

26th Biennial Conference
on
Numerical Analysis

23 June - 26 June, 2015

Programme

Tuesday 23rd June

<i>Chair:</i>	JA325 Barrenechea				
9:00-9:05	Opening Remarks				
9:05-10:05	S Brenner	Finite Element Methods for Fourth Order Elliptic Variational Inequalities			
10:05-11:05	F Bornemann	Random Matrix Distributions, Operator Determinants, and Numerical Noise			
11:05-11:30	COFFEE/TEA				
<i>Chair:</i>	JA325 M1	JA314 M2	JA317 M3	JA412 M4	
11:30-11:55	G Matthies M1 Local projection type stabilisation applied to inf-sup stable discretisations of the Oseen problem	E Larsson M2 Filtering and parameter estimation of partially observed diffusion processes using Gaussian RBFs	W Bao M3 Computational methods for the dynamics of the Gross-Pitaevskii/nonlinear Schrödinger equation with rotation and dipole-dipole interaction	R Grima M4 A comparison of approximation methods for stochastic biochemical networks	
11:55-12:20	D Paredes M1 Multiscale Hybrid-Mixed Method for Advective-Reactive Dominated Problems with Heterogeneous Coefficients	M Filippone M2 Scaling inference for Gaussian processes using stochastic linear algebra techniques	B Stamm M3 A perturbation-method-based post-processing of plane-wave approximations for nonlinear Schrödinger equations	S Cotter M4 A constrained approach to the simulation of multiscale chemical kinetics	
12:20-12:45	A Cangiani M1 <i>hp</i> -Version discontinuous Galerkin methods on polytopic meshes	H Wendland M2 A high-order, analytically divergence-free approximation method for the time-dependent Stokes problem	G Friesecke M3 Sparse control of quantum systems	K Zygalakis M4 Hybrid modelling of stochastic chemical kinetics	
12:45-14:00	LUNCH-Lord Todd				
<i>Chair:</i>	JA325 Knight				
14:00-15:00	T Kolda	A Survey of Optimization Challenges in Tensor Decomposition			
<i>Chair:</i>	JA325 M1	JA314 M2	JA317 M3	JA412 M5	
15:05-15:30	A Allendes M1 A robust numerical method for a control problem of singularly perturbed equations	C Keim M2 A High-Order, Analytically Divergence-free Approximation Method for the Navier-Stokes Equations	Y Maday M3 Quantum Calculations in Solution for Large to Very Large Molecules: presentation of the mathematical algorithm	D Higham M5 Numerical Analyticity	
15:30-15:55	N Ahmed M1 Adaptive time step control with variational time stepping schemes for convection-diffusion-reaction equations	K Webster M2 Approximation of Lyapunov Functions from Data	F Lipparini M3 Fast domain decomposition methods for continuum solvation models	J Levesley M5 Sparse interpolation and quasi-interpolation using Gaussians	
15:55-16:20	J Novo M1 Local error estimates for the SUPG method applied to evolutionary convection-reaction-diffusion equations	N Mohammed M2 Grid Refinement in the Construction of Lyapunov Functions Using Radial Basis Functions	V Gavini M3 Large-scale real-space electronic structure calculations	P Grindrod M5 Urban Living: Towards a Comparison of City-based Digital Social Networks and of Individual Demand Behaviour (Part 1)	
16:20-16:45	COFFEE/TEA				
<i>Chair:</i>	JA325 D Higham				
16:45-17:55	M Giles (A.R. Mitchell Lecture) Multilevel Monte Carlo methods				
18:15-19:15	DINNER-Lord Todd				
20:00-21:00	RECEPTION-Glasgow City Chambers				

Tuesday 23rd June

11:05–11:30

COFFEE/TEA

Chair:

JA 327 **Strakoš**

JA505 **Maischak**

JA507 **Duintjer Tebbens**

11:30-11:55

J Michaud

An introduction to time-dependent Fuzzy Domain Decomposition Methods

N Salles

Analysis of the convergence of Convolution Quadrature type methods

S Relton

Taylor's Theorem for Matrix Functions and Pseudospectral Bounds on the Condition Number

11:55-12:20

E Spence

Applying GMRES to the Helmholtz equation with shifted Laplacian preconditioning: what is the largest shift for which wavenumber-independent convergence is guaranteed?

