Ben Weinkove

Contact Information

Address: Mathematics Dept, Northwestern University, 2033 Sheridan Road, Evanston, IL 60208

Webpage: sites.google.com/view/benweinkove/home

Employment

Chair of Department, Northwestern University, September 2021 - present

Professor, Northwestern University, Jan 2013 - present

Visiting Professor, Northwestern University, Sep 2012 - Dec 2012

Professor, UC San Diego, Sep 2012 - Dec 2012 (on leave)

Associate Professor, UC San Diego, 2008-2012

Benjamin Peirce Assistant Professor, Harvard University, 2004-2008 (on leave 2005-2006)

Royal Society Research Assistant, Imperial College London, 2005-2006

Education

PhD Mathematics, with distinction, Columbia University, advisor: D.H. Phong, 1999-2004

MMath (undergraduate degree, mathematics), Oxford University, 1995-1999

Awards & Honors

Fellow of the American Mathematical Society, Class of 2017

Invited Plenary Speaker, AMS Central Section Meeting, University of Akron, 2012

Alfred P. Sloan Fellow 2008

Grants

Nonlinear Partial Differential Equations and Geometry, NSF DMS-2005311, $247,948, 2020-2023

Elliptic and Parabolic Partial Differential Equations on Manifolds, NSF DMS-1709544, $207,000, 2017-2020

RTG Analysis on Manifolds, NSF DMS-1502632 $2,185,074, 2015-2020 (co-PI)

Nonlinear PDEs and complex geometry, NSF DMS-1406164 $185,307, 2014-2017

73rd Midwest PDE seminar, NSF DMS-1420160, $9,000, 2014-2015 (co-PI)

Emphasis Year in Geometric Analysis at Northwestern University, NSF DMS-1454077 $48,950, 2015-2016

Analysis, Complex Geometry, and Mathematical Physics, NSF DMS-1266145, 2012-2013, $49,990 (co-PI)

Great Lakes Geometry Conference 2013, NSF DMS-1301714, 2012-2013, $18,500 (co-PI)

Elliptic and parabolic complex Monge-Ampère equations on compact manifolds, NSF DMS-1105373, 2011-2014, $187,683, transferred to Northwestern as DMS-1332196

Southern California Geometric Analysis Seminar, NSF DMS-1006180, 2010-2013, $70,000 (co-PI)

PDE's in complex and symplectic geometry, NSF DMS-0848193, 2008-2011, $136,272

Parabolic flows and canonical metrics in Kähler geometry, NSF DMS-0504285, 2005-2008, $115,995

Publications

1. M. Sherman, B. Weinkove, *The perfect conductivity problem with arbitrary vanishing orders and non-trivial topology*, arXiv:2301.03682, to appear in J. Math. Analysis & Appl.

2. A. Chau, B. Weinkove, *Instantaneous convexity breaking for the quasi-static droplet model*, arXiv:2210.12281, to appear in Interfaces and Free Boundaries

3. A. Chau, B. Weinkove, *Concavity of solutions to semilinear equations in dimension two*, Bull. Lond. Math. Soc. 55 (2023), no. 2, 706–716

4. B. Weinkove, *The insulated conductivity problem, effective gradient estimates and the maximum principle*, Math. Ann. 385 (2023), no. 1-2, 1–16

5. V. Tosatti, B. Weinkove, *The Chern-Ricci flow*, Atti Accad. Naz. Lincei Rend. Lincei Mat. Appl. 33 (2022), no. 1, 73–107

6. A. Chau, B. Weinkove, *The Stefan problem and concavity*, Calc. Var. Partial Differential Equations 60 (2021), no. 5, Paper No. 176, 13 pp

7. A. Chau, B. Weinkove, *Strong space-time convexity and the heat equation*, Indiana Univ. Math. J. 70 (2021), no. 4, 1189–1210

8. V. Tosatti, B. Weinkove, *The complex Monge-Ampère equation with a gradient term*, Pure Appl. Math. Q. 17 (2021), no. 3, 1005–1024

