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## DEGREES

- 9/1993, Ph.D., Dept. of Astronomy, Columbia University.  
Advisor: Kevin Prendergast. Thesis topic: Numerical Methods for Fluid Equations
- 7/1987, B.S., Dept. of Geophysics, Beijing University.

## POSITIONS

- 7/2004 – present, Professor, Department of Mathematics, HKUST.
- 7/2001 – 6/2004, Associate Professor, Department of Mathematics, HKUST.
- 9/1996 – 6/2001, Assistant Professor, Department of Mathematics, HKUST.
- 10/1993 – 8/1996, Postdoc, Department of Mechanical and Aerospace Engineering, Princeton University. Advisor: Antony Jameson.

## VISITING POSITIONS

- Jan. 2004 - July 2004, Consultant, Air Vehicles Directorate, Air Force Research Laboratory, Wright-Patterson Air Force Base, Ohio.
- summers of 1995-2002 and August 1998 – Jan. 1999, Visiting scientist, Institute for Computer Applications in Science and Engineering, NASA Langley Research Center, Virginia.

## AWARDS

- China-U.S. Physics Examination and Application Program (CUSPEA) Student (1987).
- Merit Increase at HKUST (2001).

## STUDENTS SUPERVISED

- YIP Fai (MPhil 1997-1998): Finite Volume CE/SE Methods
- LIAN Yongsheng (MPhil 1998-1999): Multicomponent Chemical Reactive Flow Calculations
- ZHANG Hu (MPhil 1999-2000): Navier-Stokes Shock Structure Calculation by Gas-kinetic Scheme.
- CHEN Cheng (MPhil 2001-2001): Viscous Flow Simulation Using Unstructured Meshes.
- QUE Yin Tik (MPhil 2000-2003): BGK Kinetic Schemes for the Shallow Water Equations.

## RESEARCH GRANTS

- Principal Investigator, RGC HKUST6102/04E, Sept. 2004– August 2006, HK\$337,631. Project title: Implicit gas-kinetic scheme and accurate computation of heat transport for hypersonic viscous flow
- Principal Investigator, RGC HKUST6116/03E, Sept. 2003– August 2005, HK\$377,149. Project title: gas-kinetic scheme for multidimensional flow simulations.
- Principal Investigator, RGC HKUST6108/02E, August 2002– July 2004, HK\$413,404. Project title: Development and Application of Gas-kinetic Schemes to Near-continuum Flow Simulations.
- Principal Investigator, RGC HKUST6132/00p, August 2000– July 2002, HK\$287,817. Project title: Gas-kinetic Methods for Computational Fluid Dynamics.
- Principal Investigator (with W.H. Hui (CoI)), RGC HKUST6166/97p, Sept. 1997 - August 1999, HK\$416,000. Project title: Generalized Lagrangian BGK Method for Computing Multispecies Chemical Reactive Flow.
- Co-Investigator (with M. Ghidaoui (PI) and M. Davidson (CoI)), RGC HKUST6230/99E, Sept. 1999 - August 2001, HK\$490,000. Project title: Theoretical and Experimental Studies of Flow in the Leeward of Islands and Its Impact on Environmental Hydraulics.
- Principle Investigator, DAG 98/99.SC22, Jan. 1999 – August 2000, HK\$50,000. Project title: Gas-kinetic Method for Multiphase Flows.
- Principle Investigator, DAG 96/97.SC36, Dec. 1996 – May 1998, HK\$78,100. Project title: Gas-kinetic Method for the Navier-Stokes Equations.

## MAJOR INVITED PRESENTATIONS

- 7/2000 — First International Conference on Computational Fluid Dynamics, Kyoto, Japan.
- 23-27 Feb./1998 — 29th CFD Lecture Series at von Karman Institute for Fluid Dynamics, Belgium.

