

## IVAN GRAHAM - LIST OF PUBLICATIONS

The following list of publications is in reverse chronological order. Mathematical Reviews reference numbers, where relevant, are given in square brackets. Some papers are also available in electronic form at <http://www.maths.bath.ac.uk/~igg/publications>

- [1] S. N. Chandler-Wilde, I. G. Graham, S. Langdon, E.A. Spence, Numerical-asymptotic boundary integral methods in high-frequency scattering, **Acta Numerica** 21, 2012, pp 89 - 305. Published online: 19 April 2012.  
DOI: <http://dx.doi.org/10.1017/S0962492912000037>
- [2] I.G. Graham, T.Y. Hou, O. Lakkis and R. Scheichl Editors, **Numerical Analysis of Multiscale Problems**, Springer Lecture Notes in Computational Science and Engineering 83, 2011.
- [3] E.A. Spence, S. N. Chandler-Wilde, I. G. Graham, V. P. Smyshlyaev, A new frequency-uniform coercive boundary integral equation for acoustic scattering, **Communications in Pure and Applied Mathematics**, 64(10) (2011) 1384-1415.
- [4] T Betcke, S N Chandler-Wilde, I G Graham, S Langdon and M Lindner, Condition number estimates for combined potential integral operators in acoustics and their boundary element discretisation, to appear in **Numerical Methods for PDEs**, 2011.
- [5] F. Scheben and I.G. Graham, Iterative methods for neutron transport eigenvalue problems, Preprint Preprint 06/10, Bath Institute for Complex Systems, 2010, accepted for **SIAM J Sci. Comp.**, February 2011.
- [6] S. Giani and I. G. Graham, Adaptive finite element methods for computing band gaps in photonic crystals, accepted for **Numerische Mathematik**, September 2011.
- [7] I. G. Graham, F. Y. Kuo, D. Nuyens, R. Scheichl, and I. H. Sloan, Quasi-Monte Carlo methods for computing flow in random porous media, **J. Comp. Physics** appeared online, April 4th 2011. DOI: 10.1016/j.jcp.2011.01.023 .
- [8] V. Domínguez, I.G. Graham and V.P. Smyshlyaev, Stability and error estimates for Filon-Clenshaw-Curtis rules for highly-oscillatory integrals, **IMA J. Numer. Anal.** doi:10.1093/imanum/drq036, Published April 18th 2011.
- [9] T. Kim, V. Domínguez, I. G. Graham and V. P. Smyshlyaev, Recent Progress On Hybrid Numerical-Asymptotic Methods For High-Frequency Scattering Problems, In proceedings of the 7th UKBEM Conference (H. Power Ed, Nottingham, July 2009).

- [10] C.-C. Chu, I.G.Graham and T.-Y. Hou, A new multiscale finite element method for high-contrast elliptic interface problems, **Math. Comp.** 79 (2010) 1915-1955.
- [11] J. Van lent, R. Scheichl and I.G. Graham, Energy Minimizing Coarse Spaces for Two-level Schwarz Methods for Multiscale PDEs, **Numerical Linear Algebra with Applications**, doi 10.1002/nla.641, published online, 12th March 2009.
- [12] S.N. Chandler-Wilde and I.G. Graham, Boundary integral methods in high-frequency scattering, In “Highly Oscillatory Problems”, B. Engquist, T. Fokas, E. Hairer, A. Iserles, editors, Cambridge University Press, 2009, 154-193.
- [13] Simon N. Chandler-Wilde, Ivan G. Graham, Stephen Langdon, and Marko Lindner, Condition Number Estimates for Combined Potential Boundary Integral Operators in Acoustic Scattering, **Journal of Integral Equations and Applications**, 21 (2009), 229-279.
- [14] S. Giani and I.G.Graham, A convergent adaptive method for elliptic eigenvalue problems, **SIAM J Numer Anal**, 47 (2009), 1067-1091. DOI: 10.1137/070697264.
- [15] I.G. Graham, C.-C. Chu and T.Y. Hou, A new multiscale finite element method for high contrast elliptic interface problems, Oberwolfach Report 36/2008 on **Non-standard Finite Element Methods** (Eds S.C. Brenner, C. Carstensen and P. Monk), Mathematisches Forschungsinstitut Oberwolfach, 2008.
- [16] I.G. Graham, Robust boundary integral methods in high-frequency scattering, Oberwolfach Report 19/2008 on **Analysis of Boundary Element Methods** (Eds M. Costabel and E.P. Stephan), Mathematisches Forschungsinstitut Oberwolfach, 2008.
- [17] B. Aksoylu, I.G. Graham, H. Klie and R. Scheichl, Towards a rigorously justified algebraic preconditioner for high-contrast diffusion problems, Dedicated to Wolfgang Hackbusch on the occasion of his 60th birthday **Computing and Visualization in Science**, 11, pp. 319-331, 2008.
- [18] I. G. Graham, L. Grasedyck, W. Hackbusch, and S. A. Sauter, Optimal Panel-Clustering in the Presence of Anisotropic Mesh Refinement, **SIAM J. Numer. Anal.** 46 (2008), 517-543. DOI: 10.1137/060677987
- [19] I.G. Graham, Robust boundary integral methods in high frequency scattering, in **Computational Electromagnetism and Acoustics**, Oberwolfach Report 5/2007 (Eds. R. Hiptmair, R.H.W. Hoppe, P.Joly and U. Langer (2007))
- [20] I.G. Graham and R. Scheichl, Coefficient-explicit Condition Number Bounds for Overlapping Additive Schwarz, in Domain Decomposition methods in Science and Engineering XVII, **Lecture Notes in Computational Science and Engineering** Vol 60, U. Langer, M. Discacciati, D. Keyes, O. Widlund and W. Zulehner (Eds) (2008). ISBN: 978-3-540-75198-4 .
- [21] I.G. Graham and R. Scheichl, Robust Domain Decomposition Algorithms for Multiscale PDEs, **Numerical Methods for Partial Differential Equations**, 23(4):859-878, 2007. DOI 10.1002/num20254.

