# Scientific Program
## Workshop on Meteorological Sensitivity Analysis and Data Assimilation
## 1-6 July 2018 Aveiro, Portugal

| Pre-Workshop Tutorials | | | |
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| Sunday | | | 1 July 2018 |
| Sensitivity Analysis | | | |
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| 1100 | **Andrew Lorenc** | 0.1 | Basic Data Assimilation |
| 1300 | Lunch | | |
| 1430 | **Dan Holdaway** | 0.2 | Adjoint model development, validation, and application |

# Session 1

## Monday AM                                                     2 July 2018

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| **Sensitivity Analysis** | | | |
| | | | Session Chair: Nikki Privé |
| 0900 | **Ronald Errico David Carvalho** | 1.0 | Opening comments and instructions |
| 0920 | **Marta Janisková,** P. Lopez, F. Vána | 1.1 | Well known and less obvious applications of adjoint models: Do we explore enough their potential? |
| 0940 | **Michael Morgan,** Zhaoxiangrui He | 1.2 | Using adjoint-informed optimal initial condition perturbations  to study tropical cyclone intensity change. |
| 1000 | **Craig Oswald,** Michael Morgan | 1.3 | Understanding the sensitivity of cyclogenesis using adjoint analysis |
| 1020 | **Coffee Break** | | |
| 1050 | **Alexander Goldstein** | 1.4 | New methods for the calculation and analysis of quasi-optimal adjoint perturbation |
| 1110 | **Zoë Brooke Zibton,** Michael Morgan, Brett Hoover | 1.5 | Adjoint sensitivity diagnosis of the intensification of Hurricane Harvey |
| 1130 | **Brian Ancell**, Allison Bogusz, Matthew Lauridsen, Christian Nauert | 1.6 | Chaos seeding within perturbation experiments |
| 1150 | **Jeremy Berman,** Ryan Torn | 1.7 | The impact of warm conveyor belt forecast errors on variability in the downstream waveguide |
| 1230 | **Lunch** | | |

# Session 2

| | | | General Theoretical Data Assimilation |
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| | | | Session Chair: Sarah Dance |
| 1400 | **Richard Menard,** Sergey Skachko | 2.1 | Ensemble variance loss of in transport models and its implication to 4Dvar |
| 1420 | **Olivier Pannekoucke,** S. Ricci, R. Ménard, M. Bocquet, O. Thual | 2.2 | Parametric Kalman filter : toward an alternative to the EnKF? |
| 1440 | **Asia Pelc,** Craig H. Bishop | 2.3 | Accelerating local ensemble tangent linear models with order reduction |
| 1500 | **Benjamin Ménétrier,** Etienne Arbogast, Loïk Berre, Yannick Trémolet | 2.4 | The Normalized Interpolated Convolution on an Adaptive Subgrid (NICAS) method, a new implementation of localization for EnVar applications |
| 1520 | F. Mercier**, Yann Michel,** P. Jolivet, S. Gurol, T. Montmerle | 2.5 | Block methods for solving an ensemble of data assimilations |
| 1540 | | | **Coffee Break** |
| 1600 | **Wei Kang**, Liang Xu | 2.6 | Data assimilation for models with a sparse error covariance |
| 1620 | **Maha H. Kaouri,** Coralia Cartis, Amos Lawless, Nancy Nichols | 2.7 | Gauss-Newton-type optimization methods for variational data assimilation |
| 1640 | Serge Gratton, Selime Gürol, **Ehouarn Simon,** Philipe Toint | 2.8 | On the use of the saddle formulation in weakly-constrained 4D-Var |
| 1700 | **Adrian Sandu,** Vishwas Rao, Elias Nino, Michael Ng | 2.9 | Solving robust 4D-Var data assimilation |
| 1930 | | | **Dinner** |