M Maischak

New developments for exact quadrature in n -dim Galerkin BEM on polyhedral surfaces

J Pérez Álvaro

Pseudospectra and eigenvalue condition numbers of Fiedler companion matrices

12:20-12:45

I Graham

Domain decomposition for high-frequency Helmholtz problems using absorption

T Betcke

Computing spectral properties of boundary integral operators in three dimensions with BEM++

V Noferini

An algorithm to compute the polar decomposition of a 3×3 matrix

12:45-14:00

LUNCH-Lord Todd

Chair:

JA327 **Graham**

JA505 **Betcke**

JA507 **Duff**

15:05-15:30

J Blake

Domain Decomposition Methods for the Neutron Transport Equation

M Scroggs

Solving FEM/BEM Coupled Problems With FEniCS And BEM++

P Knight

Using matrix scaling to identify block structure

15:30-15:55

E van't Wout

The design of a fast boundary element method for use in medical ultrasound techniques

A Reinarz

Sparse Galerkin BEM for the heat equation

A Al-Mohy

Numerical Algorithms to Compute the Sine and the Cosine of a Matrix

15:55-16:20

M Beneš

Asynchronous multi-time-step domain decomposition method for evolution problems

J Duintjer Tebbens

A way to improve incremental 2-norm condition estimation

16:20-16:45

COFFEE/TEA

Wednesday 24th June

<i>Chair:</i>	JA325: Mackenzie							
9:00-10:00	C Elliott		Parabolic PDEs on evolving domains					
10:00-11:00	K Willcox		Data-Driven Model Reduction to Support Decision Under Uncertainty					
11:00-11:30	COFFEE/TEA							
<i>Chair:</i>	JA325 M6		JA314 M2		JA317 M7		JA412 M5/M3	
11:30-11:55	N Arthurs	M6	Q Zhang	M2	N Trefethen	M7	T Lee	M5
	Conservation Based Moving-Mesh Methods for Conservation Laws		Radial Basis Functions Interpolation with Error Indicator		Initial value problems and a new ODE textbook		Urban Living: Towards a Comparison of City-based Digital Social Networks and of Individual Demand Behaviour (Part 2)	
11:55-12:20	J Giesselmann	M6	F Filbir	M2	A Townsend	M7	E Estrada	M5
	Entropy based error estimates for fully discrete schemes for hyperbolic conservation laws		Learning functions on data defined manifolds		Beyond Chebyshev		Communicability Angles and the Spatial Efficiency of City Networks	
12:20-12:45	S May	M6	W zu Castell	M2	B Hashemi	M7	A Levitt	M3
	Embedded Boundary Methods for flow in complex geometries		Analogues of Classical Results on Radial Basis Functions for Zonal Basis Functions on the Sphere		From 2D to 3D		Parallel eigensolvers for electronic structure computations	
12:45-14:00	LUNCH-Lord Todd							
<i>Chair:</i>	JA325: Ramage							
14:00-15:00	C Moler		Evolution of MATLAB					
<i>Chair:</i>	JA325 M6		JA314 M8		JA317 M7		JA412 M3	
15:05-15:30	X Meng	M6	P Conrad	M8	H Montanelli	M7	C Yang	M3
	Optimal error estimates for discontinuous Galerkin methods based on upwind-biased fluxes for linear hyperbolic equations		Probability Measures on Numerical Solutions of ODEs and PDEs for Uncertainty Quantification and Inference		Computing choreographies		Absorption Spectrum Estimation via Linear Response Time-dependent Density Functional Theory	
15:30-15:55	K Lye	M6	A Gray	M8	M Javed	M7	L Lin	M3
	Multi-level Monte-Carlo methods for entropy measure valued solutions of hyperbolic conservation laws		Parameter estimation for the stochastic SIS epidemic model		Best approximations in Chebfun and applications to digital filters		A posteriori error estimates for Discontinuous Galerkin methods using non-polynomial basis functions with applications to solving Kohn-Sham density functional theory	
15:55-16:20	V Schleper	M6	D Silvester	M8	A Birkisson	M7	V Ehrlacher	M3
	Convergence of a numerical scheme for a mixed hyperbolic-parabolic system in two space dimensions		Efficient solvers for unsteady incompressible flow: hydrodynamic stability and UQ		Computing distinct solutions of nonlinear ODEs with Chebfun		Greedy algorithms for electronic structure calculations for molecules	
16:20-16:45	COFFEE/TEA							
<i>Chair:</i>	JA325 M6		JA314 M8		JA317 M7		JA412 M1	
16:45-17:10	N Sfakianakis	M6	A Mantzaris	M8	A Austin	M7	A Hierro	M1
	On the entropy dissipation of adaptive mesh reconstruction techniques		Message-Passing Hierarchy in a Dynamic Network		High-Accuracy Chebyshev Coefficients via Contour Integrals		Monotonicity Preserving Techniques for Continuous and Discontinuous Galerkin Methods	
17:10-17:35	P Townsend	M6	S Delahaies	M8	R Slevinsky	M7	G Barrenechea	M1
	A well-balanced kinetic scheme for the shallow water equations with rain		A practical method to assess parameter sensitivity and uncertainty in C-cycle models		A fast and well-conditioned spectral method for singular integral equations		Stability and error analysis of algebraic flux correction schemes	
17:35-18:00	M Vuik	M6	A Forbes	M8	J Aurentz	M7	O Sutton	M1
	Automated parameters for troubled-cell indicators using outlier detection		Accounting for model inadequacy in environmental monitoring		Krylov methods for operators		Virtual Element Methods for Elliptic Problems	
18:30 for 19:00	DRINKS RECEPTION, DINNER and CEILIDH-Barony Hall							

