

Narrative summary

Sarah L DANCE is Professor of Data Assimilation at the University of Reading, leader of Reading's Data Assimilation Research Centre (DARC) and Divisional Director of Data Assimilation for the UK National Centre for Earth Observation. She won the Royal Meteorological Society Adrian Gill Prize 2020 for her *"world-leading research in data assimilation, the mathematical technique for the fusion of observations with state-of-the-art computational models. Her work on the fundamental mathematical theory and novel methods for data assimilation for hazardous weather and flood prediction has been transformational in bringing together the disciplines of mathematics, numerical weather prediction and hydrology."* She has won approx. £15 million (GBP) in research grant funding. She has experience leading successful, large, consortium projects (e.g. the NERC Flooding from Intense Rainfall programme) and recently held an EPSRC Senior Fellowship in Digital Technology for Living with Environmental Change (2016-2022). Her research has led to improvements in operational weather forecast accuracy at the Met Office, ECMWF, US Naval Research Laboratory, NASA, NCEP and DWD among others.

Employment

Present appointment: Divisional Director of Data Assimilation for the National Centre for Earth Observation (2021-present);

Professor of Data Assimilation (2018- present); Associate Professor(2014-2018); Lecturer (2010-2014); RCUK Academic Fellow (2005-2009) jointly held in the Departments of Mathematics & Statistics and Meteorology, University of Reading, UK

Maternity leave 02/2011-02/2012; Part-time (0.6 FTE 03/2012-12/2021, 0.8FTE from 01/2022)

Previous appointment: NCAS Postdoctoral fellow (PI Prof Paul Mason) (2002-2006), Department of Meteorology, University of Reading, UK

Education and Qualifications

2008 Postgraduate certificate of academic practice (Distinction), University of Reading, UK
 2002 Ph.D. Applied Mathematics, Brown University, USA
 1999 Sc.M. Applied Mathematics, Brown University, USA
 1997 B.A. (Hons) Mathematics, 1st class; Clare College, University of Cambridge, UK

Selected recent research grants

Approx £20 million in research grant funding with in-kind contributions from industry and government partners totalling £2.5 million. Only recent grants are included in the table.

Description	Role	Type of grant
NE/Y006216/1 NCEO Single Centre EO Science for the 2020s 01/04/24-31/3/29, £8.6 million	Divisional Director	NERC National Capability
Transatlantic Data Science Academy Scoping Project 1/11/24-31/3/25 £570k	Project leader	DSIT/Met Office Academic Partnership
A FAIR (flood aware informed resilient) approach to community flood risk. 01/08/22-31/3/27 £220k-	Reading PI	EA/DEFRA FCERM innovation programme

PhD/Postdoc supervision and PhD examination

PhD supervision: 12 PhD students completed and 3 current students

Postdoctoral research staff: 10 former staff and 4 current

Example destinations for PhD and postdoctoral staff: University of Oxford (Hooke Fellowship), TU Eindhoven (Assistant Professor), Met Office (Senior Scientist), SPIRE Global (Research scientist).

PhD examination: Internal examiner for 10 candidates and Independent Chair for 1 candidate (University of Reading); external examiner for 9 candidates (Universities of Oxford, Warwick, Leeds, Heriot Watt in the UK; Bergen and NTNU in Norway; Paris-Saclay, France).

Selected research leadership, indicators of esteem and memberships

Prizes: Royal Meteorological Society (UK) Adrian Gill Prize 2020

Selected invited keynote presentations/panels: ECMWF's 50th anniversary workshop, Bonn, April 2025; American Meteorological Society, January 2025; Royal Meteorological Society Masterclass, 2022; International EnKF Workshop, Norway(online) 2021, RealPEP, Germany 2020.

Selected International committees: World Meteorological Organisation (WMO) Data Assimilation and Observing Systems (DAOS) Working Group Co-Chair (2022-present), Met Office Scientific Advisory Committee, 2024-present,

Selected Conference Organisation: Scientific Steering Committee for the International Workshop on Sensitivity Analysis and Data Assimilation in Meteorology and Oceanography- "Adjoint workshop", (2018, 2024); Co-Convenor for annual European Meteorological Society Conference DA session (2013-2019).

Expert Reviewer: NERC & EPSRC Peer Review College; British Council, NSF (USA), Irish Research Council; KFAS (Kuwait); 20+ international journals; promotion reviews (UK) and professorial appointments (Sweden).

Professional Society Membership: Society for Industrial and Applied Mathematics, Royal Meteorological Society, British Hydrological Society, Fellow of the Higher Education Academy.

Selected Recent Publications

ORCID ID: <https://orcid.org/0000-0003-1690-3338> (full list of publications)

I have published over 70 peer reviewed papers in international journals. My h-index is 33 (google scholar 01/12/2024). It is my practice to acknowledge the work completed by my PhD students or PDRAs by making them the first author on papers for which they have completed the majority of the technical and analytical work.

Hu, G and **Dance, SL** A novel localized fast multipole method for computations with spatially correlated observation error statistics in data assimilation (2024) *JAMES*, 16(6) e2023MS003871, doi: 10.1029/2023MS003871

Hu, G and **Dance, SL** (2024) Sampling and misspecification errors in the estimation of observation-error covariance matrices using observation-minus-background and observation-minus-analysis statistics (2024) *QJR Meteorol Soc* 150:3052–3077 doi: 10.1002/qj.4750

Tabeart JM, **Dance SL**, Lawless AS, Nichols NK, Waller JA. New bounds on the condition number of the Hessian of the preconditioned variational data assimilation problem (2022). *Numer Linear Algebra Appl.* 2022; 29:e2405. doi:10.1002/nla.2405

Tabeart, JM, **Dance, SL**, Lawless, AS, Migliorini, S, Nichols NK, Smith, F, Waller, JA (2020) The impact of using reconditioned correlated observation-error covariance matrices in the Met Office 1D-Var system. *QJR Meteorol Soc.* 146: 1372-1390. doi:10.1002/qj.3741

Simonin, D, Waller, JA, Ballard, SP, **Dance, SL** and Nichols, NK (2019), A pragmatic strategy for implementing spatially correlated observation errors in an operational system: an application to Doppler radial winds. *Q J R Meteorol Soc.* 2019; 145: 2772-2790. doi:10.1002/qj.3592