# Session 3

Tuesday AM                                                            3 July 2018

| | | | | Data Assimilation Systems |
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| | | | | Session Chair: Loïk Berre |
| 0830 | **Răzvan Ştefănescu,** Dusanka Zupanski | 3.1 | Accuracy improvement of hybrid 4DEnVar and MLEF methods |
| 0850 | **Zhijin Li** | 3.2 | Some theoretical and practical Issues on multiscale data assimilation for high-resolution models |
| 0910 | **Dale Barker** | 3.3 | UK Met Office data assimilation strategy |
| 0930 | **Patrick Laloyaux**, Jacky Goddard, Simon Lang, Massimo Bonavita | 3.4 | The ECMWF weak constraint 4D-Var formulation |
| 0950 | **Tim Payne** | 3.5 | Rapid update cycling with delayed observations |
| 1010 | **Coffee Break** | | |
| 1030 | **Andrew Lorenc,** Mohamed Jardak | 3.6 | A comparison of hybrid variational data assimilation methods in the Met Office global NWP system |
| 1050 | **Ricardo Todling,** S. Akella, A. El Akkraoui J. Guo, L. L. Takacs | 3.7 | Preliminary experiments extending the assimilation window of the GMAO Hybrid 4DEnVar |
| 1110 | **Daryl Kleist,** Ting Lei, Rahul Mahajan, Cathy Thomas, Deng-Shun Chen | 3.8 | Scale-dependent localization and weighting in the FV3-GFS Hybrid Data Assimilation Scheme |
| 1130 | **Catherine Thomas,** Rahul Mahajan, Daryl Kleist, Jeffrey Whitaker, Russ Treadon | 3.9 | Adopting NCEP's Hybrid 4DEnVar data assimilation system to the FV3GFS |
| 1150 | **Marcin Chrust,** Mats Hamrud , Olivier Marsden, Deborah Salmond, Stephen English | 3.10 | Towards operational implementation of the Object Oriented Prediction System at ECMWF |
| 1230 | **Lunch** | | |

# Session 4

Tuesday PM                                             3 July 2018

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| **Data Assimilation Systems Cont.** | | | |
| | | | Session Chair: Andy Moore |
| 1400 | **Yannick Trémolet** | 4.1 | The Joint Effort for Data assimilation Integration (JEDI) |
| 1420 | **Daniel Holdaway** | 4.2 | Progress towards hybrid 4DVar with the FV3 dynamical core |
| 1440 | **Timothy Smith,** Patrick Heimbach | 4.3 | A dynamical reconstruction of AMOC Variability at the mouth of the South Atlantic |
| 1500 | **Nora Loose,** Patrick Heimbach, Kerim Nisancioglu | 4.4 | Uncertainty Quantification as a tool for Observing System Design in oceanographic inverse problems |
| 1520 | **Coffee Break** | | |
| 1540 | **Javier García-Pintado,** Pepijn Bakker , André Paul, Matthias Prange, Michael Schulz | 4.5 | Experiments for online estimation of model parameters for multidecadal climate reconstruction with the Community Earth System Model (CESM) |
| 1600 | **Ivo Pasmans,** Alexander Kurapov | 4.6 | Ensemble-variational data assimilation in the coastal ocean circulation model off Oregon-Washington (at the US West Coast) |
| 1630 | **Poster Session** | | |

# Poster Session

Tuesday PM                                             3 July 2018

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| **Will Crawford,** Sergey Frolov, Neil Barton, Craig Bishop | P.1 | Accounting for error in an ensemble of seasonal forecasts using a high resolution global coupled model |
| **Victor Trappler,** Elise Arnaud, Laurent Debreu, Arthur Vidard | P.2 | Parameter control in presence of uncertainties: robust estimation of bottom friction |
| **Zak Bell,** Sarah L Dance, Joanne A Waller | P.3 | Accounting for error due to unresolved scales in data assimilation |
| **Yvonne Ruckstuhl,** Tijana Janjic | P.4 | Joint parameter and state estimation with ensemble Kalman filter based algorithms for convective scale applications |
| Jean-Philippe Argaud, Serge Gratton, **Dimitri Mottet,** Ehouarn Simon | P.5 | Interaction between ensemble filter/smoother and model dynamics for stiff ODEs |

