

宋晓东教授简历

短简历

宋晓东 1986 年获得中国科技大学地球物理理学学士，1994 年获得美国加州理工学院地球物理学博士，之后在哥伦比亚大学做博士后、讲师和副研究员，1999 年起为美国伊利诺伊大学香槟分校助理教授、副教授、正教授，2010 起为南京大学、武汉大学、北京大学国家杰出访问教授，2020 全职回国任北京大学讲席教授、国家级专家。

宋晓东教授主要从事地震学、地球深内部结构和动力学、东亚地区深部结构和区域构造、及地震灾害的研究。他与合作者的重要研究成果包括地球内核的旋转、分层结构、内内核赤道向各向异性的发现、中国岩石圈成像、及青藏高原南部印度板块岩石结构与地壳变形的联系。他与合作者 Paul Richards 教授 1996 年地球发现内核超速旋转，被美国 SCIENCE 杂志评为当年十大科学突破之一和被美国 DISCOVER 杂志评为二十世纪最重要的发现之一。已发表论文 140 多篇，包括第一作者或通讯作者 Nature/Science 系列、Rev Geophys/PNAS 11 篇。

宋晓东曾获 1996 年国际地球物理和测地学联合会(IUGG)地球深部委员会 (SEDI)青年科学家 Doornbos 奖，1997 年日本科技厅(STA) Fellow, 1998 年中国海外杰出青年基金(B 类)资助，2016 年 亚太地球物理学会(AOGS SE)杰出讲座，2024 年中国地球物理学会科学技术创新奖一等奖。他是 2005-2010 美国国际地震研究协会(IRIS)全球地震台网(GSN)常委员会成员和主席，国际华人地球科学家协会(IPACES)创始成员、主席、Earth and Planetary Physics 副主编、Geologica Sinica 副主编。现任 Earthquake Science 总编、国家自然科学基金重大项目负责人和国家重点研发项目负责人、自然资源部深地实验室指导专家、中国地震学会地震学专业委员会主任、河北红山巨厚沉积与地震灾害国家野外科学观测站站长、中国地震科学实验场人工智能首席科学家、中国灾害防御协会防灾减灾人工智能分会首届副理事长、北京大学理学部学术委员会委员，及多个学术机构学术委员会成员。

教育经历

1986 年获得中国科学技术大学地球物理学学士学位，
1986-1988 年在中国石油勘探开发研究院读研究生，
1991 年获得美国加州理工学院地球物理学硕士学位，
1994 年获得美国加州理工学院地球物理学博士学位（计算机副科）。

工作经历

1994-1996 美国哥伦比亚大学博士后 Lamont-Doherty Postdoctoral Fellow，
1996-1999 美国哥伦比亚大学副研究员和讲师 Storke-Doherty Lecturer，
1999-2003 美国伊利诺伊大学香槟分校助理教授，
2003-2008 美国伊利诺伊大学香槟分校终身副教授，
2008-2020 美国伊利诺伊大学香槟分校终身正教授，
2019-今 北京大学讲席教授、国家级专家。

2010-2015 南京大学国家杰出访问教授，
2015-2019 武汉大学国家杰出访问教授。
1998-2007、2016-今、2018-今 中国地震局预测所、地球物理研究所、中国地震局特聘专家

科研项目

主持国家自然科学基金重大项目、科技部国家重点研发计划项目、深地国家科技重大专项专题；主持国家自然科学基金联合基金项目、国家自然科学基金重点项目、国家自然科学基金面上项目、中国国家自然科学基金海外杰出青年(B类)、中国地震局行业专项、自然资源部深地实验室开放课题；美国国家科学基金会(NSF)、美国联邦政府、哥伦比亚大学、伊利诺伊大学、William and Flora Hewlett 基金、伊利诺伊大学和法国联合基金。并参加过科技部 973 项目、中石油专项、中海油专项。

