

# 2019 EnKF workshop program

**Monday 03/06/2019**

09:30-09:45:	Welcome (Xiaodong Luo, NORCE, Norway)	
09:45-10:30:	<b>Estimation of model parameters using an evolutionary algorithm</b> <u>Pieter Houtekamer</u> Environment and Climate Change, Canada	Session chair:  Dean Oliver, NORCE Energy
10:30-11:00	<b>Bias-aware assimilation methods for numerical weather prediction</b> <u>Patrick Laloyaux</u> , Massimo Bonavita, Elias Holm and Sean Healy ECMWF	
11:00-11:30	<b>Model error estimation and treatment in data assimilation</b> <u>Alberto Carrassi</u> NERSC, Bergen, Norway; University of Bergen, Norway	
<b>11:30-11:50</b>	<b>Break</b>	
11:50-12:35	<b>Data assimilation on convective scale based on first physical principles</b> <u>Tijana Janjic Pfander</u> Ludwig-Maximilians-Universität München, Germany	Session chair:  Francois Counillon, NERSC
12:35-13:05	<b>Experiments of RTPS methods for the 4D-LETKF system implemented to a global NWP model on the cubed-sphere</b> <u>Seoleun Shin</u> Korea Institute of Atmospheric Prediction Systems (KIAPS), South Korea	
<b>13:05-14:05</b>	<b>Lunch</b>	
14:05-14:50	<b>Transitioning to strongly coupled data assimilation</b> <u>Stephen G. Penny</u> , University of Maryland, USA	Session chair:  Geir Evensen, NORCE Energy
14:50-15:20	<b>Building and testing of the first super earth system model</b> <u>Francois Counillon</u> <sup>1</sup> , N. Keenlyside <sup>1</sup> , M. Devilliers <sup>2</sup> , G. Duane <sup>1</sup> and S. Koseki <sup>1</sup> <sup>1</sup> University of Bergen, Norway; <sup>2</sup> CEREA-ENPC, France	
15:20-15:50	<b>Implementation of ensemble Kalman filter data assimilation in a high resolution spectral wave model with application in the southern North Sea</b> <u>Jesper Sandvig Mariegaard</u> and Natacha Fery DHI, Hørsholm, Denmark	
<b>15:50-16:10</b>	<b>Break</b>	
16:10-16:40	<b>Assimilation of ExoMars Trace Gas Orbiter thermal infrared observations into the LMD Mars GCM using the LETKF</b> <u>Roland M. B. Young</u> <sup>1</sup> , F. Forget <sup>1</sup> , S. Guerlet <sup>1</sup> , E. Millour <sup>1</sup> , T. Navarro <sup>1,2</sup> , N. Ignatiev <sup>3</sup> , A.V. Grigoriev <sup>3</sup> , A. Shakun <sup>3</sup> , A. Trokhimovskiy <sup>3</sup> , F. Montmessin <sup>4</sup> and O. Korablev <sup>3</sup> <sup>1</sup> Sorbonne Université, Paris, France; <sup>2</sup> University of California, Los Angeles, CA, USA; <sup>3</sup> Space Research Institute, Moscow, Russia; <sup>4</sup> UVSQ Université Paris-Saclay, France	Session chair:  Alberto Carrassi, NERSC
16:40-17:10	<b>LOTOS-EUROS EnKF for PM10 and PM2.5 forecast in Colombia</b> <u>Santiago Lopez-Restrepo</u> <sup>1,2</sup> , <u>Andres Yarce</u> <sup>1,2</sup> , Nicolas Pinel <sup>1</sup> , Arjo Segers <sup>3</sup> , O. L. Quintero <sup>1</sup> , Arnold. W. Heemink <sup>2</sup> <sup>1</sup> Universidad EAFIT, Medellin Colombia; <sup>2</sup> TU Delft, Delft, The Netherlands; <sup>3</sup> TNO, Utrecht, The Netherlands	
17:10-17:40	<b>Investigating satellite data assimilation in an idealised framework using an Ensemble Kalman Filter</b> <u>Luca Cantarello</u> <sup>1</sup> , O. Bokhove <sup>1</sup> , S. Tobias <sup>1</sup> , G. Inverarity <sup>2</sup> and S. Migliorini <sup>2</sup> <sup>1</sup> University of Leeds, Leeds, United Kingdom; <sup>2</sup> Met Office, Exeter, United Kingdom	
<b>17:40-18:40</b>	<b>Poster session</b>	
<b>19:00</b>	<b>Dinner</b>	