9. G. Székelyhidi, B. Weinkove, *Weak Harnack inequalities for eigenvalues and constant rank theorems*, Comm. Partial Differential Equations 46 (2021), no. 8, 1585–1600

10. M. Sherman, B. Weinkove, *The continuity equation, Hermitian metrics and elliptic bundles*, J. Geom. Anal. 30 (2020), 762–776

11. A. Chau, B. Weinkove, *Counterexamples to quasiconcavity for the heat equation*, Int. Math. Res. Not. 2020, (2020), no. 22, 8564–8579

12. J. Chu, V. Tosatti, B. Weinkove, *The Monge-Ampère equation for non-integrable almost complex structures*, J. Eur. Math. Soc. (JEMS) 21 (2019), no. 7, 1949–1984

13. V. Tosatti, B. Weinkove, *Hermitian metrics, (n-1,n-1) forms and Monge-Ampère equations*, J. Reine Angew. Math. 755 (2019), 67–101

14. B. Weinkove, *Convexity of level sets and a two-point function*, Pacific J. Math. 295 (2018), no. 2, 499–509

15. V. Tosatti, B. Weinkove, *The Aleksandrov-Bakelman-Pucci estimate and the Calabi-Yau equation*, Nonlinear analysis in geometry and applied mathematics. Part 2, 147–158, Harv. Univ. Cent. Math. Sci. Appl. Ser. Math., 2, Int. Press, Somerville, MA, 2018.

16. J. Chu, V. Tosatti, B. Weinkove, $C^{1,1}$ *regularity for degenerate complex Monge-Ampère equations and geodesic rays*, Comm. Partial Differential Equations 43 (2018), no. 2, 292–312

17. V. Tosatti, B. Weinkove, X. Yang, *The Kähler-Ricci flow, Ricci-flat metrics and collapsing limits*, Amer. J. Math. 140 (2018), no. 3, 653–698

18. G. Székelyhidi, V. Tosatti, B. Weinkove, *Gauduchon metrics with prescribed volume form*, Acta Math. 219 (2017), no. 1, 181–211

19. J. Chu, V. Tosatti, B. Weinkove, *On the $C^{1,1}$ regularity of geodesics in the space of Kähler metrics*, Ann. PDE 3 (2017), no. 2, Art. 15, 12 pp

20. V. Tosatti, B. Weinkove, *The Monge-Ampère equation for (n-1)-plurisubharmonic functions on a compact Kähler manifold*, J. Amer. Math. Soc. 30 (2017), 311–346

21. S. Fang, V. Tosatti, B. Weinkove, T. Zheng, *Inoue surfaces and the Chern-Ricci flow*, J. Funct. Anal. 271 (2016), no. 11, 3162–3185

22. G. Székelyhidi, B. Weinkove, *On a constant rank theorem for nonlinear elliptic PDEs*, Discrete Contin. Dyn. Syst. 36 (2016), no. 11, 6523–6532

23. B. Weinkove, *The Kähler-Ricci flow on compact Kähler manifolds*, Geometric analysis, 53–108, IAS/Park City Math. Ser., 22, Amer. Math. Soc., Providence, RI, 2016

24. B. Guo, J. Song, B. Weinkove, *Geometric convergence of the Kähler-Ricci flow on complex surfaces of general type*, Int. Math. Res. Not. IMRN 2016, no. 18, 5652–5669

25. A. Chau, B. Weinkove, *Monge-Ampère functionals and the second boundary value problem*, Math. Res. Lett. 22 (2015), no. 4, 1005–1022

26. V. Tosatti, Y. Wang, B. Weinkove, X. Yang, *$C^{2,\alpha}$ estimates for nonlinear equations in complex and almost complex geometry*, Calc. Var. Partial Differential Equations 54 (2015), no. 1, 431–453

27. V. Tosatti, B. Weinkove, X. Yang, *Collapsing of the Chern-Ricci flow on elliptic surfaces*, Math. Ann. 362 (2015), no. 3-4, 1223–1271