主要学术贡献

地核结构及其动力学

- ✧ 发现内核地震波时变并推测内核超速旋转
- ✧ 系统检验内核地震波时变可能的非内核影响

- ✧ 利用重复地震证实内核地震波时变
- ✧ 发现内核时变信号来源于内核内部（而非内核表面）
- ✧ 发现内核差速旋转的变化和反转
- ✧ 证实内核各向异性
- ✧ 发现内核上部分层结构
- ✧ 精确确定内核边界面结构
- ✧ 首次得到内核三维各向异性结构
- ✧ 发现内核沿赤道向各向异性的内内核与沿南北向各向异性的外内核
- ✧ 发现中美洲下俯冲板片到达核幔边界形成的热化学结构的地震学证据

岩石圈结构、动力学及地震灾害

- ✧ 早期获得我国全国 Pn 波速度和各向异性模型；发现青藏高原北部东部及中南部 Pn 波低速带
- ✧ 率先应用噪声互相关方法得到我国 Rayleigh 面波频散图
- ✧ 利用噪声和地震数据得到我国与东亚地区岩石圈 S 波速度模型
- ✧ 发现青藏高原南部印度板块岩石圈撕裂结构可以提供地表地质、地震活动性和地壳变形的统一机制
- ✧ 揭示青藏高原隆升机制：印度-欧亚陆陆碰撞的俯冲形态及驱动力。发现印度板块低角度平俯冲到几乎整个青藏高原之下，以及 青藏高原地壳和俯冲印度岩石圈地幔之间的大规模低速带夹层，为青藏高原的隆升提供额外浮力；碰撞驱动力可能来自深部大规模的地幔对流。
- ✧ 发展了面波、接收函数、加 P 波约束的联合反演方法；发展应用噪声互相关方法提取面波震幅和衰减方法

大地震研究及地震灾害

- ✧ 利用噪声互相关方法发现苏门答腊几个大地震引起周边介质的明显变化，首次表明大地震引起的变化超过断层面到周边较大范围的介质
- ✧ 帮助描述和记录 1997 伽师强震序列的预报和前兆观测，从统计上说明此强震序列的预报不是随机的
- ✧ 发明大地震尾波矩震级（Mwo）的新方法，有效减小了大震震级测量误差
- ✧ 揭示土耳其大双震的超剪切触发和级联破裂过程

学术荣誉

- 1989-1992: 加州理工学院邵逸夫奖学金 Sir Run Run Shaw (of Hong Kong) Graduate Fellowship at Caltech。
- 1994-1996: 哥伦比亚大学 Lamont-Doherty 地球观测台博士后 Postdoctoral Fellowship。
- 1996-1999: 哥伦比亚大学 Lamont-Doherty 地球观测台 Storke-Doherty Lecturer。
- 1996: 内核超旋转的发现被美国 SCIENCE 评为当年十大科学突破之一。The work on the rotation of the Earth's inner core (Song and Richards, Nature, 1996) was named as a 1996 Break Through of the Year by SCIENCE magazine.
- 1996: 美国 Popular Science 杂志科技奖。It also won the 1996 Award for Science and Technology by PopularScience magazine.
- 1996: 国际地球物理和大地测量学联合会(IUGG)地球深部委员会(SED)青年科学家 Doornbos 奖。Doornbos Prize by the International Union of Geophysics and Geodesy committee on Studies of Earth Deep Interior (SEDI) for the work on inner core rotation.
- 1997: 日本科技厅(STA) Fellow。Science and Technology Agency (STA) Fellow, the Research Development Corporation of Japan.
- 1998: 中国国家自然科学基金会海外杰出青年基金(杰青 B 类)(首届)。
- 2000: 内核超旋转的发现(Song and Richards, 1996) 被美国 DISCOVER 杂志评为二十世纪最重要的发现之一（共约 300 项）。Work on inner core rotation was named as one of most important science discoveries in the 20th century by DISCOVER magazine.
- 2005: 内核超旋转的证实（Zhang et al. 2005）被美国 DISCOVER 杂志评为当年最重要的 100 个科学发现之一。Science paper by Zhang et al. was selected as DISCOVER's 100 Top Science Stories of the year.
- 2006-2007: 入选美国伊利诺伊大学高等研究中心研究员。Associate, Center for Advanced Study, University of Illinois at Urbana-Champaign.
- 2010-2020: 国家级专家(短期)（南京大学、武汉大学、北京大学）。
- 2016: 地球内内核赤道各向异性工作被中国科学院中国发展报告选为“2015 年中国科研代表性成果”（两项之一）；被大英百科全书 (Encyclopedia Britannica)选为代表性工作“Year in Review 2015”（两项之一）。
- 2016: 亚洲大洋洲地球科学学会 (AOGS) 杰出讲座。Asia Oceania Geosciences Society (AOGS) Distinguished Lecture.
- 2020-今: 国家级专家、北京大学讲席教授。
- 2024: 中国地球物理学会科学技术创新奖一等奖（一位）