## OTHER RECENT INVITED PRESENTATIONS

- 24-27/10/2005 — 6th Asian Computational Fluid Dynamics Conference, Taipei, Taiwan.
- 22-26/8/2005 — 14th International Conference on the Discrete Simulation of Fluid Dynamics (DSFD 2005), Kyoto, Japan.
- 11-13/8/2005 — 8th Annual National CFD Symposium of India, Bangalore, India.
- 16-20/6/2005 — National Fluid Mechanics Symposium for Young Scientists, Mianyang, China.
- 10-14/1/2005 — Multiscale processes in fusion plasmas, Jan. 10-14, Los Angeles, USA.
- 9/2004 — 11th national shock wave and shock tube conference, Sept. 8-10, Sichuan, China.
- 9/2004 — 6th International workshop on mathematical aspects of fluid and plasma dynamics, Sept. 19-23, Kyoto, Japan.
- 5/2004 — International conference on nonlinear evolutionary partial differential equations, Jiang Su, China.
- 12/2003 — Workshop on Nonlinear Analysis and the Boltzmann Equation, Taiwan.
- 12/2003 — International Workshop on CFD-MHD methods and Applications in Astrophysics, Taiwan.
- 11/2003 — Workshop on Fluid Mechanics for Young Scientists, Xi'an, China.
- 7/2003 — Minisymposium of moving interface and free boundary problem, 5th international congress on industrial and applied mathematics, Sydney, Australia.
- 8/2003 — Workshop on multiscale problems and computation, Beijing University.
- 6/2003 — Minisymposium of recent advances in analysis and numerics for fluid dynamics problems, 2nd MIT conference on computational fluid and solid mechanics, Boston, USA.
- 8/2003 — 4th cross-strait CFD conference, Yunnan, China.
- 3/2003 — Minisymposium of numerical schemes for magnetohydrodynamics, International conference on high performance scientific computing, Hanoi, Vietnam.
- 10/2002 — Chinese National Shock Wave Symposium, Anhui, China.
- 8/2002 — International Conference on Nonlinear Evolution Equations, Analysis and Applications, Kaifeng, Henan University, China.
- 6/2002 — Workshop on Multiscale Analysis and Computation, Hsinchu, National Tsinghua University, Taiwan.

- 7/2001 — International Conference on Dynamics of Continuous, Discrete and Impulsive Systems, London, Canada.
- 9/2001 — National Fluid Dynamics Conference for Young Scientists, Wuxi, China.
- 3/2001 — International Conference on Scientific & Engineering Computing, Beijing, China.
- 3/2001 — IMA Workshop on Hyperbolic Conservations Laws, Chinese University of Hong Kong.
- 2/2001 — Third Cross-Strait Computational Fluid Dynamics Conference, Tainan, Taiwan.
- 12/2000 — Special session on: theoretical and numerical aspects of nonlinear conservation laws. AMS-HKMS meeting, Hong Kong Baptist University.
- 9/2000 — Fourth Asian Computational Fluid Dynamics Conference, Sichuan, China.
- 8/2000 — Ninth International Conference on Discrete Simulation of Fluid Dynamics, Santa Fe, USA.
- 7/2000 — Computational Fluid Dynamics for the 21st Century, Kyoto, Japan
- 5/2000 — IMA workshop on simulation of transport in transition regimes, Minneapolis, USA.
- 9/1999 — Second Cross-strait CFD Conference, Sichuan, China.
- 6/1999 — IMS Conference on Differential Equations from Mechanics, The Chinese University of Hong Kong.
- 7/1998 — Fifth International Workshop on Mathematical Aspects of Fluid and Plasma Dynamics, Hawaii, USA.
- 5/1998 — Modern Developments in Computational Fluid Dynamics and Computational Plasma, Columbia University, USA.

## **SHORT COURSES**

- 9-10 June /1998 — National Laboratory for Computational Fluid Dynamics, Beijing University of Aeronautics and Astronautics, China.
- 7-10 June/1997 — ICASE Short Course on Gas Automata, Lattice Boltzmann Equations, and Gas Kinetics, NASA Langley Research Center, USA.