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| **Sujeong Lim,** Hyo-Jong Song, Ji-Hyun Ha, In-Hyuk Kwon, Hyun-Jun Han | P.6 | Sensitive experiments of the tropical cyclone bogus data assimilation depending on the background error covariance within the hybrid-4DEnVar system |
| **Arthur Vidard** | P.7 | Assessment of approximate 4D-Var schemes for ocean reanalysis |
| **Magda Sousa,** Rui Ruela, Ines Alvarez , Maite deCastro, Moncho Gomez-Gesteir, João Dias | P.8 | Analysis of global sea surface temperature changes under future scenarios |
| **Carina Lopes,** R. Mendes, I. Caçador, J.M. Dias | P.9 | On the use of Landsat imagery for long-term coastal wetland monitoring |
| **Alexander Kurapov,** A. Moore, E. Myers, E. Bayler | P.10 | Variational data assimilation in the US West Coast Ocean Forecast System (WCOFS) |
| **Michael Goodliff,** Anton Kliewer, Steven Fletcher John Forsythe, Andrew Jones | P.11 | Detection of lognormal signals in different atmospheric flows |
| **Rui Silva** and Irina Gorodetskaya | P.12 | Regional climate model's cloud microphysics and spatial resolution role in precipitation simulation during an atmospheric river event in Portugal |
| **Luca Cantarello,** O. Bokhove, S. Tobias, G. Inverarity, S.Migliorini | P.13 | Investigating satellite radiance data assimilation at different scales in an idealised convective modelling framework |
| **Min-Jeong Kim,** Dan Holdaway | P.14 | Sensitivity of Different Types of Observations to NASA GEOS Hurricane Analyses and Forecasts |
| **Clayton Cantrall,** Tomoko Matsuo | P.15 | Inference of thermospheric temperature profiles from ultra-violet emission observations from the NASA Global Observations of Limb and Disk (GOLD) mission |
| **Craig Bishop** | P.16 | Data assimilation strategies for state dependent observation error variances |
| **Amos Lawless,** Polly  Smith, Nancy Nichols | P.17 | Treating sample covariances for use in strongly coupled atmosphere-ocean data assimilation |
| **Takuya Kurihana**, H. L.Tanaka | P.18 | Assimilation with faster super observation algorithm for meteorological 'Big Data' |
| 1930 | **Dinner** | |

# Session 5

Wednesday AM                                            4 July 2018

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| **Nature of Background Error** | | | |
| | | | Session Chair: Daryl Kleist |
| 0900 | **Loïk Berre,**<br>Benjamin Ménétrier | 5.1 | Simulation and diagnosis of observation, model and background error contributions in data assimilation cycling |
| 0930 | **Amal El Akkraoui,**<br>Ricardo Todling,<br>Ron Errico | 5.2 | How much model error in a 6h ensemble forecast? |
| 0950 | **Nedjeljka Žagar** | 5.3 | Growth of forecast errors in global NWP models and inertia-gravity wave dynamics |
| 1010 | **Coffee Break** | | |
| 1030 | **Polly Smith,**<br>Amos Lawless,<br>Nancy Nichols | 5.4 | Estimating forecast error covariances for strongly coupled atmosphere-ocean 4D-Var data assimilation |
| 1050 | **Elizabeth Satterfield,**<br>Daniel Hodyss,<br>David Kuhl, Craig Bishop | 5.5 | Observation informed generalized hybrid error covariance models |
| 1110 | **Steven Fletcher,**<br>Michael Goodliff,<br>Anton Kliewer,<br>John Forsythe,<br>Andrew Jones | 5.6 | Comparisons of mixed Gaussian-lognormal, logarithmic transform and Gaussian fits all based on temperature-mixing ratio microwave retrieval systems |
| 1130 | **Sebastien Massart** | 5.7 | Two flavours of hybrid background error covariances for ECMWF 4D Var analysis |
| 1200 | **Bag Lunch** | | |
| 1330 | **Afternoon Free Activities** | | |
| 1930 | **Dinner** | | |
| 2045 | **Andy Moore** | | Random musings on the analysis equation |