完整学术论文列表

+ 学生/博士后; ++访问学者; * 通讯作者; § 邀请稿

1. Song, X.D.*, and D.V. Helmberger, Velocity structure near the inner core boundary from waveform modeling, *J. Geophys. Res.*, 97, 6573-6586, 1992.
2. Song, X.D.*, and D.V. Helmberger, Effect of velocity structure in D'' on PKP phases, *Geophys. Res. Lett.*, 20, 285-288, 1993.
3. Song, X.D.*, and D.V. Helmberger, Anisotropy of the Earth's inner core, *Geophys. Res. Lett.*, 20, 2591-2594, 1993.
4. Song, X.D.*, and D.V. Helmberger, A P-wave velocity model of the Earth's core, *J. Geophys. Res.*, 100, 9817-9830, 1995.
5. Song, X.D.*, and D.V. Helmberger, Depth-dependence of inner core anisotropy, *J. Geophys. Res.*, 100, 9805-9816, 1995.
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8. Song, X.D.*, and D.V. Helmberger, PKP differential travel times: Implications for three-dimensional lower mantle structure, *Geophys. Res. Lett.*, 24, 1863-1866, 1997.
- § 9. Song, X.D.*, Anisotropy of the Earth's inner core, *Rev. of Geophysics*, 35, 297-313, 1997.
- 8 10. Richards, P.G., X.D. Song, A.Y. Li, Detecting Possible Rotation of Earth's Inner Core, *Science*, 282, 1227a, 1998.
11. Zhou, Y.Q. and X.D. Song, A review of the mantle dynamic system and its evolution (in Chinese), *Earth Sci. Frontiers*, 5, Suppl., 11-39, 1998.
- § 12. Song, X.D.*, The Earth's inner core and the dynamics of the Earth's deep interior (in Chinese), *Earth Sci. Frontiers*, 5, Suppl., 1-10, 1998.
13. Song, X.D.*, and D.V. Helmberger, Seismological evidence for an inner core transition zone, *Science*, 282, 924-927, 1998.
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15. Song, X.D.*, and A.Y. Li+, Support for differential inner core superrotation from earthquakes in Alaska recorded at South Pole station, *J. Geophys. Res.*, 105, 623-630, 2000.
16. Song, X.D.*, Joint inversion for inner core rotation, inner core anisotropy, and mantle heterogeneity, *J. Geophys. Res.*, 105, 7931-7943, 2000.
17. Song, X.D.*, Time dependence of PKP(BC)-PKP(DF) times: Could this be an artifact of systematic earthquake mislocations? *Phys. Earth Planet. Inter.*, 122, 221-228, 2000.
18. Song, X.D.*, Comment on "The existence of an inner core super-rotation questioned by teleseismic doublets" by Georges Poupinet, Annie Souriau, and Olivier Coutant, *Phys. Earth Planet. Inter.*, 124, 269-273, 2001.
- § 19. Song, X.D.*, The Earth's core, *International Handbook of Earthquake and*