28. V. Tosatti, B. Weinkove, *On the evolution of a Hermitian metric by its Chern-Ricci form*, J. Differential Geom. 99 (2015), 125–163

29. J. Song, B. Weinkove, *Contracting exceptional divisors by the Kähler-Ricci flow II*, Proc. Lond. Math. Soc. (3) 108 (2014), no. 6, 1529-1561

30. H. Fang, M. Lai, J. Song, B. Weinkove, *The J-flow on Kähler surfaces: a boundary case*, Analysis & PDE 7 (2014), no. 1, 215–226

31. J. Song and B. Weinkove, *Introduction to the Kähler-Ricci flow*, Chapter 3 of 'Introduction to the Kähler-Ricci flow', eds S. Boucksom, P. Eyssidieux, V. Guedj, Lecture Notes Math. 2086, Springer 2013

32. M. Sherman, B. Weinkove, *Local Calabi and curvature estimates for the Chern-Ricci flow*, New York J. Math. 19 (2013), 565–582

33. V. Tosatti, B. Weinkove, *The Chern-Ricci flow on complex surfaces*, Compos. Math. 149 (2013), no. 12, 2101–2138

34. J. Song, B. Weinkove, *Contracting exceptional divisors by the Kähler-Ricci flow*, Duke Math. J. 162 (2013), no. 2, 367–415

35. J. Song, G. Székelyhidi, B. Weinkove, *The Kähler-Ricci flow on projective bundles*, Int. Math. Res. Not. IMRN 2013 (2013), no. 2, 243–257

36. J. Song, B. Weinkove, *The degenerate J-flow and the Mabuchi energy on minimal surfaces of general type*, Universitatis Iagellonicae Acta Math. 50 (2012), 89–106

37. M. Sherman, B. Weinkove, *Interior derivative estimates for the Kähler-Ricci flow*, Pacific J. Math. 257 (2012), no. 2, 491–501

38. V. Tosatti, B. Weinkove, *Plurisubharmonic functions and nef classes on complex manifolds*, Proc. Amer. Math. Soc. 140 (2012), 4003–4010

39. V. Tosatti, B. Weinkove, *The Calabi-Yau equation on the Kodaira-Thurston manifold*, J. Inst. Math. Jussieu 10 (2011), no. 2, 437–447

40. J. Song, B. Weinkove, *The Kähler-Ricci flow on Hirzebruch surfaces*, J. Reine Angew. Math. 659 (2011), 141–168

41. V. Tosatti, B. Weinkove, *The complex Monge-Ampère equation on compact Hermitian manifolds*, J. Amer. Math. Soc. 23 (2010), no.4, 1187–1195

42. V. Tosatti, B. Weinkove, *Estimates for the complex Monge-Ampère equation on Hermitian and balanced manifolds*, Asian J. Math. 14 (2010), no.1, 19–40

43. V. Tosatti, B. Weinkove, *The Calabi-Yau equation, symplectic forms and almost complex structures*, in Geometry and Analysis, Vol. I, 475 - 493, Advanced Lectures in Math. 17, International Press, 2010

44. D.H. Phong, J. Song, J. Sturm, B. Weinkove, *On the Convergence of the modified Kähler-Ricci flow and solitons*, Comment. Math. Helv. 86 (2011), no. 1, 91–112

45. J. Song, B. Weinkove, *Constructions of Kähler-Einstein metrics with negative scalar curvature*, Math. Ann. 347 (2010), no. 1, 59–79

46. D.H. Phong, J. Song, J. Sturm, B. Weinkove, *The Kähler-Ricci flow and the $\overline{\partial}$ operator on vector fields*, J. Differential Geometry 81 (2009), 631–647

47. D.H. Phong, J. Song, J. Sturm, B. Weinkove, *The Kähler-Ricci flow with positive bisectional curvature*, Invent. Math. 173 (2008), no. 3, 651–665

