An Ensemble Approach to Data Assimilation in the Earth Sciences

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Focus: Methodological issues that cut across earth science disciplines.
Nonlinearity  Dimensionality  Uncertainty

Structure: Five research clusters, each deals with a particular issue, brings together researchers from different disciplines, focuses on one or more applications

Faculty & Research Staff
Civil and Environmental Engineering
Dennis McLaughlin  Adel Ahanin
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Electrical Engineering and Computer Science
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Earth, Atmospheric and Planetary Science
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Carl Wunsch  Gregory Lawson
Vikram Khade

Representative Articles (2003-2004)


1) Dynamic Image Segmentation
Gulf Stream "field and boundary" estimation from sparse tracer-field measurements Best Student Paper Award AGU 2003

2) Multiscale Data Assimilation
Replicates from unconditional Model
GOES IR

Independent  Batch  Schur  MAR  EnMSF

Meas  mean

0.05 0.1 0.15 0.2 0.25

Multiscale ensemble filtering, with replicates conditioned on real-time Infrared (GOES) data

3) Advanced Variational Methods
Adjoint methods for global state estimation merge diverse data sources

4) Field Alignment
Variational adjustment of displacements at grid nodes compensates for position errors in hurricane forecasts

5) Assimilation for Chaotic Systems
Ensemble Kalman filtering with realistic ocean models. Topex/Poseidon altimetry reduces errors in sea-surface height anomalies by over 40%