## PUBLISHED AND ACCEPTED PAPERS IN REFEREED JOURNALS

- (1). K. Prendergast and K. Xu (1993), "Numerical Hydrodynamics from Gas-Kinetic Theory," *J. of Comput. Phys.* **109**, pp. 53-66
- (2). K. Xu and K. Prendergast (1994), "Numerical Navier-Stokes Solutions from Gas Kinetic Theory," *J. of Comput. Phys.* **114**, pp. 9-17.
- (3). K. Xu, L. Martinelli, and A. Jameson, (1995), "Gas-Kinetic Finite Volume Methods, Flux-Vector Splitting and Artificial Diffusion ," *J. of Comput. Phys.* **120**, pp. 48-65.
- (4). K. Xu (1995), "A New Class of Gas-Kinetic Relaxation Schemes for the Compressible Euler Equations ," *J. of Stat. Phys.* **81**, pp. 147-164.
- (5). K. Xu, C. Kim, L. Martinelli, and A. Jameson (1996), "BGK-based Schemes for the Simulation of Compressible Flow," *Int. J. of Comput. Fluid Dynamics* **7**, pp. 213-235.
- (6). C. Kim, K. Xu, L. Martinelli, and A. Jameson (1997), "Analysis and Implementation of Gas-Kinetic Schemes for Computational Gas Dynamics", *Int. J. for Numerical Methods in Fluids* **25**, pp. 21-49.
- (7). K. Xu (1997), "BGK-Based Scheme for Multicomponent Flow Calculations," *J. Comput. Phys.* **134**, pp. 122-133.
- (8). K. Xu and J. Hu (1998), "Projection Dynamics in Godunov-Type Schemes", *J. Comput. Phys.* **142**, No. 2, pp. 412-427.
- (9). K. Xu and L.S. Luo(1998), "Connection between Lattice Boltzmann Equation and Beam Scheme", *Int. J. of Modern Physics C* **9**, No. 8, pp. 1177-1188.
- (10). K. Xu (1999), "A Gas-Kinetic Scheme for the Euler Equations with Heat Transfer", *SIAM J. on Scientific Computing* **20**, No. 4, pp. 1317-1335.
- (11). T. Tang and K. Xu (1999), "Gas-Kinetic Schemes for the Compressible Euler Equations I: Positivity-Preserving Analysis", *Z. angew. Math. Phys.* **50**, No. 2, pp. 258-281.
- (12). K. Xu (1999), "Unsplitting BGK-Schemes for the Shallow Water Equations", *Int. J. of Modern Physics C* **10**, No. 4, pp. 505-516.
- (13). M. Su, K. Xu, and M. Ghidaoui (1999), "Low Speed Flow Simulation by the Gas-Kinetic Scheme", *J. Comput. Phys.* **150**, pp. 17-39.
- (14). K. Xu and S.H. Lui (1999), "Rayleigh-Benard Simulation Using Gas-Kinetic BGK Scheme in the Incompressible Limit", *Physical Review E* **60**, No. 1, pp. 464-470.
- (15). K. Xu (1999), "Gas-Kinetic Theory based Flux Splitting Method for Ideal Magneto-hydrodynamics", *J. Comput. Phys.* **153**, No. 2, pp. 334-352.
- (16). S.H. Lui and K. Xu (2001), "Entropy Analysis of Gas-Kinetic Schemes for the Compressible Euler Equations", *Z. angew. Math. Phys.* **52**, pp. 62-78.

