Research Field: Planetary Physics

Focused Field: Theory and Simulation of Planetary Convection, Dynamo, Figure and Gravity

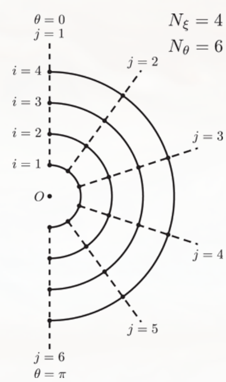
Chair Professor Keke Zhang

SHORT BIO

Keke Zhang, a Fellow of American Geophysical Union and Royal Astronomical Society, an Awardee of Royal Astronomical Society Group Achievement and the First-Prize Winner of the Macau Science Award, obtained his BSc in Astronomy from the University of Nanjing, China, in 1982, his MSc in Geophysics and Space Physics from UCLA, USA, in 1985, and his PhD in Geophysics and Space Physics from UCLA, USA, in 1987.

He is currently a chair professor and the director of State Key Laboratory of Lunar and Planetary Sciences and the director of the Macau Centre for Space Exploration and Science of China Space Agency, Macau University of Science and Technology, Macau.

His research areas include the theory and simulation of convection, instabilities and wave in rotating fluids, planetary magnetohydrodynamics, the shape, structure and gravity of giant gaseous planets, and planetary inverse problems.



Keke Zhang has developed a unified asymptotic theory for three seemingly disconnected important problems in geophysics and planetary physics: inertial waves, thermal convection, precession and libration. The unified asymptotic theory was presented in a Cambridge University Press Monograph (19 chapters, 526 pages).

He is the author of nearly 200 publications in peer-reviewed scientific journals, including Nature, Science, PNAS, Physical Review Letters, Journal of Fluid Mechanics, Geophysical Research Letters, Journal of Geophysical Research, Earth and Planetary Science Letters, Proceedings of the Royal Society of London, Astrophysical Journal Letters, Icarus and SIAM Journal on Numerical Analysis, as well as articles in major review journals such as Annual Review of Fluid Mechanics and Annual Review of Earth and Planetary Sciences.

He is also the Chief Scientist of Macau Science Satellites, the first low-latitude geomagnetic satellite focusing on the study of the South Atlantic Anomaly and the Earth's core dynamo, which is scheduled to be launched in 2022.

EDUCATION

1985-1987	PhD, Geophysics and Space Physics, University of California, Los Angeles, USA
1983-1985	MSc, Geophysics and Space Physics, University of California, Los Angeles, USA
1978-1982	BSc, Astronomy, University of Nanjing, China

PROFESSIONAL EXPERIENCE

2018-Present	Director and Chair Professor, State Key Laboratory of Lunar and Planetary Sciences, Macau University of Science and Technology
1997-2021	Chair Professor of Geophysical and Astrophysical Fluid Dynamics, University of Exeter, United Kingdom
1996-1997	Reader (Associate Professor) in Geophysical and Astrophysical Fluid Dynamics, University of Exeter, United Kingdom
1992-1996	Lecturer (Assistant Professor), University of Exeter, United Kingdom;
1989-1992	Leverhulme Trust Research Fellow, Universities of Cambridge, United Kingdom;
1987-1989	Postdoctoral Research Fellow, University of California, Los Angeles, USA;
1983-1987	Research Associate, University of California, Los Angeles, USA.

Cont.

