

PREDICTION AND DATA ASSIMILATION FOR NON-LOCAL DIFFUSIONS. FROM CRACK PROPAGATION TO RANDOM GRAPHS AND THE ARCTIC SEA ICE

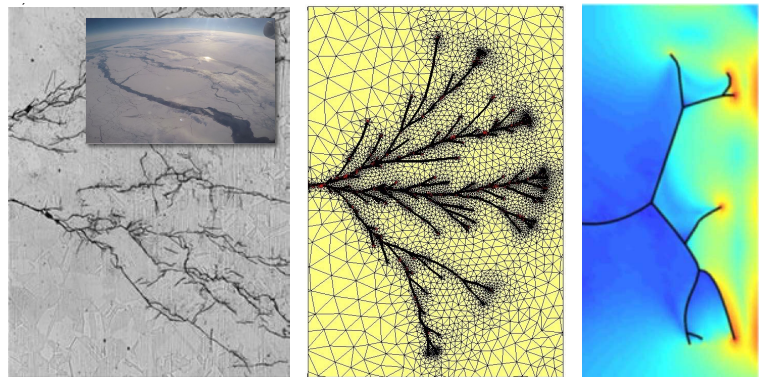
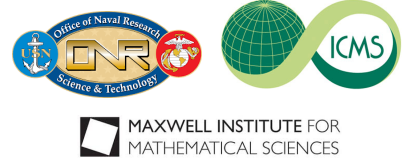
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Location: International Centre for Mathematical Sciences, Edinburgh, UK (<http://www.icms.org.uk>)

Date and duration: 4-5 June, 2018

Participants: 15 international/UK researchers + local faculty



Summary. The aim of the workshop is to gather researchers interested in the recent developments in variational analysis and data assimilation for nonlocal diffusion problems given by linear integro-differential equations on bounded domains. The nonlocal operators associated with such problems arise in many applications ranging from continuum mechanics to graph theory; a topical application area is crack nucleation and propagation which is increasingly important for understanding and modelling the large-scale dynamics of sea ice in the Arctic. The workshop will focus on a set of intertwined issues ranging from the numerical modelling of integro-differential systems under uncertainty, to well-posedness of local and nonlocal operators with random parameters, to (Lagrangian-type) data assimilation on the nodes time-dependent random graphs. In the presence of model uncertainties a number of important problems need to be addressed:

- (i) Appropriate (stochastic) parameterisation the underlying integral operators.
- (ii) Choice of the necessary data-adapted discretisation for approximating time-dependent models for crack propagation and their capture.
- (iii) Aiding the procedures in (i)-(ii) via Bayesian data assimilation and appropriate Markov Chain Monte Carlo (MCMC), and Multi Level Sequential Monte Carlo sampling (MLSMC).
- (iv) Derivation of criteria for stability, accuracy and quantification of uncertainty due to the parameterisation and/or the necessary discretisation of nonlocal problems.

It is expected that this workshop will serve as a nucleus for developing new research directions and collaborations in the area of modelling and prediction of non-local dynamical problems which fall into the large class of anomalous diffusion problems driven by dynamic streams of data.