk discusses the physical, chemical, biological, and mechanical processes that control the evolution of groundwater quantity, quality, and deformation as well as subsidence. These processes include multiphase flow of arbitrary number of phases, thermal transport, geo-mechanics, reactive transport, and propagation of electro-magnetic waves as well as their interactions and feedbacks with the media. The advances of computational models centre on their increasing design capability to foster these coupling processes: from the simplest one-phase groundwater flow to the most complete aforementioned processes. Widely used models developed by academia, research institutes, government agencies, and private industries will be reviewed in terms of the processes included in the governing equations, types of boundary conditions, discretization methods, computational platform, and users' friendliness. Four computational models developed by the author will be briefed and example problems to groundwater management and remediation will be given.

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