

MORDECAI-MARK MAC LOW
CURATOR-IN-CHARGE
DEPARTMENT OF ASTROPHYSICS
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HIGHEST DEGREE EARNED

Ph.D.

AREA OF SPECIALIZATION

Formation of planets, stars and galaxies

EDUCATIONAL EXPERIENCE

Ph.D. in Physics, University of Colorado at Boulder, 1989

M.A. in Physics, University of Colorado at Boulder, 1985

A.B. in Physics, Princeton University, 1983

PREVIOUS EXPERIENCE IN DOCTORAL EDUCATION

FACULTY APPOINTMENTS

Adjunct Associate Professor, Department of Astronomy, Columbia University, July
2002-present

Adjunct Assistant Professor, Department of Astronomy, Columbia University, May
1999-June 2002

COURSES TAUGHT

Interstellar Medium and Star Formation, Graduate Course, Columbia University, Spring
2002

GRADUATE COMMITTEES

Rachel Connolly, Teacher's College, Columbia University

Jeffrey Oishi, University of Virginia at Charlottesville, chair, 2004-2007

Moo Kwang Ryan Joung, Columbia University, chair, 2003-2006

Yuexing Li, Columbia University, chair, 2002-2005

GRADUATE ADVISEES

Jeffrey Oishi, University of Virginia at Charlottesville, 2004-2007

Moo Kwang Ryan Joung, Columbia University, 2003-2006

Yuexing Li, Columbia University, 2002-2005

Akimi Fujita, Columbia University, 2003

Guillermo Garcia-Segura, University of La Laguna (Canary Islands, Spain), 1994

RESEARCH GRANT SUPPORT

- National Aeronautics and Space Administration, “Protostellar Core Formation by Supersonic MHD Turbulence ATP-99,” \$159,911, December 15, 2000 – December 14, 2005
- National Science Foundation, “Comparing Theory with Observation Using Chemical Probes of Turbulent Molecular Clouds” (Co-PI with Simon Glover), \$149,912, August 1, 2003 – July 31, 2006
- National Science Foundation, “CAREER: Structure formation and support by magnetized, supersonic turbulence in the interstellar medium and star-forming regions,” \$360,747, May 1, 2000 – April 30, 2006
- National Science Foundation, “REU Site: Research Experiences for Undergraduates in Earth Science, Planetary Science and Astrophysics at the American Museum of Natural History” (Co-PI with Jim Webster), \$148,850, April 1, 2003 – March 31, 2006
- National Science Foundation, “REU Supplement: CAREER: Structure Formation and Support by Magnetized, Supersonic Turbulence in the Interstellar Medium and Star-Forming Regions,” \$6,520, May 1, 2004 – April 30, 2006
- National Science Foundation, “Collaborative Research: Fireworks at the Ballet: Globular Cluster Formation, Bulge Dynamics and the Role of Central Black Holes in Galaxy Mergers,” \$209,537, July 15, 2003 – June 30, 2006

