The challenge of complexity in numerical modeling of partial differential equations

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The numerical solution of complex physical problems, especially those featuring a multiphysics and multiscale nature, requires appropriate mathematical models and accurate numerical methods. Often the associated numerical problem is so large that devising computational reduction techniques based, e.g., on domain partitioning, dimensional reduction, and reduced basis methods becomes necessary. In this presentation several reduction paradigms will be illustrated for various kind of applications, including geodynamics, fluid dynamics, medicine and sports design.