Séminaire **Lundi** 3 fevrier 2014 **11:00h** / Seminar **Monday** February 3rd 2014 **11:00h**

Sujet/Subject: Clever particle filters, sequential importance sampling and the optimal proposal .

Conférencier/Lecturer: **Chris Snyder, (NCAR)**

Résumé/Abstract

Particle filters are elegant and fully non-Gaussian data-assimilation algorithms that rely on sequential importance sampling. Their performance can depend strongly on the choice of proposal distribution from which new ensemble members (particles) are drawn and the use of clever proposals has seen much recent interest in the geophysical literature. After reviewing particle filtering, sequential importance sampling and various choices for proposal distributions, I will put forward a simple test problem for particle filters and illustrate how a clever proposal can greatly improve their performance in some regimes. Nevertheless, other, asymptotic arguments delineate fundamental limitations for particle filters, regardless of the choice of proposal distribution. In particular, even particle filters employing clever proposals will suffer degeneracy (maximum importance weight approaching unity) unless the ensemble size is exponentially large in a quantity that, in the simplest case that all degrees of freedom in the system are i.i.d., is proportional to the system dimension. I will also discuss the behavior to be expected in more general cases, such as global numerical weather prediction, and how that behavior will depend on the observing network.