Accepted Manuscript

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Thomas Bellsky, Lewis Mitchell

PII: S0167-2789(18)30156-8
DOI: https://doi.org/10.1016/j.physd.2018.05.002
Reference: PHYSD 32022

To appear in: *Physica D*

Received date : 28 March 2018
Accepted date : 14 May 2018

Please cite this article as: T. Bellsky, L. Mitchell, A shadowing-based inflation scheme for ensemble data assimilation, *Physica D* (2018), https://doi.org/10.1016/j.physd.2018.05.002

A shadowing-based inflation scheme for ensemble data assimilation

Thomas Bellsky

Department of Mathematics and Statistics, University of Maine, Orono, ME, USA

Lewis Mitchell*

School of Mathematical Sciences, University of Adelaide, Adelaide, South Australia, Australia

Abstract

Artificial ensemble inflation is a common technique in ensemble data assimilation, whereby the ensemble covariance is periodically increased in order to prevent deviation of the ensemble from the observations and possible ensemble collapse. This manuscript introduces a new form of covariance inflation for ensemble data assimilation based upon shadowing ideas from dynamical systems theory. We present results from a low order nonlinear chaotic system that supports using shadowing inflation, demonstrating that shadowing inflation is more robust to parameter tuning than standard multiplicative covariance inflation, outperforming in observation-sparse scenarios and often leading to longer forecast shadowing times.

Keywords: data assimilation, shadowing, covariance inflation, chaotic dynamics, ensemble methods

2010 MSC: 37C50, 62M20, 93E10, 93E11

*Corresponding author. *Telephone*: +61 8 8313 5424 *Facsimile*: +61 8 8313 3696
Email address: lewis.mitchell@adelaide.edu.au (Lewis Mitchell)
URL: http://maths.adelaide.edu.au/lewis.mitchell (Lewis Mitchell)