- (17). Y.S. Lian and K. Xu (2000), “A Gas-Kinetic Scheme for Reactive Flows”, *Computers & Fluids* **29**, pp. 725-748.
- (18). H.Z. Tang and K. Xu (2001), “Pseudoparticle Representation and Positivity Analysis of Explicit and Implicit Steger-Warming FVS Schemes”, *J. Appl. Math. Phys. (ZAMP)* **52**, pp. 847-858.
- (19). M.S. Ghidaoui, J.Q. Deng, W.G. Gray, and K. Xu (2001), “A Boltzmann Based Model for Open Channel Flows”, *Int. J. for Numerical Methods in Fluids* **35**, pp. 449-494.
- (20). Y.S. Lian and K. Xu (2000), “A Gas-Kinetic Scheme for Multimaterial Flow and Its Application in Chemical Reaction”, *J. of Comput. Physics* **163**, No. 2, pp. 349-375.
- (21). H. Tang and K. Xu (2000), “A High-order Gas-kinetic Method for Multidimensional Ideal Magnetohydrodynamics”, *J. of Comput. Physics* **165**, No. 1, pp. 69-88.
- (22). H.Z. Tang and K. Xu (2000), “Positivity Analysis of Explicit and Implicit Lax-Friedrichs Schemes for the Compressible Euler Equations”, *J. Scientific Computing* **15**, No. 1, pp. 19-28.
- (23). K. Xu and Z.W. Li (2001), “Dissipative Mechanism in Godunov-type Schemes”, *Int. J. for Numerical Methods in Fluids* **37**, 1-22.
- (24). K. Xu and Z.H. Pan (2001), “KFVS scheme for 1D shallow water equations with wavy bottom”, *Journal of Hydrodynamics (Chinese)* **17** (2), 140-147.
- (25). H.Z. Tang and K. Xu (2001), “On positivity of a class of flux-vector splitting methods. I: explicit difference schemes. (Chinese)”, *Math. Numer. Sin.* **23**, 469-476.
- (26). J.Q. Deng, M.S. Ghidaoui, W.G. Gray, and K. Xu (2001), “A Boltzmann-based Mesoscopic Model for Contaminant Transport in Flow System”, *Advances in Water Resources* **24**, pp. 531-550.
- (27). K. Xu (2001), “A Gas-Kinetic Method for Hyperbolic-Elliptic Equations and Its Application in Two-Phase Flow”, *J. of Comput. Physics* **166**, No. 2, pp. 383-399.
- (28). K. Xu (2001), “Comment on *Development of an Improved Gas-kinetic BGK Scheme for Inviscid and Viscous Flow* [J. Comput. Phys. 158, 1-27 (2000)]”, *J. of Comput. Phys.* **171**, 843-847.
- (29). K. Xu (2001), “A Gas-kinetic BGK Scheme for the Navier-Stokes Equations and Its Connection with Artificial Dissipation and Godunov Method”, *J. Comput. Phys.* **171**, 289-335.
- (30). H.Z. Tang, P. Cheng, and K. Xu (2001), “Numerical Simulations of Resonant Oscillations in a Tube”, *Numerical Heat Transfer A – Application* **40**, pp. 37-54.
- (31). H.Z. Tang, T. Tang, and K. Xu (2004), “A Gas-kinetic Scheme for Shallow-Water Equations with Source Terms”, *J. Appl. Math. Phys. (ZAMP)* **55**, pp. 365-382.
- (32). K. Xu (2002), “Regularization of the Chapman-Enskog expansion and its description of shock structure”, *Physics of Fluids* **14**, No. 4, L17-20.

