Mathematics and Physics Seminar Series

Announcing

A Seminar Presentation on Wednesday November 6th, 2019 at 2:00 pm - 3:00 pm in North Hall 102

at The University of New Haven

Partitioned time stepping for coupled fluids

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Abstract: Simulation codes for climate, weather forecasting and hurricane research often include active ocean and atmosphere models, amongst other components. A common strategy has been to use specialized coupling software as an intermediary to facilitate communication between the air and sea codes. The resulting time marching algorithms for the coupled system are partitioned across the air-sea interface, which is ideal to allow for separate optimization of the fluid modules, such as using different internal time steps and computational grids. On the other hand, to develop partitioned methods that efficiently resolve simultaneous interactions between the fluids requires careful consideration of factors such as conservation, consistency, stability and sensitivity of the global algorithms.

An overview will be provided for partitioned time stepping research with coupled fluids that has targeted air-sea interaction. A variety of methods, models and analyses have appeared in the literature. Recently, a mathematical coupling framework has emerged that generalizes previous approaches to arbitrary orders of consistency (in a temporal sense) while potentially strengthening conservation properties in a discrete sense. Fluids are coupled across certain intervals of time, called *coupling windows*, during which the internal time steps for each fluid module can be different. We will discuss what is known about the mathematical properties when applying this framework to a simplified problem of two coupled fluids with natural heat convection, and discuss the behaviors observed in computational tests. This includes recent work to choose the size of the coupling windows adaptively. Some differences are highlighted between sequential configurations, in which the air and sea codes share processors, versus concurrent configurations.

Further Information

Refreshments will be provided starting 1:30pm For further information, please contact Dr. Yasanthi Kottegoda or Dr. Phanuel Mariano at the Department of Mathematics and Physics, YKottegoda@newhaven.edu, pmariano@newhaven.edu.