

# Min-Kai Lin

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## Employment

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### University of Arizona

*Steward Theory Fellow*

2014—

### Canadian Institute for Theoretical Astrophysics

*Postdoctoral Fellow*

2011–2014

## Education

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### University of Cambridge

*PhD, Theoretical Astrophysics*

2011

Advisor: Professor John C.B. Papaloizou

Thesis: Dynamical instabilities in disc-planet interactions

*BA and MSci, Natural Sciences: Astrophysics (First Class honors)*

2008

## Awards and honors

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- Steward Observatory Prize Fellowship in Theoretical and Computational Astrophysics 2014
- CITA Postdoctoral Fellowship 2011
- Smith Rayleigh Knight Prize 2010
- Fellow of the Cambridge Overseas Society 2008
- St. John's College Benefactors' Scholarship 2008
- Isaac Newton Studentship 2008
- Overseas Research Scholarship 2008
- Institute of Astronomy Prize (top of class) 2008
- JS Wilson Prize for Natural Sciences 2006, 2007, 2008
- College Awarded Bursary 2007
- Skerne Scholarship 2005, 2006, 2007, 2008
- College Book Prize for Academic Distinction 2005, 2006, 2007, 2008

## Teaching and supervision

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### CITA, University of Toronto

*Undergraduate summer student program*

- Student: R. Les 2014  
Project: Gap formation and stability in non-isothermal protoplanetary discs
- Student: R. Cloutier 2012  
Project: Orbital migration of giant planets induced by gravitationally unstable gaps

### University of Cambridge

*Astrophysical Fluid Dynamics for Part II Astrophysics*

2011

### Clare College, University of Cambridge

*Mathematics IA for Natural Sciences*

2008—2011

## Computing

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**Languages:** Fortran, C, IDL, Mathematica

**Astrophysical MHD codes:** Fargo, Fargo3D, Zeus-MP, Pluto, Athena

## Presentations

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- *Vertical shear instability in protoplanetary disks*  
Protoplanetary Disk Dynamics and Planet Formation, Yokohama, Japan Sep. 2015  
In the Spirit of Lyot, Montreal, Canada; CITA fluids talk Jun. 2015  
IAUS 314: Young Stars & Planets Near the Sun, Atlanta, USA May 2015
- *On the formation of one-armed spirals in locally isothermal disks*  
Disc Dynamics & Planet Formation, Larnaka, Cyprus Jun. 2015  
Star and Planet Formation in the Southwest, Tucson, USA Mar. 2015
- *Strange aspects of locally isothermal astrophysical disks and the stability of magnetized massive disks*  
UC Berkeley CIPS seminar Feb. 2015
- *Gap formation and stability in non-isothermal protoplanetary disks*  
Characterizing Planetary Systems Across the HR Diagram, Cambridge, UK Jul. 2014
- *From the complex plane to planet formation*  
CITA (ISIMA talk), University of Arizona Jul. 2014
- *Dust trapping in protoplanetary disk vortices*  
University of Toronto Mar. 2014
- *Large-scale hydrodynamic instabilities and structures in protoplanetary disks*  
Centre for Star and Planet Formation/Niels Bohr Institute, Copenhagen, Denmark Jan. 2014
- *Gravitational instability of planetary gaps and its effect on orbital migration*  
IAUS 299: Exploring the Formation and Evolution of Planetary Systems, Victoria, Canada Jun. 2013  
University of Toronto May 2013
- *Large-scale hydrodynamic instabilities in protoplanetary disks*  
MIT, Harvard-Smithsonian CfA Apr. 2013
- *Large-scale vortex formation in protoplanetary disks*  
Cornell University (invited talk), Princeton University Feb. 2013  
University of Toronto Nov. 2012
- *Vortices and spirals at gap edges in 3D self-gravitating disk-planet simulations*  
American Geophysical Union Fall Meeting, San Francisco, USA Dec. 2012  
Instabilities and Structures in Protoplanetary Disks, Marseille, France Sep. 2012
- *Planet migration with gravitationally unstable gaps*  
University of Cambridge Oct. 2011
- *Vortex instabilities in self-gravitating disc-planet interactions*  
Baroclinic Instability and Protoplanetary Accretion Disks, Ringberg, Germany Jun. 2011
- *The stability of self-gravitating gaps*  
ASIAA; University of Cambridge Nov. 2010
- *Spin down of protostars through gravitational disk torques*  
East Asian Numerical Astrophysics Meeting, ASIAA, Taiwan Nov. 2010  
International Summer Institute for Modeling in Astrophysics, UC Santa Cruz, USA Aug. 2010
- *Type III migration in a low viscosity disc.*  
American Museum of Natural History, New York City, USA Jan. 2010  
Winter Workshop on Planetary Astrophysics, KIAA, Peking University, China Dec. 2009  
University of Cambridge Oct. 2009
- *Vortices in planetary migration*  
Dynamics of Discs and Planets, Cambridge, UK Aug. 2009
- *Three-layer magnetoconvection*  
UKMHD, Coventry University, UK Jun. 2009

## Other work experiences

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### UC Santa Cruz

ISIMA summer student

2010

Project: Numerical simulations of star-disk interaction, with M. Krumholz and K. Kratter

**DAMTP, University of Cambridge**

*Summer student*

2007

Project: Three-layer magneto-convection, with L. Silvers and M. Proctor

**ASIAA, Taipei, Taiwan**

*Summer/visiting student*

2005, 2006

Project: Bar-driven density waves in galactic disks, with C. Yuan and D.C.C. Yen

**Academic services**

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Referee, The Astrophysical Journal

