

IMAR Monthly Lecture

Stabilizations and Closures for Reduced Order Models of Turbulent Flows

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Abstract: This talk is an introduction to the development of reduced order models (ROMs) for realistic, turbulent flows in engineering and geophysical applications. Due to the wide range of spatial scales displayed by these flows, ROMs are generally used in the under-resolved regime. Furthermore, since these flows are convection-dominated (turbulent), standard ROMs generally yield inaccurate results, usually in the form of spurious oscillations. To alleviate their inaccurate behaviour, ROMs are usually supplemented with stabilisations and closures. In this talk, we will carefully construct and analyse representative ROM stabilisations and closures that are based on spatial filtering and data-driven modeling. These ROM stabilisations and closures will be illustrated in challenging test problems, e.g., the turbulent channel flow and the quasi-geostrophic equations.