Wednesday 24th June

11:00–11:30	COFFEE/TEA		
<i>Chair:</i>	JA327 Silvester	JA505 C Macdonald	JA507 Rees
11:30-11:55	L Baffico Error analysis of a mixed finite element approximation of Stokes problem with Tresca friction boundary condition	E Cuesta A finite volume scheme for complex diffusion models in image processing	R Fletcher Augmented Lagrangians, non-negative QP and extensions
11:55-12:20	R Kynch Overcoming the sign conflict problem in H(curl)-conforming hexahedral hp -finite elements	K Chen A Fractional-Order Variation Based Image Co-Registration Model	J Kuřátko Application of the SQP Method for Finding Error Trajectories of a Dynamical System
12:20-12:45	S Cox Long-time, large-scale simulation of mantle convection	J Spencer Selective Segmentation with Intensity Inhomogeneity	M Moreta Adaptive hybrid Montecarlo simulated annealing
12:45-14:00	LUNCH-Lord Todd		
<i>Chair:</i>	JA327 E Spence	JA505 Jorge	JA507
15:05-15:30	J Gedicke Hodge decomposition for two-dimensional time harmonic Maxwell's equations: impedance boundary condition	J Cardoso On a Sub-Stiefel Procrustes Problem Arising in Computer Vision	O Fercoq Mind the duality gap: safer rules for the Lasso
15:30-15:55	S Barbeiro A priori finite element error analysis for problems with low regular solutions	A Portillo de la Fuente Splitting methods for the time integration of the Klein-Gordon equation with Hagstrom-Warburton high-order absorbing boundary conditions	J Papež Interpretation of the algebraic error in numerical solution of PDEs
15:55-16:20	D Broersen A promising DPG method for the (stationary) transport equation	E Sousa A high order method for advection dominated problems with fractional diffusion	E McDonald A parallelizable preconditioner for all-at-once solution of time-dependent PDE-constrained optimization problems
16:20-16:45	COFFEE/TEA		
<i>Chair:</i>	JA327 K Burrage	JA505 de Sturler	JA507 Jimack
16:45-17:10	H Yücel Fractional Allen-Cahn Equations	A Štikonas ADI method for two-dimensional pseudo-parabolic equation with integral boundary conditions	A Alrehaili Efficient Iterative Solution Algorithms For Numerical Models of Multiphase Flow
17:10-17:35	A Sariaydin Symmetric Interior Penalty Galerkin (SIPG) Method with Average Vector Field Method (AVF) for Cahn–Hilliard System with Degenerate Mobility	S Nayak A Family of Variable Mesh Methods for Solving Higher order Singular Non-linear Boundary Value Problems	E Arter A contribution to the theory of the sweeping preconditioner for the Helmholtz equation
17:35-18:00	M Weinzierl Efficient Numerical Methods for Solar Corona Simulations		

