CRUNCH Seminars at Brown, Division of Applied Mathematics

Friday – June 14, 2019

Paper review 2: Applications of Deep Learning to Ocean Data Inference and Subgrid Parameterization

Xiang Li

Methods are needed to either extract information, extrapolate, or upscale existing oceanographic data sets, to account for or represent unresolved physical processes. In this paper, machine learning is used to leverage observations and model data by predicting unresolved turbulent processes and subsurface flow fields. As a proof of concept, the convolutional neural networks (CNNs) is trained on degraded data from a high-resolution quasi-geostrophic ocean model. It demonstrates that CNNs successfully replicate the spatiotemporal variability of the subgrid eddy momentum forcing, are capable of generalizing to a range of dynamical behaviors, and can be forced to respect global momentum conservation. The results indicate that data-driven approaches can be exploited to predict both subgrid and large-scale processes, while respecting physical principles, even when data are limited to a particular region or external forcing