# PREDICTION AND DATA ASSIMILATION FOR NON-LOCAL DIFFUSIONS. FROM CRACK PROPAGATION TO RANDOM GRAPHS AND THE ARCTIC SEA ICE
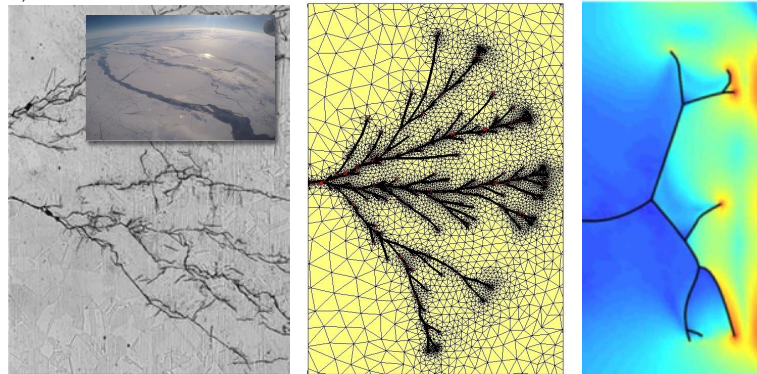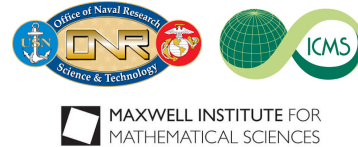
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**Location:** University of Edinburgh, Appleton Tower, 11 Crichton Street, Edinburgh, EH8 9LE

**Date**: 4-5 June, 2018
**Workshop website**

**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 integro-differential equations. 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 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. 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)** 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 class of anomalous diffusion problems driven by dynamic streams of data.