# Session 6

| Thursday AM | | | 5 July 2018 |
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| Observations and Their Errors | | | |
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| | | | Session Chair: Marta Janiskova |
| 0900 | **Nancy Nichols,** J.M. Tabeart, S.L. Dance, A.S. Lawless, J.A Waller, S. Migliorini, F. Smith, S.P. Ballard | 6.1 | Incorporating Correlated Observation Errors in Variational Data Assimilation |
| 0920 | **Jemima Tabeart**, Sarah Dance, Amos Lawless, Nancy Nichols, Joanne Waller | 6.2 | Improving the conditioning of estimated covariance matrices |
| 0940 | D. Simonin, **Joanne Waller,** S. Ballard, S. Dance, N. Nichols | 6.3 | Doppler radial wind spatially correlated observation error: operational implementation and initial results |
| 1000 | **Oliver Guillet**, S. Gratton, S. Gurol , X. Vasseurd, A. Weaver | 6.4 | Modelling observation error correlations using a diffusion operator on unstructured grids |
| 1020 | **Coffee Break** | | |
| 1040 | **Andrew Moore,** Hernan Arango, Christopher Edwards | 6.5 | Reduced-rank array modes of the California Current ocean observing system |
| 1100 | **Ji-Hyun Ha,** Hyo-Jong Song, In-Hyuk Kwon, Hyoung-Wook Chun | 6.6 | Variational bias correction of radiance data at KIAPS and associated results |
| 1120 | **Rahul Mahajan,** Thomas Auligné, Ron Gelaro, Rolf Langland | 6.7 | Forecast Sensitivity and Observation Impact (FSOI) Inter-comparison Experiment |
| 1140 | **Akira Yamazaki,** Takemasa Miyoshi, Takeshi Enomoto, Nobumasa Komori, Jun Inoue | 6.8 | Using the Ensemble Forecast Sensitivity to Observations (EFSO) technique for global observing system experiments (OSEs) |
| 1200 | **Nikki Privé,** R.M. Errico | 6.9 | Adjoint estimation of observation impact explored with an Observing System Simulation Experiment |
| 1230 | **Lunch** | | |

# Session 7

## Observations and Their Errors Cont.

Session Chair: Ron Gelaro

| 1400 | **Fabio Diniz,** R. Todling | 7.1 | Comparing the adjoint- and ensemble-based approaches to observation impact on short-range forecasts |
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| 1420 | **Daisuke Hotta,** Yoichiro Ota | 7.2 | EFSO and DFS diagnostics for JMA's global data assimilation system: their caveats and potential pitfalls |
| 1440 | **Seon Ki Park,** Ebony Lee, Milija Zupanski | 7.3 | Assimilating synthetic all-sky radiances of GEMS using a coupled meteorology-chemistry prediction and data assimilation system |
| 1500 | **Javier Amezcua,** Evan Elliot, Peter Jan van Leeuwen | 7.4 | The use of observational tendencies for data assimilation in non-Markovian systems |
| 1520 | **Sarah Dance,** Sanita Vetra-Carvalho, Joanne Waller | 7.5 | Data Assimilation for the REsilient City (DARE) |
| 1540 | **Coffee Break** | | |
| 1600 | **Elizabeth Cooper,** Sarah Dance, Javier Garcia-Pintado, Nancy Nichols, Polly Smith | 7.6 | Observation operators for assimilation of satellite observations in fluvial inundation forecasting |
| 1620 | **Sanita Vetra-Carvalho,** Sarah L. Dance, David Mason, Javier Garcia-Pintado | 7.7 | On improving urban flood prediction through data assimilation using CCTV images |
| 1640 | **Nancy Baker,** Liang Xu, Justin Tsu | 7.8 | Revisiting assumptions: a critical re-examination of ocean surface wind assimilation in the U.S. Navy's Global and Mesoscale Data Assimilation Systems |
| 1700 | **Takuya Kawabata,** Genta Ueno | 7.9 | A storm-scale particle filter for investigating predictability of convection initiation and development |
| 1930 | **Dinner** | | |

# Session 8

Friday AM                                                                 6 July 2018

## Observations and Their Errors Cont.

Session Chair: Tim Payne

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| 0900 | **David Carvalho,** W. R. McCarty, R.M. Errico, N.C. Privé | 8.1 | NASA's GMAO atmospheric motion vectors simulator: description and application to the MISTiC Winds concept |
| 0920 | **Rohit Mangla,** J. Indu | 8.2 | Evaluation of microwave radiances of GPM/GMI for the all-sky assimilation in RTTOV framework |
| 0940 | **Francois Vandenberghe,** Thomas Auligné | 8.3 | Variational assimilation of GPS radio-occultation observations in rainy conditions |
| 1000 | **Coffee Break** | | |
| 1020 | **Yasutaka Ikuta** | 8.4 | Assimilation of GPM/DPR in km-scale hybrid-4DVar system |
| 1040 | **Ronald Errico** | 8.5 | Guidelines to consider when performing OSSEs |
| 1100 | **Ronald Errico, Nikki Privé** | | Departing Wrap-Up |
| 1230 | **Lunch** | | |