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ROM Closures and Stabilizations for Under-Resolved Turbulent Flows

mercredi 30 mars 2022 13:40 (50 minutes)

In this talk, I will survey reduced order model (ROM) closures and stabilizations for under-resolved turbulent flows. Over the past decade, several closure and stabilization strategies have been developed to tackle the ROM inaccuracy in the convection-dominated, under-resolved regime, i.e., when the number of degrees of freedom is too small to capture the complex underlying dynamics. I will present regularized ROMs, which are stabilizations that employ spatial filtering to alleviate the spurious numerical oscillations generally produced by standard ROMs in the convection-dominated, under-resolved regime. I will also survey three classes of ROM closures, i.e., correction terms that increase the ROM accuracy: (i) functional closures, which are based on physical insight; (ii) structural closures, which are developed by using mathematical arguments; and (iii) data-driven closures, which leverage available data. Throughout my talk, I will highlight the impact made by data on classical numerical methods over the past decade. I will also emphasize the role played by physical constraints in data-driven modeling of ROM closures and stabilizations.

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