Thursday 25th June

<i>Chair:</i>	JA325 Dolean						
9:00-10:00	A Cohen		Adaptive algorithms for high dimensional interpolation				
10:00-11:00	J Hesthaven		High-order methods for fractional differential equations				
11:00–11:30	COFFEE/TEA						
<i>Chair:</i>	JA325 M9		JA314 M10		JA317 M6		JA412 M11
11:30-11:55	M Stynes	M9	G Albi	M10	J Ryan	M6	Z Strakoš M11
	Solution of Caputo and Riemann-Liouville two-point boundary value problems by reformulations using weakly singular Volterra integral equations		Uncertainty Quantification in Control Problems for flocking Models		Smoothness-Increasing Accuracy-Conserving (SIAC) Filtering for Discontinuous Galerkin Solutions over Nonuniform Meshes: Superconvergence and Optimal Accuracy		On the concepts of numerical stability in Krylov subspace methods
11:55-12:20	Y Huang	M9	M Bongini	M10	C Makridakis	M6	A Ramage M11
	Finite difference methods for fractional Laplacian		Sparse Control of Alignment Models in High Dimension		TBA		A multilevel preconditioner for data assimilation with 4D-Var
12:20-12:45	K Burrage	M9	A Fleig	M10			M Freitag M11
	Modelling and simulating the electrophysiology of a heterogeneous human heart by fractional models		Model Predictive Control of stochastic processes via the Fokker-Planck Equation				Preconditioners for two-sided eigenvalue problems
12:45-14:00	LUNCH-Lord Todd						
<i>Chair:</i>	JA325 Gould						
14:00-15:00	M Saunders		(Fletcher-Powell Lecture)				
	Experiments with linear and nonlinear optimization using Quad precision						
<i>Chair:</i>	JA325 M9		JA314 M10		JA317 M12		JA412 M11
15:05-15:30	M Kovács	M9	I Smears	M10	J Jorge	M12	J Pearson M11
	Higher order Grünwald approximations of fractional derivatives and fractional powers of operators		DGFEM approximation of parabolic HJB equations with Cordes coefficients		An efficient and uniformly convergent alternating direction method for solving 2D reaction-diffusion problems with time dependent boundary conditions		TBA
15:30-15:55	Y Yan	M9	A Festa	M10	E O’Riordan	M12	D Loghin M11
	Error estimates of finite element method for linear space-fractional partial differential equations		Reconstruction of independent sub-domains for a class of Hamilton-Jacobi equations and application to parallel computing		A convection dominated moving pulse		Block Interface Preconditioners for Optimal Control of Elliptic PDE
15:55-16:20	B Jin	M9	D Kalise	M10			T Rees M11
	Variational formulation of problems involving fractional order differential operators		High-order schemes for static Hamilton-Jacobi-Bellman equations				Observations on the use of block diagonal preconditioners with MINRES in interior point methods
16:20-16:45	COFFEE/TEA						
<i>Chair:</i>	JA325 M9		JA314		JA317 M12		JA412 M11
16:45-17:10	D Baffet	M9			S Franz	M12	E de Sturler M11
	High-Order Accurate Local Schemes for Fractional Differential Equations				Discontinuous Galerkin methods for time-dependent singularly perturbed problems		Simultaneous Random and Optimized Sources and Detectors for Efficient Optimization in Inverse Problems
17:10-17:35	K Pal	M9			N Kopteva	M12	J Pestana M11
	Higher order numerical methods for solving fractional differential equations				Maximum-norm a posteriori estimates for singularly perturbed reaction-diffusion problems on shape-regular and anisotropic meshes		Null-space preconditioners for saddle point problems
17:35-18:00	M Khan	M9			B García-Archilla	M12	I Riedel M11
	Numerical methods for some linear stochastic space-fractional partial differential equations				Grad-div stabilization for the evolutionary Navier-Stokes equations with inf-sup stable infinite elements		Simultaneous State and Parameter Estimation in Thermo-Elastic Models

19:30 for 20:00

DRINKS RECEPTION and CONFERENCE DINNER-Óran Mór, Byres Road
After-dinner speaker **Professor Nick Higham**

Thursday 25th June

11:00–11:30

COFFEE/TEA

Chair: JA327 **Cangiani** JA505 **Rebello** JA507 **P Burrage**

11:30-11:55

A Araújo

A Discontinuous Galerkin Scheme for Modelling Light Scattering in the Human Retina

F Nouri

Study of flows in heterogeneous porous media

A Bespalov

An adaptive algorithm for PDE problems with random data

11:55-12:20

D Antonopoulou

Finite elements for a class of non-linear stochastic pdes from phase transition problems