48. V. Tosatti, B. Weinkove, S.-T. Yau, *Taming symplectic forms and the Calabi-Yau equation*, Proc. London Math. Soc. 97 (2008), no.2, 401–424

49. D.H. Phong, J. Song, J. Sturm, B. Weinkove, *The Moser-Trudinger inequality on Kähler-Einstein manifolds*, Amer. J. Math. 130 (2008), no. 4, 1067–1085

50. J. Song, B. Weinkove, *On the convergence and singularities of the J-flow with applications to the Mabuchi energy*, Comm. Pure Appl. Math. 61 (2008), no. 2, 210–229

51. V. Tosatti, B. Weinkove, *The Calabi flow with small initial energy*, Math. Res. Lett. 14 (2007), no. 6, 1033–1039

52. B. Weinkove, *The Calabi-Yau equation on almost-Kähler four-manifolds*, J. Differential Geometry 76 (2007), 317–349

53. J. Song, B. Weinkove, *Energy functionals and canonical Kähler metrics*, Duke Math. J. 137 (2007), no. 1, 159–184

54. J. Song, B. Weinkove, *On Donaldson's flow of surfaces in a hyperkähler four-manifold*, Math. Z. 256 (2007), no. 4, 769–787

55. B. Weinkove, *A complex Frobenius theorem, multiplier ideal sheaves and Hermitian-Einstein metrics on stable bundles*, Trans. Amer. Math. Soc. 359 (2007), no. 4, 1577–1592

56. B. Weinkove, *On the J-flow in higher dimensions and the lower boundedness of the Mabuchi energy*, J. Differential Geom. 73 (2006), no. 2, 351–358

57. B. Weinkove, *Convergence of the J-flow on Kähler surfaces*, Comm. Anal. Geom. 12 (2004), no. 4, 949–965

58. B. Weinkove, *Singularity formation in the Yang-Mills flow*, Calc. Var. Partial Differential Equations 19 (2004), no. 2, 211–220

59. B. Weinkove, *The J-flow, the Mabuchi energy, the Yang-Mills flow and multiplier ideal sheaves*, PhD thesis, Columbia University 2004

Preprints

1. A. Chau, B. Weinkove, *Non-preservation of α-concavity for the porous medium equation*, arXiv:2011.03063

Recent Invited Talks

Analysis Seminar, Rutgers University, Piscataway, October 2022

Conference in honor of Slawomir Kolodziej, Jagiellonian University, Krakow, Poland, June 2022

Geometric Analysis Seminar (online), Rutgers University, Piscataway, November 2021

PDE Seminar (online), University of British Columbia, Vancouver, October 2021

Conference on Complex Analysis and Geometry (online), National University of Singapore, August 2021

Complex Analysis and Geometry in honor of Andrei Iordan and Junyan Cao (online), Jussieu, Paris, March 2021

Undergraduate Math Club (online), University of Memphis, February 2021

Colloquium (online), Syracuse University, November 2020

Colloquium (online), University of Memphis, September 2020

Geometry and Topology Seminar (online), L'Université du Québec à Montréal, June 2020

Special Session in Complex Geometry, AMS Sectional Spring Sectional Meeting, April 2020

Bridging the gap between Kähler and non-Kähler geometry, BIRS, Banff, Canada, October 2019

Current developments in Complex and Analytic Geometry, INdAM, Cortona, Italy, June 2019

Colloquium, University of Notre Dame, March 2019

Geometric Analysis Conference, Rutgers University, November 2017

Colloquium, University of California, Irvine, November 2017

Colloquium, Universidad de los Andes, Bogotá, August 2017

Workshop on Ricci flow and related aspects, National Taiwan University, Taiwan, June 2017

Geometric Analysis Seminar, McGill University, Montreal, April 2017

Recent Minicourses and lecture series

Introduction to Geometric Flows, University of Memphis, 2020-2021

The Chern-Ricci flow, GAP: Curvature flows in complex geometry, Fields Institute, Toronto, December 2017