\*Invited talks in **blue** color, speakers' names underlined, and titles in **boldface**

# 2019 EnKF workshop program

**Tuesday 04/06/2019**

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08:30-09:15	<b>Big data assimilation: A new science for weather prediction and beyond</b> <u>Takemasa Miyoshi</u> RIKEN, Japan	Session chair:  Xiaodong Luo, NORCE Energy
09:15-09:45	<b>On the efficiency of covariance localisation of the ensemble Kalman filter using augmented ensembles</b> <u>Alban Farchi</u> and Marc Bocquet CEREA, joint laboratory École des Ponts ParisTech; EDF R&D, Université Paris-Est, Champs-sur-Marne, France	
09:45-10:15	<b>Empirical anisotropic multivariate localization in the ensemble Kalman filter for earth system models</b> <u>Yiguo Wang</u> <sup>1,2</sup> , François Counillon <sup>1,2</sup> , Alexander Barth <sup>3</sup> and Sébastien Barthélémy <sup>2</sup> <sup>1</sup> NERSC, Bergen, Norway; <sup>2</sup> University of Bergen, Bergen, Norway; <sup>3</sup> University of Liege, Liege, Belgium	
<b>10:15-10:35</b>	<b>Break</b>	
10:35-11:20	<b>EnKF – FAQ</b> <u>Patrick Nima Raanes</u> NORCE Energy, Norway	Session chair:  Trond Mannseth, NORCE Energy
11:20-11:50	<b>Multimodality in the ensemble Kalman filter using a selection-Gaussian initial distribution</b> Maxime Conjard and Henning Omre <sup>1</sup> NTNU, Trondheim, Norway	
<b>11:50-12:10</b>	<b>Break</b>	
12:10-12:40	<b>High-dimensional Bayesian filtering with nonlinear local couplings</b> <u>Ricardo Baptista</u> , Alessio Spantini and Youssef Marzouk Massachusetts Institute of Technology, USA	Session chair:  Andreas Stordal, NORCE Energy
12:40-13:10	<b>Particle flow for nonlinear filters with Gromov’s method</b> <u>Fred Daum</u> Raytheon USA	
<b>13:10-19:00</b>	<b>Lunch/Time off (activities on your own)</b>	
<b>19:00</b>	<b>Dinner</b>	

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# 2019 EnKF workshop program

Wednesday 05/06/2019

08:30-09:15	<p><b>Recent ensemble smoother applications: Data-space inversion and deep learning for facies models</b></p> <p><u>Alexandre Emerick</u> Petrobras, Brazil</p>	<p>Session chair:  Remus Hanea, Equinor &amp; UiS</p>
09:15-09:45	<p><b>Combining data assimilation and machine learning to emulate a numerical model from noisy and sparse observations</b></p> <p><u>Julien Brajard</u><sup>1,2</sup>, Marc Bocquet<sup>3</sup>, Alberto Carrassi<sup>1,4</sup> and Laurent Bertino<sup>1</sup> <sup>1</sup>NERSC, Bergen, Norway; <sup>2</sup>Sorbonne University, Paris, France; <sup>3</sup>CEREA joint laboratory Ecole des Pont ParisTech and EdF R&amp;D, Universit'e Paris-Est, France; <sup>4</sup>University of Bergen, Norway.</p>	
09:45-10:15	<p><b>Ensemble-based kernel learning for a class of data assimilation problems with imperfect forward simulators</b></p> <p><u>Xiaodong Luo</u> NORCE Energy, Norway</p>	
<b>10:15-10:35</b>	<b>Break</b>	
10:35-11:20	<p><b>Ensemble methods: Challenges faced in and lessons learned from practical applications</b></p> <p><u>Jincong He</u> Chevron ETC, USA</p>	<p>Session chair:  Geir Nævdal, NORCE Energy</p>
11:20-11:50	<p><b>Using Bayesian model probability with ensemble methods to quantify uncertainty in reservoir modelling with multiple prior scenarios</b></p> <p><u>Sigurd I. Aanonsen</u><sup>1</sup>, Sverre Tveit<sup>1</sup> and Mathias Alerini<sup>2</sup> <sup>1</sup>NORCE Energy, Norway; <sup>2</sup>Equinor ASA, Norway</p>	
11:50-12:20	<p><b>Ensemble-based uncertainty quantification of geothermal reservoir models using randomized low-rank matrix algorithms and adjoint code</b></p> <p><u>Elvar K. Bjarkason</u>, Oliver J. Maclaren, Ruanui Nicholson, Angus Yeh and Michael J. O'Sullivan The University of Auckland, Auckland, New Zealand</p>	
<b>12:20-13:20</b>	<b>Lunch</b>	
13:20-14:05	<p><b>Decision making under uncertainties – a holistic ensemble approach</b></p> <p><u>Remus Hanea</u><sup>1,2</sup> <sup>1</sup>Equinor ASA; <sup>2</sup>UiS, Norway</p>	<p>Session chair:  Rolf Lorentzen, NORCE Energy</p>
14:05-14:35	<p><b>Implementation of IES in ERT and validation on an FMU example</b></p> <p><u>Geir Evensen</u><sup>1,2</sup> <sup>1</sup>NORCE Energy, Norway; <sup>2</sup>NERSC, Norway</p>	
<b>14:35-14:55</b>	<b>Break</b>	
14:55-15:25	<p><b>Assimilation of multiple linearly dependent data vectors</b></p> <p><u>Trond Mannseth</u> NORCE Energy, Norway</p>	<p>Session chair:  Sigurd Aanonsen, NORCE Energy</p>
15:25-15:55	<p><b>Olympus optimization under geological uncertainty</b></p> <p><u>Yuqing Chang</u><sup>1</sup>, Rolf J. Lorentzen<sup>1</sup>, Geir Nævdal<sup>1</sup> and Tao Feng<sup>2</sup> <sup>1</sup>NORCE Energy, Norway; <sup>2</sup>Equinor ASA, Norway</p>	
<b>15:55-16:00</b>	<b>Concluding remarks (Randi Valestrand, NORCE Energy, Norway)</b>	

