

2022 EnKF workshop program

Monday 30/05/2022

08:45-09:00	Welcome (Xiaodong Luo, NORCE)	
09:00-09:45	Multiscale alignment ensemble filtering technique and its application in geoscience <u>Yue (Michael) Ying</u> Nansen Environmental and Remote Sensing Center (NERSC), Norway	Session chair: Dean Oliver, NORCE
09:45-10:15	Integrating measurement representativeness and release temporal variability to improve the Fukushima-Daiichi ¹³⁷Cs source reconstruction <u>Joffrey Dumont Le Brazidec</u> ^{1,2} , Marc Bocquet ² , Olivier Saunier ¹ , Yelva Roustan ² ¹ IRSN, France; ² CEREA, France	
10:15-10:45	Incorporating correlated observation error statistics in upper atmospheric ensemble data assimilative modelling <u>Adil Siripatana</u> , Sean Elvidge, David R. Themens University of Birmingham, UK	
10:45-11:00	Break	
11:00-11:30	Deep learning to estimate model biases in an operational NWP assimilation system <u>Patrick Laloyaux</u> ¹ , Thorsten Kurth ² , Peter Dueben ¹ , David Hall ² , Massimo Bonavita ¹ ¹ ECMWF; ² NVIDIA	Session chair: Laurent Bertino, NERSC
11:30-12:00	Combining machine learning and data assimilation to improve the hydrodynamic forecasting in a tidal estuary <u>Clemens Cremer</u> , Jesper Sandvig Mariegaard, Henrik Andersson, Henrik Madsen DHI, Denmark	
12:00-13:30	Lunch	
13:30-14:00	Benefit of vertical localisation in sea surface temperature assimilation: identical twin experiments <u>Yiguo Wang</u> ¹ , François Counillon ¹ , Sébastien Barthélémy ² , Alexander Barth ³ ¹ Nansen Environmental and Remote Sensing Center (NERSC), Norway; ² University of Bergen, Norway; ³ Université de Liège, Belgium	Session chair: Andreas Stordal, NORCE
14:00-14:30	A Gaussian high-order sampling hybrid filter for biogeochemical data assimilation: application to chlorophyll satellite data <u>S. Spada</u> ¹ , A. Teruzzi ¹ , S. Maset ² , S. Salon ¹ , G. Cossarini ¹ ¹ National Institute of Oceanography and Applied Geophysics – OGS, Italy; ² Università degli Studi di Trieste, Italy	
14:30-14:45	Break	
14:45-15:15	Maximizing the added value of multiple observations: Optimal error covariances and cross-covariances for improved data assimilation <u>Annika Vogel</u> , Richard Menard Environment and Climate Change Canada, Canada	Session chair: Yiguo Wang, NERSC
15:15-15:45	Assimilation of screen-level variables for soil moisture analysis into multilayer soil model INM RAS – MSU <u>Svetlana Travova</u> ¹ , Mikhail Tolstykh ^{1,2} ¹ Hydrometcenter of Russia, Russia; ² Institute of Numerical Mathematics, Russia	
15:45-16:00	Break	
16:00-16:30	Recurrent neural network emulation for high resolution sea surface forecasts Stephen G. Penny ¹ , Tim Smith ¹ , Tse-Chun Chen ¹ , Jason Platt ² , Hsin-Yi Lin ¹ , Michael Goodliff ¹ , Henry Abarbanel ²	Session chair: Patrick Raanes, NORCE

	¹ CIRES / NOAA PSL, USA; ² UCSD, USA	
16:30-17:00	Using Deep Learning to increase the ensemble size in an EnKF with the recentering technique: experiments with Lorenz 1996 model <u>Vikram Khade</u> Environment and Climate Change Canada (ECCC), Canada	
17:00-17:15	Break	
17:00-17:30	A new look at the ensemble Kalman Filter: Duality and non-asymptotic analysis C.G. Krishnanunni, J. Wittmer, H. Nguyen, <u>T. Bui-Thanh</u> University of Texas at Austin, USA	Session chair: Yue (Micheal) Ying, NERSC
17:30-18:00	How does the regression step in the two-step EnKF connect to Bayesian estimation? <u>Ian Grooms</u> University of Colorado, USA	
18:00-19:00	Poster session	
19:00-	Dinner	