Parabolic flows on complex surfaces, Geometric Analysis Conference, Rutgers University, November 2017

Laplace's equation and conformal maps, Summer Northwestern Analysis Program (SNAP), Northwestern, July 2017

The Kähler-Ricci flow, Minicourse on Ricci flow and related aspects, National Taiwan University, Taiwan, June 2017

Editorial Boards

Transactions of the American Mathematical Society, 2022 - present

Memoirs of the American Mathematical Society, 2022 - present

Pure and Applied Mathematics Quarterly, 2018 - present

Journal of Mathematical Study, 2019 - present

Conference and Seminar organization

Asymptotics in Complex Geometry, in memory of Steve Zelditch, Northwestern, March 2024

Differentialgeometrie im Grossen Workshop, Oberwolfach, July 2023

Differentialgeometrie im Grossen Workshop, Oberwolfach, July 2021

Northwestern, Notre Dame, UIC Complex Geometry Seminar, 2019 - 2021

Informal Geometric Analysis Seminar, Northwestern, October 2012 – present

Differentialgeometrie im Grossen Workshop, Oberwolfach, July 2019

Nonlinear PDEs in real and complex geometry, AIM Workshop, San José, CA, August 2018

Summer Northwestern Analysis Program, Northwestern, July-August 2017

Differentialgeometrie im Grossen Workshop, Oberwolfach, July 2017

Thematic Program in Kähler Geometry, Notre Dame, June 2017

AMS Special Session, Loyola University, October 2015

Emphasis Year in Geometric Analysis at Northwestern, 2014-2015, including the Workshop on Ricci curvature May 2015, the Summer School in Geometric Analysis, July 2015, and three one-day conferences.

Midwest PDE Seminar, Northwestern, May 2014

Complex Geometry Summer School, Rutgers University, August 2013

Analysis, Complex Geometry, and Mathematical Physics, A Conference in Honor of D.H. Phong, Columbia University, May 2013

The Great Lakes Geometry Conference, Northwestern, April 2013

AMS Special Session, University of Akron, Ohio, October 2012

AMS Special Session, University of Honolulu, Hawaii, March 2012

Southern California Geometric Analysis Seminar, 2009 – 2013

UCSD Differential Geometry Seminar, 2008 – 2012

UC Irvine - UCSD Joint Geometry Seminar, 2008 - 2012

Department, University and Professional Service

Chair of Department, Northwestern 2021 - present

Chair of Boas Committee, Northwestern 2019 - 2020

Graduate Admissions Committee 2018 - 2019

Chair of Hiring Committee, 2017-2018

Nemmers Committee, 2016

Chair of Boas/RTG Committee, Northwestern, 2014 - 2016

Chair of Lecturer Hiring Committee, Northwestern, 2014 - 2016

Budget Committee, Northwestern, 2013, 2014, 2016

Goldwater Scholarship nominating committee, Northwestern, 2015

Hiring Committee, Northwestern, 2013 - 2015

Faculty Distance Learning Workgroup, Northwestern, 2013 - 2015

Chair of Colloquium Committee, Northwestern, 2013 - 2014

Organizer of Yamabe Lectures, Northwestern, 2013

UCSD Committee work, including Hiring Committee, Graduate Admissions, 2008 - 2012

National Science Foundation panelist (8 times), 2007 – 2021

Harvard University Committee work including Graduate Admissions, Qualifying Exams, Colloquium 2004 - 2008

Referee for many journals including Acta Math., Inventiones, JDG, J. AMS, Duke Math. J., Amer. Math. J.

Former PhD Students

Wanxing Liu, Northwestern (Amazon from Winter 2023), graduated 2022

Xi Sisi Shen, Northwestern (postdoc at Columbia University from Fall 2021), graduated 2021

Gregory Edwards, Northwestern (postdoc at University of Notre Dame from Fall 2018), graduated 2018, jointly advised with Valentino Tosatti

Matt Gill, UCSD (postdoc at UC Berkeley from Fall 2012), graduated 2012