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# 2019 EnKF workshop program

**Poster session: Monday 03/06/2019**

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## **Toward background error covariance hybridization for climate prediction**

Sébastien Barthélémy<sup>1,3</sup>, François Counillon<sup>2,3</sup> and Noel Keenlyside<sup>1,3</sup>

<sup>1</sup>University of Bergen; <sup>2</sup>Nansen Environmental and Remote Sensing Center; <sup>3</sup>Bjerknes Center for Climate Research, Norway

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## **Reduced variational filtering and smoothing via transports**

Daniele Bigoni, A. Spantini, R. Baptista and Y. Marzouk

Massachusetts Institute of Technology, USA

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## **Ensemble-based variational data assimilation for emission and deposition parameter estimation using satellite measurements**

Andrés Yarce Botero<sup>1,2</sup>, Santiago Lopez-Restrepo<sup>1,2</sup>, Nicolas Pinel<sup>1</sup>, O. L. Quintero<sup>1</sup>, Arjo Segers<sup>3</sup>, Martijn Schaap<sup>2</sup> and A. W. Heemink<sup>2</sup>

<sup>1</sup>Universidad EAFIT, Medellín, Colombia; <sup>2</sup>TU Delft, Delft, The Netherland; <sup>3</sup>TNO, Utrecht, The Netherland

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## **Applications of EFSO for improving NWP**

Tse-Chun Chen and Eugenia Kalnay

University of Maryland, USA

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## **Diagnosing data assimilation with sensitivity analysis**

Isabelle Mirouze<sup>1</sup>, S. Ricci<sup>1</sup>, P. Roy<sup>2</sup>, M. De Lozzo<sup>2</sup> and N. Goutal<sup>3</sup>

<sup>1</sup>CECI; <sup>2</sup>CERFACS; <sup>3</sup>LNHE / LHSV, France

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## **Interaction between ensemble filters and model's dynamic to improve forecast for nuclear reactors monitoring**

Jean-Philippe Argaudy<sup>1</sup>, Serge Gratton<sup>2</sup>, Dimitri Mottety<sup>2</sup>, Ehouarn Simon<sup>2</sup>

<sup>1</sup>EDF R&D - Palaiseau, France; <sup>2</sup>IRIT - Toulouse University, France

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## **Use of K-SVD algorithm to sparsely represent 4D seismic data**

Ricardo Soares, Xiaodong Luo and Geir Evensen

NORCE Energy, Bergen, Norway

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## **Efficient optimization of well drilling sequence with learned heuristics**

Lingya Wang, and Dean Oliver

NORCE Energy, Bergen, Norway

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\*Presenters' names underlined