Séminaire de mathématiques et leurs applications

10 janvier 2019

Giorgio Giorgiani
Institut de Recherche sur la Fusion par confinement Magnétique,
CEA Cadarache, France

Title: High-order discontinuous Galerkin simulations for fluids, waves and plasmas.

Abstract: Recent advances in computational technology push forward the development of more and more accurate numerical schemes. Moreover, the run towards the exascale calls for algorithms designed for maximizing the locality of the computations and hence reduce communications, resulting therefore highly parallelizable. High-order schemes fit in this framework, as capable for increasing accuracy, reduce the computational cost and optimize parallelization aspects.

Discontinuous Galerkin methods, in particular, are particularly suited for developing high-order schemes, thanks to their robustness and stabilization properties. Moreover, they allow using unstructured meshes and curved elements, thus permitting the description of realistic geometries. Finally, the hybridization technique, recently introduced, allows to reduce linear systems issued from the spatial discretization and enhance the performance of high-order elements.

In this talk are presented some applications of high-order discontinuous Galerkin schemes in the field of wave propagation, fluid dynamics and plasma physics, along with related topics such as p-adaptivity, stabilization and shock-capturing. In particular, recent results are discussed on the development of a HDG scheme on unstructured non-aligned meshes for fusion plasma simulations.