KEY PUBLICATIONS

Zhang, K. and Busse, F. (1987)
On the onset of convection in rotating spherical shells. *Geophys. Astrophys. Fluid Dyn.*, **39**, 119-147.
Zhang, K. and Busse, F. (1988)
Finite amplitude convection and magnetic field generation in a rotating spherical shell. *Geophys. Astrophys. Fluid Dyn.*, **44**, 33-53.
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Zhang, K. and Busse, F. (1990)
Generation of magnetic fields by convection in a rotating spherical fluid shell of infinite Prandtl number. *Phys. Earth Planet. Inter.*, **59**, 208-222.
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Zhang, K. (1991)
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The influence of Ekman boundary layers on rotating convection. *Geophys. Astrophys. Fluid Dyn.*, **71**, 145-162.
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On coupling between the Poincar´e equation and the heat equation. *J. Fluid Mech.*, **268**, 211-229. ∗
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Zhang, K. (1995)
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Zhang, K. (1996)
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Zhang, K., Chen, D. and Jones, C.A. (2004)
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Zhang, K., Chan, K., Liao, X. and Aurnou, J. M. (2013)
The nonresonant response of fluid in a rapidly rotating sphere undergoing longitudinal libration. *J. Fluid Mech.*, **720**, 212–235.
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On precessing flow in an oblate spheroid of arbitrary eccentricity *J. Fluid Mech.*, **743**, 358-384.
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Zhang, K. and Liao, X. (2017)
THEORY AND MODELING OF ROTATING FLUIDS (19 chapters, ~ 520 pages; ISBN 978-0-521-85009-4), a Cambridge Monograph on Mechanics, Cambridge University Press.

Cont.

RESEARCH GRANTS 2001-2021

1. UK Part. Phys. & Astro. Res. Council (2001-2004): £136,420 (Co-Investigator)
2. UK Royal Society (2001-2004): £17,625 (Principal Investigator)
3. UK Leverhulme Trust (2002-2005): £76,728 (Co-Investigator)
4. UK Nat. Environ. Res. Council (2001-2004): £16,450 (Principal Investigator)
5. UK Nat. Environ. Res. Council (2003-2007): £148,843 (Principal Investigator)
6. UK Part. Phys. & Astro. Res. Council (2004-2007): £164,542 (Principal Investigator)
7. UK Royal Society (2004-2007): £18,000 (Principal Investigator)
8. UK Leverhulme Trust (2005-2006): £21,519 (Principal Investigator)
9. UK Part. Phys. & Astro. Res. Council (2005-2008): £164,482 (Co-Investigator)
10. UK Part. Phys. & Astro. Res. Council (2006-2009): £12,000 (Co-Investigator)
11. UK Part. Phys. & Astro. Res. Council (2008): £100,000 (Principal Investigator)
12. UK Sci. & Tech. Facilities Council (2009-2012): £23,506 (Co-Investigator)
13. UK Royal Society (2010-2012): £12,000 (Principal Investigator)
14. UK Sci. & Tech. Facilities Council (2010-2013): £1,032,000 (Co-Investigator)
15. Hong Kong Research Council (2010-2013): HKD 754,055 (Co-Investigator)
16. UK Nat. Environ. Res. Council (2010-2013): £348,396 (Principal Investigator)
17. UK Sci. & Tech. Facilities Council (2011-2014): £245,175 (Principal Investigator)
18. UK Leverhulme Trust (2011-2012): £22,000 (Principal Investigator)
19. Hong Kong Research Council (2015-2018): £60,000 (Co-Investigator)
20. UK Leverhulme Trust (2015-2018): £210,000 (Principal Investigator)
21. Macau FDCT Research Council (2016-2019): ~£350,000 (Principal Investigator)
22. UK Sci. & Tech. Facilities Council (2018-2021): £382,000 (Co-Principal Investigator)
23. NSFC/Macau FDCT Research Council (2017-2020): ~ £400,000 (Principal Investigator)
24. Macau FDCT Research Council (2019-2022): ~£350,000 (Principal Investigator)
25. Macau Foundation and China National Space Administration (20202025): ~£50,000,000 for the first two satellites (A and B) of the constellation (Principal Investigator and Chief Scientist)
26. China National Space Administration (2020-2022) ~ £650,000 for planetary magnetism research (Principal Investigator)
27. China National Space Administration (2020-2022) ~ £630,000 for giant planets research (Principal Investigator)