RECENT ARTICLES IN REFEREED JOURNALS

- Jappsen, A.-K., R. S. Klessen, R. B. Larson, Y. Li, and M.-M. Mac Low. (In Press). The Stellar Mass Spectrum from Non-Isothermal Gravoturbulent Fragmentation. *Astron. Astrophys.*,
- Mac Low, M.-M., D. Balsara, J. Kim, and M. A. Avillez. (In press). The Distribution of Pressures in a Supernova-Driven Interstellar Medium. I. Magnetized Medium. *Astrophys. J.*
- Ballesteros-Paredes, J., R. S. Klessen, M.-M. Mac Low, and E. Vázquez-Semadeni. 2007. Molecular cloud turbulence and star formation. *In* B. Reipurth, D. Jewitt, and K. Keil (editors), *Protostars and Planets V*: 63-80. Tucson: University of Arizona Press.
- Glover, S. C. O. and M.-M. Mac Low. 2007. Simulating the formation of molecular clouds. I. Slow formation by gravitational collapse from static initial conditions. *Astrophysical Journal Supplement* 169: 239-268.
- Glover, S. C. O. and M.-M. Mac Low. 2007. Simulating the formation of molecular clouds. II. Rapid formation from turbulent initial conditions. *Astrophysical Journal* 659: 1317-1337.
- Joung*, M. K. R. and M.-M. Mac Low. 2007. Turbulent structure and star formation in a stratified, supernova-driven, interstellar medium. *In* B. G. Elmegreen and J. Palous (editors), *Triggered Star Formation in a Turbulent Interstellar Medium*: 358-362. Cambridge: Cambridge University Press. (Sponsor: M.-M. Mac Low)
- Jappsen, A.-K., S. C. O. Glover, R. S. Klessen, and M.-M. Mac Low. 2007. Star formation at very low metallicity. II. On the insignificance of metal-line cooling during the early stages of gravitational collapse. *Astrophysical Journal* 660: 1332-1343.

- Mac Low, M.-M., Y. Li*, and R. S. Klessen. 2007. Galactic-scale star formation by gravitational instability. *In* B. G. Elmegreen and J. Palous (editors), *Triggered Star Formation in a Turbulent Interstellar Medium*: 336-343. (Sponsor: M.-M. Mac Low)
- Hayes, J. C., M. L. Norman, R. A. Fiedler, J. O. Bordner, P. S. Li, S. E. Clark, A. ud-Doula, and M.-M. Mac Low. 2006. Simulating radiating and magnetized flows in multiple dimensions with ZEUS-MP. *Astrophysical Journal Supplement* 165: 188-228.
- Joung*, M. K. R. and M.-M. Mac Low. 2006. Turbulent structure of a stratified supernova-driven interstellar medium. *Astrophysical Journal* 653: 1266-1279. (Sponsor: M.-M. Mac Low)
- Oishi*, J. S. and M.-M. Mac Low. 2006. The inability of ambipolar diffusion to set a characteristic mass scale in molecular clouds. *Astrophysical Journal* 638: 281-285. (Sponsor: M.-M. Mac Low).
- Pavlovski, G., M. D. Smith, and M.-M. Mac Low. 2006. Hydrodynamical simulations of the decay of high-speed molecular turbulence - II. Divergence from isothermality. *Monthly Notices of the Royal Astronomical Society* 368: 943-958.
- Jappsen, A.-K., R. S. Klessen, R. B. Larson, Y. Li*, and M.-M. Mac Low. 2005. Non-isothermal gravoturbulent fragmentation. *In* M. S. Nanda Kumar, M. Tafalla, and P. Caselli (editors), *Cores to clusters: Star formation with next generation telescopes*: 77-86. New York: Springer. (Sponsor: M.-M. Mac Low)
- Jappsen, A.-K., R. S. Klessen, R. B. Larson, Y. Li*, and M.-M. Mac Low. 2005. Non-isothermal gravoturbulent fragmentation: Effects on the IMF. *In* R. de Grijs and R. M. González-Delgado (editors), *Starbursts: From 30 Doradus to Lyman break galaxies*: 31P. Dordrecht: Springer. (Sponsor: M.-M. Mac Low)
- Klessen, R. S., K. Jappsen, R. Larson, Y. Li*, & M.-M. Mac Low. 2005. The stellar mass spectrum from non-isothermal gravoturbulent fragmentation. *In* E. Corbelli, F. Palla, and H. Zinnecker (editors), *The Stellar initial mass function 50 years later*: 363-370. Dordrecht: Kluwer. (Sponsor: M.-M. Mac Low)
- Li, Y., M.-M. Mac Low, and R. S. Klessen. 2005. Star Formation in Isolated Disk Galaxies. I. Models and Star Formation Characteristics. *Astrophys. J.*, in press.
- Li, Y., M.-M. Mac Low, and R. S. Klessen. 2005. Control of Star Formation in Galaxies by Gravitational Instability. *Astrophys. J. (Letters)*, 620, L19
- Balsara, D. S., J. Kim, M.-M. Mac Low, and G. J. Mathews. 2004. Amplification of Interstellar Magnetic Fields by Supernova-Driven Turbulence. *Astrophys. J.*, 617, 339.
- Brunt, C. M. and M.-M. Mac Low. 2004. Modification of Projected Velocity Power Spectra by Density Inhomogeneities in Compressible Supersonic Turbulence. *Astrophys. J.*, 604, 196.