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

Tuesday 31/05/2022

09:00-09:45	On state and parameter estimation in earthquake cycle models <u>Femke Vossepoel</u> TUDelft, The Netherlands	Session chair: Remus Hanea, Equinor
09:45-10:15	A reduced basis ensemble Kalman method for inverse problems F. Silva ¹ , C. Pagliantini ¹ , M. Grepl ² , K. Veroy ¹ ¹ Eindhoven University of Technology, The Netherlands; ² RWTH Aachen University, Germany	
10:15-10:45	Estimating soil organic carbon stocks with ensemble Kalman Filter methods <u>Toni Viskari</u> Finnish Meteorological Institute, Finland	
10:45-11:00	Break	
11:00-11:30	A shadowing-type data assimilation method for partially observed models Bart de Leeuw ¹ , <u>Svetlana Dubinkina</u> ² ¹ CWI Amsterdam, The Netherlands; ² VU Amsterdam, The Netherlands	Session chair: Laurent Bertino, NERSC
11:30-12:00	Convergence properties for a data-assimilation method based on a Gauss-Newton iteration <u>Nazanin Abedini</u> , Svetlana Dubinkina Vrije Universiteit Amsterdam, The Netherlands	
12:00-19:00	Lunch and free time	
19:00-	Dinner	

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Wednesday 01/06/2022

09:00-09:45	Application of ensemble-based methods in reservoir management decision support <u>Yuging Chang</u> Norwegian Research Centre (NORCE), Norway	Session chair: Dean Oliver, NORCE
09:45-10:15	Observability-based ensemble initiation for the EnKF in history matching problems <u>Tarek Daa-Eldeen</u> , Carl Fredrik Berg, Morten Hovd Norwegian University of Science and Technology (NTNU), Norway	
10:15-10:45	Analytical application development for digital hydrodynamic reservoir model updating and adjustment <u>Anastasia G. Mukhina</u> , Diana D. Oleynikova Gubkin Russian State University of Oil and Gas, Russian	
10:45-11:00	Break	
11:00-11:30	Online algorithms for learning data-driven models of chaotic dynamics <u>Marc Bocquet</u> ¹ , Alban Farchi ¹ , Quentin Malartic ¹ , Massimo Bonavita ² , Patrick Laloyaux ² , Marcin Chrust ² ¹ CEREA, France; ² ECMWF, UK	Session chair: Patrick Raanes, NORCE
11:30-12:00	Learning variational DA models and solvers with uncertainty quantification <u>N.Lafon</u> ¹ , R.Fablet ² , P.Naveau ¹ ¹ LSCE, IPSL-CNRS, France, ² IMT Atlantique UMR CNRS Lab-STICC, France	
12:00-13:00	Lunch	
13:00-13:30	Learning neural network-based turbulence models with ensemble Kalman method <u>Xin-Lei Zhang</u> ¹ , <u>Heng Xiao</u> ² , Xiaodong Luo ³ , Guowei He ¹ ¹ Chinese Academy of Sciences, China; ² Virginia Tech, USA; ³ Norwegian Research Centre (NORCE), Norway	Session chair: Rolf Lorentzen, NORCE
13:30-14:00	Recurrent application of pseudo ensemble smoother for calibration of channelized reservoirs using convolutional autoencoder <u>Sungil Kim</u> ¹ , Kyungbook Lee ² , Jungtek Lim ³ , Hoonyoung Jeong ⁴ , Baehyun Min ⁵ ¹ Korea Institute of Geoscience and Mineral Resources, Republic of Korea; ² Kongju National University, Republic of Korea; ³ SmartMind, Republic of Korea; ⁴ Seoul National University, Republic of Korea; ⁵ Ewha Womans University, Republic of Korea	
14:00-14:30	Deep convolutional generative adversarial network as parameterization method in data assimilation of non-Gaussian fields <u>Paulo Henrique Ranazzi</u> , Marcio Augusto Sampaio Universidade de São Paulo, Brasil	
14:30-14:45	Break	
14:45-15:15	Log-normalization constant estimation using the ensemble Kalman-Bucy filter with application to high-dimensional models <u>Hamza Ruzayqat</u> ¹ , Dan Crisan ² , Pierre Del Moral ³ , Ajay Jasra ¹ ¹ King Abdullah University of Science and Technology, Saudi Arabia; ² Imperial College London, UK; ³ Center INRIA Bordeaux Sud-Ouest & Institut de Mathématiques de Bordeaux, France	Session chair: Yiguo Wang, NERSC
15:15-15:45	An ensemble Kalman-Bucy filter for correlated observation noise <u>Sebastian Ertel</u> , Wilhelm Stannat TU Berlin, Germany	
15:45-16:00	Break	
16:00-16:30	Block updating in a band matrix formulation of Bayesian EnKF <u>Håkon Gryvill</u> , Håkon Tjelmeland Norwegian University of Science and Technology (NTNU), Norway	Session chair: Yue (Micheal) Ying, NERSC
16:30-17:00	Sampling error in the estimation of observation error covariance matrices using observation-minus-background and observation-minus-analysis statistics <u>Guannan Hu</u> ¹ , Sarah L. Dance ^{1,2} ¹ University of Reading, UK; ² National Centre for Earth Observation (NCEO), UK	
17:00-17:15	Break	