- Engineering Seismology, (W. H. K. Lee, H. Kanamori, P. C. Jennings, and C. Kisslinger, Eds.), Volume 1, Chapter 56, Academic Press, San Diego, 2002.
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 - § 21. Song, X.D.*, and X.X. Xu, The Earth's Core (in Chinese), *New Frontiers of Sciences: Structure Evolution and Dynamics of the Earth* (Eds: Y.X. Zhang, A. Yin), Higher Education Press, Beijing, China, 2002. 宋晓东和许晓霞, 地核-20世纪的发现及展望, 地球的结构、演化和动力学, 主编: 张有学和尹安, 高等教育出版社, 第四章, 2002.
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 - § 24. Song, X.D.*, Three-dimensional structure and differential rotation of the inner core, in *Earth Core: Dynamics, Structure, Rotation* (V.M. Dehant, K.C. Creager, S. Zatman, S. Karato, Eds.), *Geodynamics Series*, Vol. 31, American Geophysical Union, 2003.
 25. Xu, X.X.+, and X.D. Song, Evidence for inner core super-rotation from time-dependent differential PKP travel times observed at Beijing Seismic Network, *Geophys. J. Int.*, 152, 509-514, 2003.
 26. Huang, J.L., X.D. Song, S.Y. Wang, Fine structure of Pn velocity beneath Sichuan-Yunnan region, *Sci. China, Ser. D.*, 46 Suppl., 201-209, 2003.
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 28. Song, X.D.*, S.T. Li, Y.C. Li, S.H. Zheng, and X.N. Xie, Structure of lithospheric mantle and its implications for major basins in China (in Chinese), *Earth Sci.-J. China Univ. Geosci.*, 29(5), 531-538, 2004.
 29. Song, X.D., A review of Pn tomography of China, in *Advances in Seismology and Physics of Earth's interior in China* (Y.T. Chen and C.Y. Wang, Eds.), *Seismology Press*, Beijing, 321-345, 2004.
 30. Zhang, J. (^), X.D. Song (^*), Y.C. Li, P.G. Richards, X.L. Sun, F. Waldhauser, Inner core differential motion confirmed by earthquake doublet waveform doublets, *Science*, 309, 1357-1360, doi:10.1126/science.1113193, 2005. (^ equal contribution)
 31. Sun, X.L.+, G. Poupinet (^), and X.D. Song (^), Examination of systematic mislocation of South Sandwich Islands Earthquakes using station pairs: Implications for inner core rotation, *J. Geophys. Res.*, 111, B11305, doi:10.1029/2005JB004175, 2006. (^ alphabetic order)

32. Liang, C.T., and X.D. Song, A low velocity belt beneath northern and eastern Tibetan Plateau from Pn tomography, *Geophys. Res. Lett.*, 33, L22306, doi:10.1029/2006GL027926, 2006.
- § 33. Song, X.D.*, Inner core anisotropy, in *Encyclopedia of Geomagnetism and Paleomagnetism* (D. Gubbins and E. Herrero-Bervera, Eds.), 418-420, Springer, 2007.
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35. Sun, X.L., **X.D. Song***, S.H. Zheng, and D.V. Helmberger, Evidence for a chemical-thermal structure at base of mantle from sharp lateral P-wave variations beneath Central America, *Proc. Natl. Acad. Sci. USA*, 104 (1), 26-30, doi:10.1073/pnas.0609143103, 2007.
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37. Song, X.D.*, G. Poupinet, Inner core rotation from event-pair analysis, *Earth Planet. Sci. Lett.*, doi: 10.1016/j.epsl.2007.06.034, 2007.
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39. Sun, X.L., and X.D. Song, The inner inner core of the Earth: Texturing of iron crystals from three-dimensional seismic anisotropy, *Earth Planet. Sci. Lett.*, 56-65, doi: 10.1016/j.epsl.2008.01.049, 2008.
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44. Xu, Z.J., and X.D. Song, Joint inversion for crustal and Pn velocities and Moho depth for eastern margin of Tibetan Plateau, *Tectonophysics*, 491, 185-193, 2010.
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- § 57. Song, X.D.* Differential Rotation of the Earth's Inner Core, *Encyclopedia of Solid Earth Geophysics*, H. Gupta (Ed.), 118-121, 2014.
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60. 宋晓东*, 李江涛, 鲍学伟, 李思田, 王良书, 任建业, 中国西部大型盆地的深部结构及对盆地形成和演化的意义, *地学前缘*, 22 (1), 127-137

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