- (33). K. Xu (2002), “A Slope-update Scheme for Compressible Flow Simulation”, *J. Comput. Phys.* **178**, No. 1, pp. 252-259.
- (34). K. Xu (2002), “A well-balanced gas-kinetic scheme for the shallow water equations with source terms”, *J. Comput. Phys.* **178**, No. 2, pp. 533-562.
- (35). K. Xu (2003), “Super-Burnett Solutions for Poiseuille Flow”, *Physics of Fluids* **15**, No. 7, pp. 2077-2080.
- (36). K. Xu and X.Y. He (2003), “Lattice Boltzmann Method and Gas-kinetic BGK Scheme in the Low Mach Number Flow Simulations”, *J. Comput. Phys.* **190**, pp. 100-117.
- (37). K. Xu (2004), “Discontinuous Galerkin BGK Method for Viscous Flow Equations: One-dimensional System”, *SIAM J. Scientific Computing*, **25**, No. 6, pp.1941-1963.
- (38). K. Xu and Z.H. Li (2004), “Microchannel flow in slip regime: gas-kinetic BGK-Burnett solutions”, *J. Fluid Mechanics* **513**, pp. 87-110.
- (39). T. Ohwada and K. Xu (2004), “The kinetic scheme for full Burnett equations”, *J. Comput. Phys.* **201**, pp. 315-332.
- (40). K. Xu and L. Tang (2004), “Non-equilibrium BGK Model for Nitrogen Shock Structure”, *Physics of Fluids* **16**, 3824.
- (41). K. Xu, M.L. Mao, and L. Tang (2005), “A multidimensional gas-kinetic BGK scheme for hypersonic viscous flow”, *J. Comput. Phys.* **203** (2005), pp. 405-421.
- (42). Q.B. Li, S. Fu, and K. Xu (2005), “A compressible Navier-Stokes flow solver with scalar transport”, *J. Comput. Phys.* **204** (2005), pp. 692-714.
- (43). K. Xu and E. Josyula (2005), “A multiple translational temperature model and its shock structure solution”, to appear in *Physical Review E*.

## REPORTS and PUBLICATIONS in CONFERENCE PROCEEDINGS

- (c1). K. Xu, L. Martinelli, and A. Jameson(1994), “Gas-Kinetic Finite Volume Methods,” 14th Int. Conference on Numer. Methods in Fluid Dynamics, India
- (c2). K. Xu, L. Martinelli, and A. Jameson(1995), “Euler Multigrid Calculations Using a Gas-Kinetic Scheme,” *AIAA 95-0206*.
- (c3). K. Xu and A. Jameson (1995), “Gas-Kinetic Relaxation (BGK-Type) Schemes for the Compressible Euler Equations,” *AIAA 95-1736*.
- (c4). K. Xu, C. Kim, L. Martinelli, and A. Jameson(1995), “On the Construction of BGK-type Schemes for Compressible Flow Simulations,” 6th Int. Sym. on CFD, Lake Tahoe, Nevada, Sept. 4-8,1995.
- (c5). C.A. Kim, A. Jameson, L. Martinelli and K. Xu (1997), “An Accurate LED-BGK Solver on Unstructured Adaptive Meshes”, *AIAA-97-0328*.
- (c6). K. Xu (1997), “A BGK Solver for Multicomponent Euler Equations”, *AIAA 97-2079*.
- (c7). K. Xu (1997), “A Gas-Kinetic Scheme for the Euler Equations with Heat Transfer”, *7th Int. Symp. on CFD*, Beijing, China.
- (c8). K. Xu (1999), “Gas Evolution Dynamics in Godunov-type Schemes and Analysis of Numerical Shock Instability”, ICASE Report 99-6, NASA Langley Research Center.
- (c9). K. Xu and S.H. Lui (1998), “Rayleigh-Benard Simulation using Gas-kinetic BGK scheme in Incompressible Limit”, ICASE Report 98-56, NASA Langley Research Center.
- (c10). S.H. Lui and K. Xu (1999), “Entropy Analysis of Kinetic Flux Vector Splitting Schemes for the Compressible Euler Equations”, ICASE Report 99-5, NASA Langley Research Center.
- (c11). K. Xu (1999), “Does Perfect Riemann Solver Exist ?”, *AIAA 99-3344*.
- (c12). K. Xu (1999), “Gas-kinetic Flux Splitting Method for Ideal Magnetohydrodynamics”, *AIAA 99-3323*.
- (c13). K. Xu and L.S. Luo (1999), “Connection between the Lattice Boltzmann Equation and the Beam Scheme”, ICASE Report 99-10, NASA Langley Research Center.
- (c14). K. Xu (1999), “A Gas-kinetic Method for Hyperbolic-elliptic Equations and its Application in Two-phase Fluid Flow”, ICASE Report No. 99-31, NASA Langley Research Center.
- (c15). Y.S. Lian and K. Xu (1999), “Gas-Kinetic Scheme for Multimaterial Flow and Its Application in Chemical Reaction”, ICASE Report 99-28, NASA Langley Research Center.
- (c16). K. Xu (2000), “Gas-Kinetic Schemes for Fluid Simulations”, will be published in lecture notes in physics, Springer. Invited lecture at 1st International Conference on CFD, July 9-14, Kyoto, Japan.