2013—

Referee, Astronomy and Astrophysics

2013—

Referee, Astrophysics and Space Science

2013—

Panelist, NASA Proposal Review Panel

2015

## Publications

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\* = directly supervised student

### Refereed:

17. *Cooling requirements for the vertical shear instability in protoplanetary disks*  
**Lin, M.-K.**, Youdin, A.N, ApJ, 811, 17 2015
16. *Gap formation and stability in non-isothermal protoplanetary discs*  
\*Les, R., **Lin, M.-K.**, MNRAS, 450, 1503 2015
15. *One-armed spirals in locally isothermal, radially structured self-gravitating discs*  
**Lin, M.-K.**, MNRAS, 448, 3806 2015
14. *Linear stability of magnetized massive protoplanetary disks*  
**Lin, M.-K.**, ApJ, 790, 13 2014
13. *Testing large-scale vortex formation against viscous layers in three-dimensional discs*  
**Lin, M.-K.**, MNRAS, 437, 575 2014
12. *Steady state of dust distributions in disk vortices: observational predictions and applications to transitional disks*  
Lyra, W., **Lin, M.-K.**, ApJ, 775, 17 2013
11. *Orbital migration of giant planets induced by gravitationally unstable gaps: the effect of planet mass*  
\*Cloutier, R., **Lin, M.-K.**, MNRAS, 434, 621 2013
10. *Non-barotropic linear Rossby wave instability in three-dimensional disks*  
**Lin, M.-K.**, ApJ, 765, 84 2013
9. *Effects of upper disc boundary conditions on the linear Rossby wave instability*  
**Lin, M.-K.**, MNRAS, 428, 19 2013
8. *Vortex and spiral instabilities at gap edges in three-dimensional self-gravitating disc-satellite simulations*  
**Lin, M.-K.**, MNRAS, 426, 3211 2012
7. *Rossby wave instability in locally isothermal and polytropic disks: three-dimensional linear calculations*  
**Lin, M.-K.**, ApJ, 754, 21 2012
6. *Outward migration of a giant planet with a gravitationally unstable gap edge*  
**Lin, M.-K.**, Papaloizou, J.C.B., MNRAS, 421, 780 2012
5. *Spin-down of protostars through gravitational torques*  
**Lin, M.-K.**, Krumholz, M. R., Kratter, K. M., MNRAS, 416, 580 2011
4. *Edge modes in self-gravitating disc-planet interactions*  
**Lin, M.-K.**, Papaloizou, J.C.B, MNRAS, 415, 1445 2011
3. *The effect of self-gravity on vortex instabilities in disc-planet interactions*  
**Lin, M.-K.**, Papaloizou, J.C.B, MNRAS, 415, 1426 2011
2. *Type III migration in a low viscosity disc*  
**Lin M.-K.**, Papaloizou, J.C.B, MNRAS, 405, 1473 2010
1. *Three-layer magnetoconvection*  
**Lin, M.-K.**, Silvers, L. J., Proctor, M.R.E., Physics Letters A, 373, 69 2008

### Conference proceedings and abstracts:

4. *Vertical shear instability in the solar nebula*  
**Lin, M.-K.**, Youdin, A.N., IAUS 314 proceedings 2015

3. *Gravitational instability of planetary gaps and its effect on orbital migration*  
**Lin, M.-K.**, \*Cloutier, R., IAUS 299 proceedings 2014
2. *Instabilities at planetary gap edges in 3D self-gravitating disks*  
**Lin, M.-K.**, Instabilities and Structures in Proto-Planetary Disks, Marseille, France,  
EPJ Web of Conferences, 46, id.07001 2013
1. *Evolution of bar-driven disks under the influence of the interaction between two inner Lindblad resonances*  
Yuan, C., Yen, D. C. C., **Lin, M.-K.**, AAS Meeting 207, #188.04 2005

## Citations

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Search engine: NASA ADS

16. Lin, M.-K., Youdin, A.N., 2015, ApJ, 811, 17	1
15. Les, R., Lin, M.-K., 2015, MNRAS, 450, 1503	1
14. Lin, M.-K., ApJ, 2014, 790, 13,	1
13. Lin, M.-K., 2014, MNRAS, 437, 575	7
12. Lyra, W., Lin, M.-K., 2013, ApJ, 775, 17	31
11. Cloutier, R., Lin, M.-K., 2013, MNRAS, 434, 621	2
10. Lin, M.-K., 2013, ApJ, 765, 84	10
9. Lin, M.-K., 2013, MNRAS, 428, 19	2
8. Lin, M.-K., 2012, MNRAS, 426, 3211	23
7. Lin, M.-K., 2012, ApJ, 754, 21	32
6. Lin, M.-K., Papaloizou, J.C.B., 2012, MNRAS, 421, 780	12
5. Lin, M.-K., Krumholz, M. R., Kratter, K. M., 2011, MNRAS, 416, 580	11
4. Lin, M.-K., Papaloizou, J.C.B, 2011, MNRAS, 415, 1445	18
3. Lin, M.-K., Papaloizou, J.C.B, 2011, MNRAS, 415, 1426	30
2. Lin M.-K., Papaloizou, J.C.B, 2010, MNRAS, 405, 1473	29
1. Lin, M.-K., Silvers, L. J., Proctor, M.R.E., Physics Letters A, 373, 69	1