

CV- Huiming Bao

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PROFESSIONAL PREPARATION

Peking University, P. R China	Palaeontology & Stratigraphy	B. Sc.	1982-1986
Nanjing Institute of Geology and Paleontology, Academia Sinica	Calcareous Algae & carbonate sedimentology	M.Sc.	1986-1989
Princeton University	Stable isotope geochemistry	Ph. D	1993-1998
University of California San Diego	Atmospheric chemistry & Stable isotopes	Postdoc	1998-2001

APPOINTMENTS

2007-	Associate professor in Geology and Geophysics, Louisiana State University
2001-2007	Assistant professor in Geology and Geophysics, Louisiana State University
1998-2001:	Postdoctoral Research Chemist, University of California San Diego
1996-1997:	Research Scientist, University of California, Santa Cruz (in absentia from Princeton University)
1993-1998:	Assistant in Instruction/Research, Princeton University
1989-1993:	Assistant Researcher, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences

RESEARCH INTERESTS

Multiple stable isotopic systems; Earth systems history (focusing on the interaction between the biosphere, hydrosphere, and atmosphere)

COURSES TAUGHT

Physical Geology and Earth System History for undergraduate students;
Stable Isotope Geochemistry and Carbonate Geochemistry and Petrology at the graduate levels;
Advanced seminars: *Atmospheric signatures in rock records*;
Multi-Dimensional Stable Isotope Fractionation.

PUBLICATIONS

2011:

Peng, Yongbo*, **Bao, Huiming**, Zhou, Chuanming, and Yuan, Xunlai, ^{17}O -depleted barite from two Marinoan cap dolostone sections, South China, *Earth and Planetary Science Letters*, in press.

Kohl, I. E.* and **Bao, Huiming**, 2011, Triple-Oxygen-Isotope Determination of Molecular Oxygen Incorporation in Sulfate Produced during Abiotic Pyrite Oxidation (pH = 2-11), *Geochimica et Cosmochimica Acta*, in press.

Sun, Tao* and **Bao, Huiming**, 2011, Thermal-Gradient Induced Non-Mass-Dependent Isotope Fractionation. *Rapid Communications in Mass Spectrometry*, 25, 765-773.

Bing Shen, Shuhai Xiao, **Huiming Bao**, Alan J. Kaufman, Chuanming Zhou, and Xunlai Yuan, 2011, Carbon, sulfur, and oxygen isotope evidence for a strong depth gradient and oceanic oxidation after the Ediacaran Hankschouglaciation, *Geochimica et Cosmochimica Acta*, 75, 1357-1373.

Sun, Tao* and **Bao, Huiming**, 2011, Non-mass-dependent ^{17}O anomalies generated by a superimposed thermal gradient on a rarefied O_2 gas in a closed system. *Rapid Communications in Mass Spectrometry*, 25, 20-24; DOI: 10.1002/rcm.4825.

2010:

Bao, Huiming, Yu, Shaocai, and Tong, Daniel Q., 2010, Massive volcanic SO_2 oxidation and sulphate aerosol deposition in Cenozoic North America. *Nature*, doi:10.1038/nature09100

Zhou, Chuanming, **Bao, Huiming**, Peng, Yongbo and Yuan, Xunlai, 2010, Timing the deposition of ^{17}O -depleted barite at the aftermath of Nantuo glacial meltdown in South China. *Geology*, 38 (10), 903-906.

2009

*Peng, Y., **Bao, Huiming**, and Yuan, X-L, 2009, New morphological observations for Paleoproterozoic acritarchs from the Chuanlinggou Formation, North China, *Precambrian Research*, 168, 223-232.

Bao, Huiming, Ian J. Fairchild, Peter M. Wynn, and Christoph Spötl, 2009, Stretching the Envelope of Past Surface Environments: Neoproterozoic Glacial Lakes from Svalbard, *Science*, 323, 119-122; DOI: 10.1126/science.1165373.

2008

Bao, Huiming, Jim Lyons, and Chuanming Zhou, May 2008, Triple oxygen isotope evidence for elevated CO_2 levels after a Neoproterozoic glaciation, *Nature*, 453 (7194), 504-506; DOI: 10.1038/nature06959.

Bao, Huiming, Sun, T., Kohl, I., and Peng, Y.-P., 2008, Comments on “Early Archaean microorganisms preferred elemental sulfur, not sulfate”, *Science*, v. 319 (5868), p. 1336.