- [22] I.G. Graham, P. Lechner and R. Scheichl, Domain Decomposition for Multiscale PDEs, **Numer. Math.** 106 (2007), 471-510. DOI 10.1007/s00211-007-0074-1.
- [23] I.G. Graham and P.O. Lechner, Domain Decomposition for heterogeneous media, in Domain Decomposition Methods in Science and Engineering XVI, **Lecture Notes in Computational Science and Engineering**, Vol. 55 O. Widlund, and D. Keyes (Eds.) (2006). ISBN: 3-540-34468-3
- [24] V. Domínguez, I.G. Graham and V.P. Smyshlyaev, A hybrid numerical-asymptotic boundary integral method for high-frequency acoustic scattering, **Numer. Math.** 106 (2007), 471-510. DOI:10.1007/s00211-007-0071-4.
- [25] J. Berns-Mueller, I.G. Graham and A. Spence, Inexact inverse iteration for symmetric matrices, **Linear Algebra and its Applications** 416 (2006), 389-413.
- [26] I.G. Graham and W. McLean, Anisotropic Mesh Refinement, the Conditioning of Galerkin boundary element matrices and simple preconditioners, **SIAM J. Numer. Anal.** 44 (2006), 1487-1513.
- [27] B.D. Bonner, I.G. Graham and V.P. Smyshlyaev, The computation of conical diffraction coefficients in high-frequency acoustic wave scattering, **SIAM J. Numer. Anal.**, 43 (2005), 1202-1230.
- [28] I.G. Graham, W. Hackbusch, S.A. Sauter, Finite Elements on Degenerate Meshes: Inverse-type Inequalities and Applications, **IMA J. Numer. Anal.**, 25 (2005), 379-407. doi:10.1093/imanum/drh017
- [29] W. Dahmen, B. Faermann, I.G. Graham, W. Hackbusch, S.A. Sauter, Inverse Inequalities on Non-Quasiuniform Meshes and Application to the Mortar Element Method, **Mathematics of Computation**, 73 (2004), 1107-1138. Published online July 14th 2003, S 0025-5718(03)01583-7. ISSN: 1088-6842(e), 0025-5718(p)
- [30] M. Ganesh and I.G. Graham, A high-order algorithm for obstacle scattering in three dimensions, **Journal of Computational Physics**, 198 (2004), 211–242. ISSN: 0021-9991
- [31] E. Vainikko and I.G. Graham, A parallel solver for PDE systems and application to the incompressible Navier-Stokes equations, **Applied Numerical Mathematics** 49 (2004), 97-116.
- [32] M.A.J. Chaplain, M. Ganesh, I.G. Graham and G. Lolas, Mathematical modelling of solid tumour growth: Applications and pre-pattern formation, in “Morphogenesis and Pattern Formation in Biological Systems” eds. T. Sekimura, S. Noji, N. Ueno and P.K. Maini Springer Verlag, Tokyo 2003.
- [33] I.G. Graham, A. Spence and E. Vainikko, Parallel iterative methods for Navier-Stokes equations and application to eigenvalue computation, **Concurrency and Computation: Practice and Experience**, 15 (2003), 1151–1168.

