Séminaire vendredi le 12 juillet 2019 11:00 / Seminar Friday July 12ᵗʰ 2019 11:00h

Sujet/Subject: Bayesian Data Assimilation Within a Regional Modeling Framework

Langue/language   : Anglais/English

Conférenciers/Lecturers: **Jonathan Poterjoy (University of Maryland)**

Résumé/Abstract:

Particle filters (PFs) are sequential Monte Carlo methods that can solve data assimilation problems characterized by non-Gaussian error distributions for prior model variables or measurements. From the perspective of a geoscientist, PFs contain several theoretical properties that make them attractive for research and environmental prediction. Namely, they preserve dynamical balances during data assimilation update steps; they require no special treatment for nonlinear measurement operators or non-Gaussian errors; and they provide an elegant solution to the underlying Bayesian filtering problem. Recent efforts applying PFs for geophysical models have resulted in "localized" PFs, which approximate a given data assimilation application as a large set of loosely coupled problems that can be solved independently using relatively small ensembles – an approach long used for ensemble Kalman filters (EnKFs).

The current study uses an experimental regional prediction system to examine properties of the Poterjoy (2016) local PF, which was recently revised by Poterjoy et al. (2019). Experiments are performed over a month-long period from 2017 using a model domain that captures several Atlantic tropical cyclone events. The application presents a challenging geophysical data assimilation problem, owing to strong nonlinearity in the system dynamics and the extensive use of indirect remotely-sensed measurements from satellites. This research identifies advantages of the local PF for applications known to pose challenges for Gaussian filters and smoothers, and describes new developments for applying PFs for multi-scale geophysical flows.

Poterjoy, J., 2016: A localized particle filter for high-dimensional nonlinear systems. Mon. Wea. Rev., 144, 59 – 76.

Poterjoy, J., L. J. Wicker, and M. Buehner, 2019: Progress in the development of a localized particle filter for data assimilation in high-dimensional geophysical systems., *Mon. Wea. Rev.* 147, 1107 – 1126.