- Joung, M. K. R., M.-M. Mac Low, and D. S. Ebel. 2004. Chondrule Formation and Protoplanetary Disk Heating by Current Sheets in Non-Ideal Magnetohydrodynamic Turbulence. *Astrophys. J.*, 606, 532.
- Li, Y., M.-M. Mac Low, and R. S. Klessen. 2004. Formation of Globular Clusters in Galaxy Mergers. *Astrophys. J. (Letters)*, 614, L29.
- Li, Y., M.-M. Mac Low, and T. Abel. 2004. Ionization of Compressible Turbulence. *Astrophys. J.*, 610, 339.
- Li, P. S., M. L. Norman, M.-M. Mac Low, and F. Heitsch. 2004. The Formation of Self-Gravitating Cores in Turbulent Magnetized Clouds. *Astrophys. J.*, 605, 800.
- Mac Low, M.-M. and R. S. Klessen. 2004. The Control of Star Formation by Supersonic Turbulence. *Rev. Mod. Phys.*, 76, 125.
- Fujita, A., C. Martin, M.-M. Mac Low, and T. Abel. 2003. The Influence of Supershells and Galactic Outflows on the Escape of Ionizing Radiation from Dwarf Starburst Galaxies. *Astrophys. J.*, 599, 50.
- Li, Y., R. S. Klessen, and M.-M. Mac Low. 2003. Effects of the Equation of State on the Formation of Star Clusters. *Astrophys. J.*, 592, 975.
- Avillez, M. A. and M.-M. Mac Low. 2002. Mixing Time Scales in a Supernova-Driven Interstellar Medium. *Astrophys. J.*, 581, 1047.
- Ballesteros-Paredes, J. and M.-M. Mac Low. 2002. Physical vs. Observational Properties of Clouds in Turbulent Molecular Cloud Models. *Astrophys. J.*, 570, 734.
- Korycansky, D. G., K. J. Zahnle, and M.-M. Mac Low. 2002. High Resolution Calculations of Asteroid Impacts into the Venusian Atmosphere II: 3D Models. *Icarus*, 157, 1.
- Ossenkopf, V. and M.-M. Mac Low. 2002. Turbulent Velocity Structure in Molecular Clouds. *Astron. Astrophys.*, 390, 307.
- Pavlovski, G., M. D. Smith, M.-M. Mac Low, and A. Rosen. 2002. Hydrodynamical simulations of the decay of high-speed molecular turbulence. I. Dense molecular regions. *Monthly Not. Roy. Astron. Soc.*, 337, 477.
- Avillez, M. A. and M.-M. Mac Low. 2001. Mushroom-Shaped Structures as Tracers of Buoyant Flow in the Galactic Disk. *Astrophys. J. (Letters)*, 551, L57
- Heitsch, F., E. G. Zweibel, M.-M. Mac Low, P. Li, and M. L. Norman. 2001. Magnetic Field Diagnostics Based on Far-Infrared Polarimetry: Tests Using Numerical Simulations. *Astrophys. J.*, 561, 800.
- Heitsch, F., M.-M. Mac Low, and R. S. Klessen. 2001. Gravitational Collapse in Turbulent Molecular Clouds. II. Magnetohydrodynamical Turbulence. *Astrophys. J.*, 547, 280.