Bao, Huiming, Jaime D. Barnes, Zach D. Sharp, and David R. Marchant, 2008, Two chloride end-members in soils of the McMurdo Dry Valleys, Antarctica. *Journal of Geophysical Research, D: Atmospheres*, 113, D03301, doi:10.1029/2007JD008703.

Farquhar, J., Canfield, D. E., Masterson, A., **Bao, H.**, and Johnston, D., 2008, Sulfur and oxygen isotope study of sulfate reduction in experiments with natural populations from Fællestrand, Denmark, *Geochimica et Cosmochimica Acta*, 72, 2805-2821.

Bing Shen, Shuhai Xiao, Alan J. Kaufman, **Huiming Bao**, Chuanming Zhou, Haifeng Wang, Stratification and mixing of a post-glacial Neoproterozoic ocean: Evidence from carbon and sulfur isotopes in a cap dolostone from northwest China, 2008, *Earth and Planetary Science Letters*, 265 (102), 209-228.

Socki, R. A., Harvey, R. P. , Bish, D. L., Tonui, E., **Bao, Huiming**, 2008, Stable isotope systematics of cryogenic evaporite deposits from Lowis Cliff ice tongue, Antarctica: A Mars

analog, *Lunar and Planetary Science Conference* (NASA, Houston, 2008), Vol. XXXIX, pp. 1964.

2007

Bao, Huiming, Rumble III, D., Lowe, D. R., 2007, The five stable isotope compositions of the Fig Tree barites: Implications on sulfur cycle in an early Archean ocean. *Geochimica et Cosmochimica Acta*, doi: 10.1016/j.gca.2007.05.032.

Schiffbauer, J. D., Yin, L.-M., Bondnar, R. J. Kaufman, A. J., Meng, F.W., Hu, J., Shen, B., Yuan, X.-L., **Bao, H. M.**, and Xiao, S. H., 2007, Ultrastructural and geochemical characterization of Archean–Paleoproterozoic graphite particles: Implications for recognizing traces of life in highly metamorphosed rocks. *Astrobiology*, 7(4), 684-704, DOI: 10.1089/ast.2006.0098.

2006

Bao, Huiming, and D. R. Marchant (2006), Quantifying sulfate components and their variations in soils of the McMurdo Dry Valleys, Antarctica, *Journal of Geophysical Research, D: Atmosphere*, 111, D16301, doi:10.1029/2005JD006669.

*Howell, K. J. and **Bao, Huiming**, 2006, Caliche as a geological repository of atmospheric sulfate, *Geophysical Research Letters*, 33, L13816, doi: 10.1029/2006GL026518.

*Jenkins, K. A. and **Bao, Huiming**, 2006, Multiple oxygen and sulfur isotope characterization of total atmospheric sulfate deposition in Baton Rouge, Louisiana, USA, *Atmospheric Environment*, 40, 4528-4537.

Bao, Huiming, 2006, Purifying synthetic barite for oxygen isotope measurement by dissolution and reprecipitation in a chelating solution. *Analytical Chemistry*, 78(1): 304-309.

2005

Airieu, S.A., Farquhar, J., Thiemens, M.H., Leshin, L.A., **Bao, H.**, and Young, E., 2005, Planetary sulfate and aqueous alteration in CM and CI carbonaceous chondrites: *Geochim. Cosmochim. Acta*, v. 69, p. 4166-4171.

Loope, D. B., Mason, J. A., **Bao, H.**, et al., 2005, Deformation structures and an alteration zone linked to deposition of volcanogenic sulfate in an ancient playa (Oligocene of Nebraska, USA). *Sedimentology*, 52, 123-139.

Bao, Huiming, 2005, Sulfate in modern playa settings and in ash beds in hyperarid deserts: Implication on the origin of ¹⁷O-anomalous sulfate in an Oligocene ash bed. *Chemical Geology*, 214 (1-2), 127-134.

2004

Bao, Huiming and Gu, Baohua, 2004, Natural perchlorate has a unique oxygen isotope signature. *Environmental Science and Technology*, 38(19): 5073-5077.; [10.1021/es049516z](https://doi.org/10.1021/es049516z)

Bao, Huiming, Jenkins, K.A., Khachatryan, M. and Chong-Díaz, G., 2004. Different sulfate sources and their post-depositional migration in Atacama soils. *Earth & Planetary Science Letters*, 224 (3-4), 577-587.