- [34] I.G. Graham, A. Spence and E. Vainikko, Parallel iterative methods for Navier-Stokes equations and application to stability assessment, in Euro-Par 2002 Parallel Processing, B. Monien and R. Feldman (Eds), **Lecture Notes in Computer Science** 2400, Springer-Verlag, Berlin, 2002, pp705-714. ISSN 0302 9743, ISBN 3 540 44049 6.
- [35] I.G. Graham and I.H. Sloan, Fully discrete spectral boundary integral methods for Helmholtz problems on smooth closed surfaces in  $\mathbf{R}^3$ , **Numerische Mathematik** 92 (2002), 289-323. Published online, December 18th 2001 (DOI 10.1007/s002110100343. [ISSN: 0029-599X (p) 0945-3245 (e) ]
- [36] B.D. Bonner, I.G. Graham and V.P. Smyshlyaev, Numerical aspects of conical diffraction coefficient calculations, appeared in Proceedings of 3rd UK Conference on Boundary Integral Methods, Ed P.J. Harris, University of Brighton Press, 2001. ISBN 1 901177 32 7
- [37] M.A.J. Chaplain, M.Ganesh, and I.G. Graham, Spatio-temporal pattern formation on the surface of the unit sphere: Numerical simulation and application to solid tumour growth, **Journal of Mathematical Biology**, 42 (2001), 387-423.
- [38] S. Langdon and I.G. Graham, Boundary integral methods for singularly perturbed boundary value problems, **IMA J. Numer. Anal.** 21 (2001), 217-237. ISSN 0272-4979
- [39] I.G. Graham, W. Hackbusch and S.A. Sauter, Hybrid boundary elements: Theory and implementation, **Numerische Mathematik** 86 (2000), 139-172. ISSN 0029 599X
- [40] I.G. Graham, W. Hackbusch and S.A. Sauter, Discrete boundary element methods on general meshes in 3D, **Numerische Mathematik** 86 (2000), 103-137. ISSN 0029 599X
- [41] I.G. Graham, W. Hackbusch and S.A. Sauter, Hybrid Galerkin boundary elements on degenerate meshes, in **Mathematical Aspects of Boundary Element Methods** (M. Bonnet, A.-M. Sändig and W.L. Wendland, Eds.), CRC Press, 2000. ISBN 1 58488 006 6.
- [42] J.Elschner and I.G. Graham, Numerical methods for integral equations of Mellin type, in **Numerical Analysis 2000**, Volume 6: Ordinary differential and Integral Equations, C.T.H. Baker, J.D. Pryce, G.Vanden Berghe and G.Monegato, eds. Elsevier, Amsterdam, 2000, also J. Comp. Applied. Maths 125 (2000), 423-437.
- [43] K.A. Cliffe, I.G. Graham, R. Scheichl and L. Stals, Parallel computation of flow in heterogeneous media using mixed finite elements, **Journal of Computational Physics** 164 (2000), 258-282. ISSN 0021-9991
- [44] I.G. Graham and M.J. Hagger, Unstructured additive Schwarz-CG method for elliptic problems with highly discontinuous coefficients, **SIAM J. Sci. Comp.** 20 (1999), pp. 2041-2066. ISSN 1064-8275

