

# Curriculum Vitae -- XIAODONG SONG

## I. Personal History and Professional Experience

### A. Educational Background

University of Science and Technology of China, B.S., Geophysics, June 1986  
Research Institute of Petroleum Exploration and Development (under former Ministry of Petroleum), M.S., Geophysics (1986-1989, degree incomplete)  
California Institute of Technology, M.S., Geophysics, May 1991  
California Institute of Technology, Ph.D., Geophysics with Computer Science Minor, May 1994

### B. Employment and Affiliations

1994/09/01-1996/06/30 Postdoctoral Fellow, Lamont-Doherty Earth Observatory of Columbia University; also Visiting Investigator at Dept. of Terrestrial Magnetism, Carnegie Institute of Washington  
1996/07/01-1999/08/20 Storke-Doherty Lecturer, Dept. of Earth and Environmental Sciences, Columbia University; and Associate Research Scientist, Lamont-Doherty Earth Observatory of Columbia University  
1999/08/21-2003/08/20 Assistant Professor, Dept. of Geology, Univ. of Illinois, Urbana, IL  
2003/08/21-2008/08/20 Associate Professor, Dept. of Geology, Univ. of Illinois, Urbana, IL  
2008/08/21-Present Professor, Dept. of Geology, Univ. of Illinois, Urbana, IL

### C. Honors and Distinguishments

1989-1992 Sir Run Run Shaw (of Hong Kong) Graduate Fellowship at Caltech (awarded to two outstanding Caltech students from China in 1989)  
1994-1996 Lamont-Doherty Postdoctoral Fellowship (one per year)  
1996-1999 Storke-Doherty Lectureship (the most prestigious award given by Lamont-Doherty Earth Observatory, Columbia Univ. to one junior researcher per year)  
1996 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. It also won the 1996 Award for Science and Technology by PopularScience magazine.  
1996 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 Science and Technology Agency (STA) Fellow, the Research Development Corporation of Japan  
1998 Outstanding Overseas Young Scientist Award by the NSF of China  
2000 Work on inner core rotation was named as one of most important science discoveries in the 20th century by DISCOVER magazine.

2005 Science paper by Zhang et al. was selected as DISCOVER's 100 Top Science Stories of the year.  
2006-2007 Associate, Center for Advanced Study, UIUC  
2010 Chinese National Visiting Scholar (“Qian-Ren” B)  
2011/07-2015/06 Distinguished Guest Professor, Nanjing Univ., China  
2015/07-Present Distinguished Guest Professor, Wuhan Univ., China  
2016 Asia Oceania Geosciences Society (AOGS) Distinguished Lecture

## II. Peer-Reviewed Publications

+ Supervised student/postdoc contribution

\* Corresponding author

§ Invited contribution

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.
6. Song, X.D.\*, Anisotropy in the central part of the inner core, *J. Geophys. Res.*, 101, 16,689-16,097, 1996.
7. Song, X.D.\*, and P.G. Richards Seismological evidence for differential rotation of the Earth's inner core, *Nature*, 382, 221-224, 1996.
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.
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.
14. Zhang, G.M, L.R. Zhu, X.D. Song\*, Z.X. Li, M.L. Yang, N.Q. Su, and X.Z. Chen, Predictions of the 1997 strong earthquakes in Jiashi, Xinjiang, China, *Bull. Seism. Soc. Am.*, 89, 1171-1183, 1999