R Čiegis

On efficient numerical methods for unidirectional models of nonlinear-optics

P Russell

Parallelised Adaptive Importance Sampling

12:20-12:45

M Lau

A New Scientific Computing Platform on Mobile Devices

J-P Berrut

Linear barycentric rational interpolation with guaranteed degree of precision

G Katsiolides

Multilevel Monte Carlo Methods in Atmospheric Dispersion Modelling

12:45-14:00

LUNCH-Lord Todd

Chair:

JA327

JA505 **Duncan**

JA507 **Bespalov**

15:05-15:30

J Mackenzie

A computational method for the coupled solution of reaction-diffusion equations on evolving domains and surfaces

J Gospodarczyk

Efficient merging of multiple segments of Bézier curves

P Burrage

Populations of Models for Stochastic Differential Equations

15:30-15:55

T Ranner

Finite element methods for coupling bulk and surface phenomena

T Hnětynková

Wedge-shaped generalization of Jacobi matrices

Pranjal

An optimal solver for linear systems arising from stochastic FEM approximation of diffusion equations with random coefficients

15:55-16:20

T Diogo

Numerical analysis of cordial Volterra integral equations

16:20-16:45

COFFEE/TEA

Chair:

JA327 **Berrut**

JA505

JA507

16:45-17:10

L Gao

Some numerical solutions of Maxwell equations

17:10-17:35

D Merkert

An efficient solver for elliptic PDEs on the torus based on trigonometric collocation

17:35-18:00

P Khandelwal

Numerical solution for fourth-order two-point boundary value problems based on exponential sextic spline

Friday 26th June

<i>Chair:</i>	JA325 Pestana	
9:00-10:00	M Gander	Linear and Non-Linear Preconditioning
10:00-11:00	R Scheichl	Multilevel Uncertainty Quantification
11:00-11:30	COFFEE/TEA	
<i>Chair:</i>	JA325 M12	JA314 M11
11:30-11:55	S Russell M12 Sparse grid finite element methods for singularly perturbed problems	J Gondzio M11 Preconditioners for higher order methods in big data optimization
11:55-12:20	N Madden M12 A balanced-norm finite element method for singularly perturbed problems	E Sachs M11 Preconditioners for Optimization with Partial Integro-Differential Equations
12:20-12:45	A Hegarty M12 Numerical solution of singularly perturbed elliptic problems on non-rectangular domains	J Pearson M11 Preconditioning for constrained optimization problems
12:45-14:00	LUNCH - Foyer outside JA325	
	END OF CONFERENCE	

Friday 26th June

11:05–11:30

COFFEE

Chair:

JA317 Allendes

JA41 Davies

11:30-11:55

Y Sabawi

A posteriori error analysis of discontinuous Galerkin methods for elliptic interface problems

M Farquhar

GPU accelerated algorithms for computing matrix function vector products

11:55-12:20

C Gonzalez Aguayo

Finite Element Methods with Fictitious Domain for Transient Heat Equation: Stability and Convergence Analysis

M Rebelo

Meshfree methods for Brinkman flows driven by arbitrary forces

12:20-12:45

A Wachtel

Stabilization of High Aspect Ratio Mixed Finite Elements for Incompressible Flow

12:45-14:00

LUNCH - Foyer outside JA325

END OF CONFERENCE

Number	Title	Organiser(s)
M1	Stable and accurate discretisations for convection-dominated problems	G. Barrenechea and N. Kopteva
M2	Kernel methods in numerical analysis and learning theory	J. Levesley and H. Wendland
M3	Recent developments of mathematical aspects of computational chemistry	B. Stamm
M4	Numerical methods in stochastic problems in biology	K. Zygalakis and S. Cotter
M5	City analytics	D. Higham and J. Levesley
M6	Recent advances in numerical methods for hyperbolic conservation laws	T. Pryer
M7	Chebfun: new developments cool applications and on the horizon	N. Trefethen
M8	Data analytics and uncertainty quantification	A. Forbes and D. Higham
M9	Numerical methods for fractional differential equations	Y. Huang and B. Jin
M10	Numerical methods for feedback control of dynamical systems and related topics	D. Kalise
M11	Numerical linear algebra for optimisation and data assimilation	M. Freitag and J. Pearson
M12	Singularly perturbed differential equations	N. Madden and M. Stynes