- [45] I.G. Graham, R.A. Horrocks and S.A. Sauter, “Enriched” Hybrid Galerkin BEM, in **Proceedings of 2nd UK Conference on Boundary Integral Methods**, (L. Wrobel, S.N. Chandler-Wilde, Eds.), Brunel University Press, 1999, pp 177-188. ISBN 1-902316-00-2.
- [46] A. Spence and I.G. Graham, Numerical Methods for Bifurcation Problems, In **The Graduate’s Guide to Numerical Analysis** (M. Ainsworth, J. Levesley and M. Marletta, Eds.), Springer Series in Computational Mathematics, Volume 26, Springer-Verlag, Berlin, 1999. ISBN 3-540-6 5752-5.
- [47] I.G. Graham, W. Hackbusch and S.A. Sauter, Fast integration in 3D boundary elements, in **Domain Decomposition Methods in Science and Engineering** (C.-H. Lai, P.E. Bjørstad, M. Cross, and O.B. Widlund, Eds.), Domain Decomposition Press, Bergen, 1999, pp 37-48. ISBN 82-994951-1-3.
- [48] R.C. Ferguson and I.G. Graham, Multilevel adaptive methods for semilinear equations with applications to device modelling, in **Domain Decomposition Methods in Science and Engineering** (P. Bjørstad, M. Espedal and D. E. Keyes, Eds), Domain Decomposition Press, Bergen, 1998. ISBN 82-994951-0-5.
- [49] I.G. Graham and M.J. Hagger, Additive Schwarz, CG and discontinuous coefficients, in **Proceedings of 9th International Conference on Domain Decomposition** (P. Bjørstad, M. Espedal and D. Keyes, Eds), Domain Decomposition Press, Bergen, 1998. ISBN 82-994951-0-5.
- [50] M.Ganesh, I.G. Graham and J. Sivaloganathan, A new spectral boundary integral collocation method for three-dimensional potential problems, **SIAM J. Numer. Anal.**, 35 (1998), 778-805. ISSN 0036-1429 [99b:65173]
- [51] J. Elschner and I.G. Graham, Quadrature methods for Symm’s integral equation on polygons, **IMA J. Numer. Anal.** 17 (1997), 643-664. ISSN 0272-4979 [98h:45013]
- [52] I.G. Graham, W. Hackbusch and S.A. Sauter, The hybrid Galerkin boundary element method, in **Proceedings of the First UK Conference on Boundary Integral Methods**, (L. Elliott, D.B. Ingham and D. Lesnic, Eds), Leeds University Press, Leeds, 1997. ISBN 0 85316 179 8
- [53] R.K. Coomer and I.G. Graham, Massively parallel methods for semiconductor device modelling, **Computing** 56 (1996), 1-27. ISSN 0010-485X [95k:65072]
- [54] R.K. Coomer and I.G. Graham, Domain decomposition methods for device modelling, in **Domain Decomposition Methods in Science and Engineering** (Proceedings of the 7th International Conference on Domain Decomposition, October 27-30, 1993, The Pennsylvania State University), D.E. Keyes and J. Xu, eds., American Mathematical Society, Providence, 1995. [95j:65160]
- [55] J.Elschner and I.G. Graham, An optimal order collocation method for first kind boundary integral equations on polygons, **Numerische Mathematik** 70 (1995), 1–31. [95m:65215]

- [56] M. Ganesh, I.G. Graham and J. Sivaloganathan, A pseudospectral 3D boundary integral method applied to a nonlinear model problem from finite elasticity, **SIAM J. Numer. Anal.** 31 (1994), 1378-1414. [95g:45011]
- [57] J. Elschner and I.G. Graham, Parametrization methods for boundary integral equations of the first kind on polygonal boundaries, in **Boundary Value Problems and Integral Equations on Nonsmooth Domains** (M. Costabel, M. Dauge and S. Nicaise, Editors), Marcel Dekker, 1994, pp 81-99. [96e:65076]
- [58] G.A. Chandler and I.G. Graham, The calculation of water waves modelled by Nekrasov's equation, **SIAM J. Numer. Anal.** 30 (1993), 1041- 1065. [94e:65144]
- [59] I.G. Graham and K.E. Atkinson, On the Sloan iteration applied to integral equations of the first kind, **IMA J. Numer. Anal.** 13 (1993), 29-41. [94b:65173]
- [60] K.E. Atkinson and I.G. Graham, Iterative solution of linear systems arising from the boundary integral method, **SIAM J. Sci. Stat. Comp.** 13 (1992), 694-722. [92m:65169]
- [61] I.G. Graham, Lin Qun and Xie Rui-feng, Extrapolation of Nyström solutions of boundary integral equations on non-smooth domains, **J. Computational Mathematics** 10 (1992), 231-244. [93a:65179]
- [62] J.I.L. Gold and I.G. Graham, Towards automation of boundary integral methods for Laplace's equation, in **The Mathematics of Finite Elements and Applications**, J.R. Whiteman (ED), Academic Press, 1991, 349-359. [92d:65007]
- [63] I.G. Graham and Y. Yan, Piecewise constant collocation for first kind boundary integral equations, **J. Austral. Math. Soc. (Series B)** 33 (1991), 39-64. [92g:65141]
- [64] I.G. Graham and Y.Yan, Boundary integral methods for Laplace's equation, in **Numerical Analysis 1989** (D.F. Griffiths and G.A. Watson, eds), Longman Scientific, 122-136, 1990. (Based on an invited talk at the 13th Biennial Dundee Numerical Analysis Conference, June 1989.) 92d:65009]
- [65] I.G.Graham and W.R. Mendes, Nyström-Product integration for Wiener-Hopf equations with applications to radiative transfer, **IMA J. Numer. Anal.** 9 (1989), 261-284. [91c:65084]
- [66] I.G.Graham , R.E.Shaw and A. Spence, Adaptive numerical solution of integral equations with application to a problem with a boundary layer, in **Congressus Numerantium** 68 (1989), 75-90, Utilitas Mathematica Publishing, Winnipeg, Manitoba, Canada, 1989. [90b:65247]
- [67] K.E.Atkinson and I.G.Graham, An iterative variant of the Nyström method for boundary integral equations on non smooth boundaries, in **The Mathematics of Finite Elements and Applications**, JR Whiteman, ed., Academic Press, 1988. [89c:65004]