17:15-18:00	A framework for machine learning of model error in dynamical systems <u>Matthew Levine</u> Caltech, USA	Session chair:
18:00-18:30	A sampling method based on the second order Langevin dynamics Ziming Liu ¹ , Andrew Stuart ² , <u>Yixuan Wang</u> ² ¹ MIT, USA; ² Caltech, USA	Andreas Stordal, NORCE
18:30-	Dinner	

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Thursday 02/06/2022

09:00-09:45	Graphical sparse precision matrix estimation and the ensemble information filter <u>Berent Anund Stromnes Lunde, Fedra Curic</u> Equinor, Norway	Session chair: Dean Oliver, NORCE
09:45-10:15	4D history matching using ESM DA and flow-based distance-to-front measurement <u>Eduardo Barre la</u> ^{1,2} , Philippe, Berthet ¹ , Mario Trani ¹ , Olivier Thual ² , Corentin Lapeyre ³ ¹ TotalEnergies S.E., France; ² Toulouse INP, France; ³ CERFACS, France	
10:15-10:45	Towards application of multilevel data assimilation in realistic reservoir history-matching problems <u>Mohammad Nezhadali</u> , Tuhin Bhakta, Kristian Fossum, Trond Mannseth Norwegian Research Centre (NORCE), Norway	
10:45-11:00	Break	
11:00-11:30	Data assimilation in hierarchical models <u>Dean Oliver</u> Norwegian Research Centre (NORCE), Norway	Session chair: Rolf Lorentzen, NORCE
11:30-12:00	Gas production from methane hydrates and application of data assimilation technique <u>Koji Yamamoto</u> ¹ , Yutaro Arima ¹ , Satoshi Otsuki ¹ , Kazuaki Mikami ¹ , Hisanao Ouchi ² , Chihiro Nakajima ² , Koya Akamine ² , Yusuke Shimotoku ² , Machiko Tamaki ² , Motoyoshi Naiki ² , Mika Takekoshi ³ , Soma Watahiki ³ , Atsuki Oba ³ ¹ Japan Oil, Gas and Metals National Corporation (JOGMEC), Japan; ² Japan Oil Engineering Co., Ltd. (JOE), Japan; ³ Kozo Keikaku Engineering Inc. (KKE), Japan	
12:00-13:00	Lunch	
13:00-13:30	Bayesian seismic rock physics inversion using a localized ensemble-based approach - with an application to the Alvheim field <u>Mina Spremic</u> ¹ , Jo Eidsvik ¹ , Per Avseth ^{1,2} ¹ NTNU, Norway; ² Dig Science, Norway	Session chair: Yue (Michael) Yin, NERSC
13:30-14:00	Handling sparse observations in ensemble-based filtering with an application to drift trajectory forecasting <u>Florian Beiser</u> ^{1,2} , Håvard Heitlo Holm ¹ , Jo Eidsvik ² ¹ SINTEF Digital, Norway; ² Norwegian University of Science and Technology (NTNU), Norway	
14:00-14:30	Continuous Hyper-parameter OPTimization (CHOP) in an ensemble Kalman filter <u>Xiaodong Luo</u> ¹ , Chuan-an Xia ² ¹ Norwegian Research Centre (NORCE), Norway; ² Fuzhou University, China	
14:30-14:35	Concluding remarks (Laurent Bertino, NERSC)	

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Posters: Monday 30/05/2022

Possible improvements to EnOpt for control

Patrick N. Raanes

Norwegian Research Centre (NORCE), Norway

Improving land surface initialization in NorCPM using soil moisture assimilation

Akhilesh S. Nair¹, François Counillon^{1,2}, Noel Keenlyside¹

¹University of Bergen, Norway; ²Nansen Environmental and Remote Sensing Center (NERSC), Norway

Estimation of ocean biogeochemical parameters in an earth system model using the dual one step ahead smoother

Tarkeshwar Singh^{1,2}, François Counillon^{1,2}, Jerry F. Tjiputra^{2,3}, Yiguo Wang^{1,2}, Mohamad El Gharamti⁴

¹Nansen Environmental and Remote Sensing Center (NERSC), Norway; ²University of Bergen, Norway; ³Norwegian Research Centre (NORCE), Norway; ⁴National Center for Atmospheric Research (NCAR), USA

Atmospheric constrain in NorCPM

Lilian Garcia-Oliva¹, François Counillon^{1,2}, Ingo Bethke¹, Noel Keenlyside¹, Lea Svendsen¹

¹University of Bergen, Norway; ²Nansen Environmental and Remote Sensing Center (NERSC), Norway