For Favor of Posting

香港浸會大學
HONG KONG BAPTIST UNIVERSITY

香港浸會大學理學院
HKBU Faculty of Science

The Institute of Computational and Theoretical Studies: Data Assimilation Program

Lecture 1: Numerical Weather Prediction and Data Assimilation

Lecture 2: The Assimilation of Novel Remote-Sensing Instruments in Km-Scale Weather Prediction Models

Speaker : Dr. Martin Weissmann
Hans-Ertel-Centre for Weather Research
Meteorologisches Institut, LMU
Germany

Date : 6 May 2015 (Wednesday)

Time : 11:00 a.m. - 12:00 noon (Lecture 1)
2:00 p.m. - 3:00 p.m. (Lecture 2)

Venue : FSC1217
Fong Shu Chuen Library
HSH Campus
Hong Kong Baptist University

Abstract:

Lecture 1: Numerical Weather Prediction and Data Assimilation

Improvements in data assimilation, both concerning data assimilation methodology and the use of additional satellite observations, have been a major contributor to advances in numerical weather prediction (NWP). Modern global NWP models assimilate several million satellite observations per day from a variety of different instruments.

Traditionally, two different approaches are used for data assimilation in meteorology, variational methods and ensemble Kalman filters. Both exhibit certain advantages and disadvantages and currently all major weather centers either deploy or work towards hybrid methods for their global NWP models that combine the advantages of both.

In addition to global NWP models, many weather centers deploy regional NWP models. These are usually run for a limited domain size, but using a higher horizontal resolution of a few km to explicitly represent atmospheric convection that is a primary forecast event. This poses significant additional challenges for data assimilation as the short life time and stochastic nature of convection require to assimilate very frequent and dense remote-sensing observations as well as to account for the inherent forecast uncertainty.

The presentation will review basic concepts of data assimilation and the current status of global and regional data assimilation systems. Additionally, it will provide an overview of the global observing network and special regional observations as well as of ongoing research efforts in meteorological data assimilation.

Lecture 2: The Assimilation of Novel Remote-Sensing Instruments in Km-Scale Weather Prediction Models

Appropriate initial conditions for convective-scale (km-resolution) NWP models are a crucial requirement for accurate weather forecasts. Due to highly nonlinear dynamics even small initial condition errors can quickly grow to significant forecast errors. Data assimilation for such models is a particularly challenging task given stochastic nature of convection and the subsequent need to incorporate temporally and spatially dense observations.

Ensemble systems that conduct multiple parallel forecasts to estimate their uncertainty are a promising approach to address the limited predictability of convection. The German Weather Service therefore currently develops the Km-scale ENsemble Data Assimilation system KENDA. The HErZ research group at LMU works on the refinement of this experimental system, specifically concerning the inclusion of cloud-related satellite observations from geostationary satellites. Clouds are the first signal of atmospheric convection that can be observed area-wide, but their assimilation and foresting is challenging due to unresolved scales, double-penalty errors and strong nonlinearity.

Including frequent and dense observations from a variety of observing systems in data assimilation also crucially requires efficient tools to monitor the contribution of different observations to forecast quality that is usually referred to as observation impact. While observation impact can in principle be evaluated by conducting parallel numerical forecast experiments, this becomes infeasible for a large number of different observations. Our research group implemented, refined and evaluated a method to estimate observation impact efficiently based on information from the data assimilation system and correlations of ensemble forecasts to avoid the need for parallel experiments. For the first time, we demonstrated that the method provides reasonable estimates of observation impact in a convective-scale modelling system.

The Data Assimilation Program is organized by the Centre for Mathematical Imaging and Vision.

– All interested are welcome –

For further information, please visit **http://www.math.hkbu.edu.hk/**, or call 3411-5056.