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.), Part A, Chapter 56, Academic Press, San Diego, 2002.
20. Song, X.D.\*, and X.X. Xu, Inner core transition zone and anomalous PKP(DF) waveforms from polar paths, *Geophys. Res. Lett.*, 29(4), 10.1029/2001GL013822, 2002.
- § 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.
22. Sun, X.L.+, and X.D. Song, PKP travel times at near antipodal distances: Implications for inner core anisotropy and lowermost mantle structure, *Earth Plant. Sci. Lett.*, 199, 429-445, 2002.
- § 23. 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.
24. 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.
25. 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.
26. Liang, C.T.+, X.D. Song, and J.L. Huang, Tomographic inversion of Pn travel-times in China, *J. Geophys. Res.*, 109, B11304, doi:10.1029/2003JB0027 89, 2004.
27. 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), 531-5 38, 2004.
28. 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.
29. 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)
30. 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)
  31. 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.
  - § 32. Song, X.D.\*, Inner core anisotropy, in *Encyclopedia of Geomagnetism and Paleomagnetism* (D. Gubbins and E. Herrero-Bervera, Eds.), 418-420, Springer, 2007.
  33. Zheng, S.H., X.L. Sun, and X.D. Song, Fine structure in lowermost mantle beneath Central Pacific from PKP waves recorded at China Seismic Network, *Chinese J. Geophys.*, 50(1), 183-191, 2007.
  34. 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.
  35. Sun, D.Y., D.V. Helmberger, X.D. Song, S.P. Grand, Predicting a global perovskite and postperovskite phase boundary, in *Post-Perovskite: The Last Mantle Phase Transition* (K. Hirose, J. Brodholt, T. Lay, D. Yuen, Eds.), *Geophys. Monogr. Ser.*, Vol. 174, American Geophysical Union, 2007.
  36. 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.
  37. Sun, X.L., and X.D. Song, Tomographic inversion for three-dimensional anisotropy of Earth's inner core, *Phys. Earth. Planet. Inter.*, 167, 53-70, doi:10.1016/j.pepi.2008.02.011, 2008.
  38. 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.
  39. Dai, W., and X.D. Song\*, Detection of motion and heterogeneity in Earth's liquid outer core, *Geophys. Res. Lett.*, 35, L16311, doi:10.1029/2008GL034895, 2008.
  40. Song, X.D.\*, and W. Dai, Topography of Earth's inner core boundary from high-quality waveform doublets, *Geophys. J. Int.*, 175, 386-399, doi: 10.1111/j.1365-246X.2008.03909.x, 2008.
  41. Zheng, S.H., X.L. Sun, X.D. Song\*, Y.J. Yang, M.H. Ritzwoller, Surface wave tomography of China from ambient seismic noise correlation, *Geochem. Geophys. Geosyst.*, 9, Q05020, doi:10.1029/2008GC001981, 2008.
  42. Xu, Z.J., and X.D. Song, Temporal changes of surface wave velocity associated with major Sumatra earthquakes from ambient noise correlation, *Proc. Natl. Acad. Sci. USA*, 106, 14207-14212, 2009.
  43. 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.

44. Lindner, D., X.D. Song\*, and P. Ma, New insights into the inner-core rotation and its variability, *J. Geophys. Res.*, 115, doi:10.1029/2009JB006294, 2010.
45. Sun, X.L., X.D. Song\*, S.H. Zheng, Y.J. Yang, and M.H. Ritzwoller, Three dimensional shear wave velocity structure of the crust and upper mantle beneath China from ambient noise surface wave tomography, *Earthq. Sci.*, 23, 449-463, **Doi**: 10.1007/s11589-010-0744-4, 2010.
46. Song, X.D.\*, Preface to the special issue on ambient noise seismology, *Earthq. Sci.*, 23, 395-396, **Doi**: 10.1007/s11589-010-0744-4, 2010.
- § 47. Song, X.D.\* Differential Rotation of the Earth's Inner Core, *Encyclopedia of Solid Earth Geophysics (Part of the series Encyclopedia of Earth Sciences)*, H. Gupta (Ed.), 118-121, Springer, 2011.
48. Li, H.Y., S.T. Li, X.D. Song, M. Gong, X. Li, J. Jia, Crustal and uppermost mantle velocity structure beneath northwestern China from seismic ambient noise tomography, *Geophys. J. Int.* 188, 131-143 DOI: 10.1111/j.1365-246X.2011.05205.x, 2012.
49. Bao, X.W., X.D. Song\*, M.J. Xu, et al., Crust and upper mantle structure of the North China Craton and the NE Tibetan Plateau and its tectonic implications, *Earth Planet. Sci. Lett.*, 369-370, 129-137, 2013.
50. Xu, Z.J., X.D. Song\*, L.P. Zhu, Joint inversion of receiver function and surface wave dispersion using Neighborhood Algorithm: An application to Hi-Climb linear array in Tibetan Plateau, *Tectonophys.*, 584, 209-220, 2013.
51. Huang, H.H., Z.J. Xu, Y.M. Wu, X.D. Song\*, B.S. Huang, N.L. Minh, First Local Seismic Tomography for Red River Shear Zone, Northern Vietnam: Stepwise Inversion Employing Crustal P and P<sub>n</sub> Waves, *Tectonophys.*, 584, 230-239, 2013.
52. Xu, Z.J., X.D. Song\*, S.H. Zheng, Shear velocity structure of crust and upper mantle in China from surface wave tomography using ambient noise and earthquake data, *Earthq. Sci.*, 26(5):267-281, doi:10.1007/s11589-013-0010-7, 2013.
53. Wang, T., J. Revenaugh, and X.D. Song\*, Two-dimensional/three-dimensional waveform modeling of subducting slab and transition zone beneath Northeast Asia, *J. Geophys. Res., Solid Earth*, 119, 4766-4786, doi:10.1002/2014JB011058, 2014.
54. Sun, X., X. Bao, M. Xu, D.W. Eaton, X.D. Song, L. Wang, Z. Ding, N. Mi, D. Yu, and H. Li (2014), Crustal structure beneath SE Tibet from joint analysis of receiver functions and Rayleigh wave dispersion, *Geophys. Res. Lett.*, 41, 1479-1484, doi:10.1002/2014GL059269, 2014.
55. A Perttu, D Christensen, G Abers, X Song, Insights into mantle structure and flow beneath Alaska based on a decade of observations of shear wave splitting, *J. Geophys. Res.*, 119 (11), 8366-8377, 2014.
56. HH Huang+, YM Wu, X Song, CH Chang, SJ Lee, TM Chang, HH Hsieh, Joint V<sub>p</sub> and V<sub>s</sub> tomography of Taiwan: Implications for subduction-collision orogeny, *Earth and Planet. Sci. Lett.* 392, 177-191, 2014.
57. HH Huang+, YM Wu, X Song, CH Chang, H Kuo-Chen, SJ Lee, Investigating the lithospheric velocity structures beneath the Taiwan region by nonlinear joint

