



DEPARTMENT OF APPLIED MATHEMATICS

應用數學系

**The Hong Kong Polytechnic University
Department of Applied Mathematics**

Colloquium

**Truncated primal-dual iterative methods for
large-scale nonlinear least squares**

by

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Abstract

Data assimilation covers techniques where prediction of the state of a dynamical system is performed using data from various origins. We consider here the optimization problem that lies in the centre of these techniques when so-called variational formulations are considered. Our main interest will be focused on the case where the dynamical system under consideration is described by *stochastic* differential equations. Such a problem is called “Weakly-constrained variational Data Assimilation”.

We will compare the merits of the three main approaches that are considered by the community: state, forcing, saddle-point formulations. They lead to large-scale optimization problems which must be solved iteratively. As it is usually the case in this setting, efficiency will dramatically rely on the ability to design effective parallel implementations of suitably preconditioned, convergent and variationally coherent minimization algorithms. Using these principles we derive a new variant of the saddle point algorithm in which the monotonicity of the likelihood along the iterates is enhanced.

A parametric study of the algorithms will be presented both in a sequential and idealized parallel environment on the Burgers equation and on a quasi-Geostrophic model that are considered as representative of real models occurring in Meteorology or Oceanography. We show the merits of our new saddle-point formulation and of more classical ones based on the full orthogonalization method.

This is a joint work with Selime Gürol (CERFACS, France), Ehouarn Simon (INPT/ENSEEIH-IRIT, France), and Philippe Toint (The University of Namur, Belgium).

Date : 31 May, 2018 (Thursday)

Time : 11:00a.m. – 12:00noon

Venue : TU801, The Hong Kong Polytechnic University

***** ALL ARE WELCOME *****