- [68] I.G.Graham and G.A.Chandler, High order methods for linear functionals of solutions of second kind integral equations, **SIAM J. Numer. Anal.** 25 (1988), 1118-1137. [90b:65246]
- [69] G.A.Chandler and I.G.Graham, The convergence of Nyström methods for Wiener-Hopf equations , **Numerische Mathematik** 52 (1988), 345-364. [89j:65089]
- [70] G.A.Chandler and I.G.Graham, Product integration-collocation methods for noncompact integral operator equations, **Math. Comp.** 50 (1988), 125-138. [88k:65127]
- [71] G.A.Chandler and I.G.Graham, Uniform convergence of Galerkin solutions to noncompact integral operator equations, **IMA J. Numer. Anal.** 7 (1987), 327-334. [90c:65158]
- [72] I.G.Graham, S.Joe and I.H.Sloan, Iterated Galerkin versus iterated collocation for Fredholm integral equations of the second kind, **IMA J. Numer. Anal.** 5 (1985), 355-369. [86j:65178]
- [73] I.G.Graham and C.Schneider, Product integration for weakly singular integral equations in m dimensional space, in **Constructive Methods for the Practical Treatment of Integral Equations** (G.Hammerlin and K.H.Hoffman eds.) ISNM 73, Birkhauser, 1985. [87j:45001]
- [74] I.G.Graham, Estimates for the modulus of smoothness, **J. Approx. Theory** 44 (1985), 95-112. [86k:41007]
- [75] I.G.Graham, Numerical methods for multidimensional integral equations, in **Computational techniques and applications** (J.Noye and C.Fletcher,eds.). Elsevier, 1984. [86h:65195]
- [76] K.E.Atkinson, I.G.Graham and I.H.Sloan, Piecewise continuous collocation for integral equations , **SIAM J. Numer. Anal.** 20 (1983), 172-186. [85a:65175]
- [77] I.G.Graham, Galerkin methods for second kind integral equations with singularities, **Math. Comp.** 39 (1982), 519-533. [84d:65090]
- [78] I.G.Graham, Singularity expansions for the solutions of second kind Fredholm integral equations with weakly singular convolution kernels, **J. Integral Equations** 4 (1982), 1-30. [83e:45006]
- [79] I.G.Graham, Collocation methods for two dimensional weakly singular integral equations, **J. Austral. Math. Soc.** (Series B) 22 (1981), 456-473. [85h:65099]
- [80] I.G.Graham, Some application areas for Fredholm integral equations of the second kind, in **The Application and Numerical Solution of Integral Equations** (eds R.S.Anderssen , F.R. de Hoog and M.Lukas) (Alphen aan den Rijn: Sijthoff and Noordhoof, 1980) [82b:45002]
- [81] I.G.Graham 'The Numerical Solution of Fredholm Integral Equations of the Second Kind' ( Ph.D. Thesis , University of N.S.W., 1980).

- [82] I.G.Graham and I.H.Sloan, On the compactness of certain integral operators **J. Math. Anal. Appl.** 68 (1979), 580-594. [80j:47059]