- inversion of local and teleseismic P wave data: Slab continuity and deflection, *Geophys. Res. Lett.* 41 (18), 6350-6357, 2014.
58. 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 2015.
59. Wang, T., **X.D. Song\***, Xia H. Han, Equatorial anisotropy of Earth's inner inner core from autocorrelation of earthquake coda, *Nature Geosci.*, 8 (3), 224-227, doi:10.1038/ngeo2354, 2015.
60. Bao, X.W.+ X Sun, M Xu, DW Eaton, X Song, L Wang, Z Ding, N Mi, H Li, D Yu, Z Huang, P Wang. Two crustal low-velocity channels beneath SE Tibet revealed by joint inversion of Rayleigh wave dispersion and receiver functions, *Earth Planet. Sci. Lett.* 415, 16-24, 2015.
61. Bao, X.W., X.D. Song, J.T. Li, High-resolution lithospheric structure beneath Mainland China from ambient noise and earthquake surface-wave tomography, *Earth Planet. Sci. Lett.*, 417, 132-141, DOI: 10.1016/j.epsl.2015.02.024, 2015.

### III. Professional Service

**Member, IRIS GSN Standing Committee**, 2005-2006.

**Chair, IRIS GSN Standing Committee**, 2007/12-Present.

**Delegate** to the U.S.-China Coordinating Meeting for Earthquake Studies, May 2007.

**Editorial Board Member**, *Progress in Natural Sciences* (NSF of China), 2000-20005.

**Editorial Board Member**, *Earthquake Science* (Seismo. Soc. China), 2008-present

**Editorial Board Member, Earth Science (J. China U. Geosci. and Springer)**, 2006-present

**Co-Editor**, *Tectonophysics*, Vol. 491(1-4), 2010, Special issue on May 12 2008 Great Wenchuan Earthquake.

**Editor**, *Earthquake Science*, Special issue on ambient noise seismology (to be published in October, 2010).

**Associate Editor**, *Geologica Sinica* (English version), 2014-present.

**Chair-Elect and Chair**, the International Professionals for the Advancement of the Chinese Earth Sciences (IPACES), 2015-2016

**Co-convener and Co-Chair**, Special Seismology session on Anisotropy and Rotation of the Inner Core, Spring AGU, Boston, MA, 1998.

**Convener and Chair**, Special Union/SEDI session on Structure and Dynamics of the Inner Core, Fall AGU, San Francisco, CA, 1998.

**Co-Chair**, Session on Core Structure, Fall AGU, San Francisco, CA, 2000. Member of Editorial Board of journal *Progress in Natural Science*, 2000-Present.

**Co-Convener**, Inner Core - Outer Core Lower Mantle Structure and Interactions, IASPEI/IAGA General Assemblies, Hanoi, Vietnam, 18-30 August 2001.

**Convener and Chair**, Special Union Session on The Earth's Core: New Insights and Challenges, Spring AGU, Washington DC, 2002.

**Co-Convener and Co-Chair**, Special on Intraplate Tectonics: North China and Other Regions, Fall AGU, San Francisco, CA, 2004.

**Program Committee**, 2006 AGU West Pacific Meeting.

**Co-Chair**, Special Union Session on The Great 2008 Wenchuan Earthquake: A Multidisciplinary View (I and II), Fall AGU, San Francisco, CA, 2008.

**Program Committee**, Sino-US Earthquake Studies Workshop, Boulder, Nov., 2008.

**Co-Convener**, Special session on crustal and upper mantle structure of east Asia, AGU Western Pacific, Taipei, 2010.

**Chairs**, three sessions in AGU Western Pacific meeting, Taipei, 2010.

**Proposal Review Panel**, Program of Geophysics and Space Sciences, NSF of China, 2001.

**Proposal reviews** provided for NSF, DoE, Los Alamos National Laboratory, NNSA, DoD/Air Force, NASA, National Science Council (Taiwan), China NSF, China Ministry of Science and Technology.

**Manuscript reviews** provided for journals: Nature, Science, Journal of Geophysical Research, Geophysics Research Letters, Physics of Earth and Planetary Interiors, Earth and Planetary Science Letters, Geophysical Journal International, Tectonophysics, Geology, G3, AGU monographs, Encyclopedia of Geomagnetism and Palaeomagnetism, Treatise on Geophysics.