- (c17). K. Xu (2001), "Dissipative Mechanism in Godunov Method", in Notes on Numerical Fluid Mechanics, Vol. 78, ( Computational Fluid Dynamics for the 21st Century ) M. Hafez, K. Morinishi, and J. Periaux (Eds), pp. 309-321.
- (c18). K. Xu and H.Z. Tang (2000), "A Gas-kinetic Method for Ideal Magnetohydrodynamics", invited lecture at 4th Asian Computational Fluid Dynamics Conference, September.
- (c19). K. Xu (2000), "A Gas-kinetic BGK Scheme for the Compressible Navier-Stokes Equations", ICASE Report 00-38, NASA Langley Research Center.
- (c20). K. Xu (2001), "A Compact Gas-kinetic Scheme", 3rd Cross-strait CFD Conference, Feb. 12-14, 2001, Taiwan.
- (c21). K. Xu (2001), "Regularization of the Chapman-Enskog expansion and its description of shock structure", ICASE Report 2001-39, NASA Langley Research Center.
- (c22). K. Xu (2002), "Regularization of the Chapman-Enskog expansion and the Shock Structure Calculation", paper presented at 23rd International conference on Rarefied Gas Dynamics, July 20-25, Whistler, British Columbia, Canada.
- (c23). K. Xu (2003), "Kinematic and dynamic dissipation in shock capturing schemes", Second MIT conference on computational fluid and solid mechanics, June 17-20, Boston, USA.
- (c24). K. Xu (2003), "Numerical dissipation and shock capturing schemes", AIAA-3003-4114, 16th AIAA Computational Fluid Dynamics Conference, Orlando, Florida, 23-26 June, 2003.
- (c25). K. Xu and M.L. Mao (2003), "Laminar Hypersonic Viscous Flow Calculations Using Gas-kinetic BGK Scheme", National Fluid Mechanics Workshop for Young Scientists, Xi'an, Nov. 8-11 (2003).
- (c26). L. Tang and K. Xu (2004), "Unified gas-kinetic computational algorithm for continuum and rarefied flows", 42nd AIAA Aerospace Sciences Meeting & Exhibit, AIAA 2004-1179.
- (c27). E. Josyula, D.C. Wadsworth, and K. Xu (2004), "Testing Continuum and Non-continuum Descriptions in High Speed Flows", Proceeding of 24th International Conference on Rarefied Gas Dynamics, July.
- (c28). E. Josyula, W.F. Bailey, and K. Xu (2004), "Nonequilibrium relaxation in high speed flows", 37th AIAA Thermophysics Conference, June 28-July 1, Portland, Oregon. Paper 2004-2468.
- (c29). K. Xu and M.L. Mao (2004), "Gas-kinetic BGK scheme for hypersonic viscous flow", 3rd International Conference on Computational Fluid Dynamics, Toronto, Canada, July 12-16.
- (c30). E. Josyula and K. Xu (2005), "Non-equilibrium relaxation in high temperature gas flows", Third MIT conference on computational fluid and solid mechanics, June, Boston, USA.
- (c31). K. Xu and E. Josyula (2005), "Gas-kinetic model for Navier-Stokes solutions with multiple translational temperature", 35th AIAA Fluid Dynamics Conference and Exhibit, AIAA 2005-4888, Toronto, Canada.