Shuhai Xiao, **Huiming Bao**, Haifeng Wang, Alan J. Kaufman, Chuanming Zhou, Guoxiang Li, Xunlai Yuan, and Hongfei Ling, 2004, The Neoproterozoic Quruqtagh Group in eastern Chinese Tianshan: Evidence for a post-Marinoan glaciation. *Precambrian Research*, 130 (1-4), 1-26.

2003

- Bao, Huiming**, and Reheis, M.C., 2003. Multiple oxygen and sulfur isotopic analyses on water-soluble sulfate in bulk atmospheric deposition from the southwestern United States. *Journal of Geophysical Research, D: Atmosphere*, 108(D14): 4430; 10.1029/2002JD003022.
- Bao, Huiming**, Thiemens, M.H., Loope, D.B. and Yuan, X.-L., 2003. Sulfate oxygen-17 anomaly in an Oligocene ash bed in mid-North America: Was it the dry fogs? *Geophysical Research Letters*, 30(16): 1843; 10.1029/2003GL016869.

2002 (*A publication gap: Building Oxy-Anion Stable Isotope Center at LSU*)

2001

- Bao, Huiming**, Thiemens, M. H., and Heine, K., 2001, Oxygen-17 excesses of the central Namib gypcretes: Spatial distribution. *Earth & Planetary Science Letters* 192. 125-135.
- Farquhar, J., **Bao, Huiming** & Thiemens, M. H. et al., 2001, Questions regarding Precambrian sulfur isotope fractionation – Response. *Science*, 292 (5524), U6-U7.
- Thiemens, M. H., Savarino, J., Farquhar, J., **Bao, Huiming**, 2001, Mass-independent isotopic compositions in terrestrial and extraterrestrial solids and their Applications. *Accounts of Chemical Research*, 34(8), 645-652.
- Bao, Huiming**, Greg Michalski, and Mark H. Thiemens, 2001, Sulfate oxygen-17 anomalies in desert varnishes. *Geochim. Cosmochim. Acta* 65 (13), 2029-2036.
- Zhou, C., Yan, K., Hu, J., Meng, F., Chen, Z., Xue, Y., Cao, R., Yin, L., Wang, J., Wang, J., Xiao, S., **Bao, H.**, and Yuan, X., 2001, The Neoproterozoic tillites at Lantian, Xiuning County, Anhui Province [China], *Journal of Stratigraphy [in Chinese with English Abstract]*, v. 25, p. 247-252, 258.

2000

- Bao, Huiming**, Douglas A. Campbell, James G. Bockheim, Mark H. Thiemens, 2000, Origin of sulfate in Antarctic Dry Valley soils as deduced from anomalous ^{17}O compositions. *Nature* 407, 499-502.
- Bao, Huiming**, Thiemens, M. H., 2000, Generation of O_2 from BaSO_4 using a CO_2 -laser fluorination system for simultaneous $\delta^{18}\text{O}$ and $\delta^{17}\text{O}$ analysis. *Analytical Chemistry* 72(17), 4029-4032.
- Bao, Huiming et al.** 2000, Anomalous ^{17}O compositions in massive sulphate deposits on the Earth. *Nature* 406, 176-178.
- Farquhar, J., **Bao, Huiming** & Thiemens, M. H., 2000, Atmospheric influence of Earth's earliest sulfur cycle. *Science* 289, 756-758.
- Wing, S. L.; **Bao, Huiming**; & Koch, P. L., 2000, An early Eocene cool period? Evidence for continental cooling during the warmest part of the Cenozoic. In: Huber, Brian T., editor, *Warm climates in Earth history*. Cambridge : University of Cambridge, p. 197-237.
- Bao, Huiming**, Koch, P. L., and Thiemens, M. H., 2000, Oxygen isotope composition of ferric oxides from recent soil, hydrologic, and marine environments. *Geochim. Cosmochim. Acta* 64 (11), 2221-2231.

1999

- Bao, Huiming**, Koch, P. L., and Rumble, D. III , 1999, Paleocene/Eocene climatic variation in western North America: Evidence from the $\delta^{18}\text{O}$ of pedogenic hematite. *Geological Society of America Bulletin*. 111, 1405-1415.

Bao, Huiming and Koch, P. L., 1999, Oxygen isotope fractionation in ferric oxide-water systems: Low temperature synthesis. *Geochim. Cosmochim. Acta* 63, 599-613.

1998

Bao, Huiming, Koch, P. L. and Hepple, R., 1998, Hematite and calcite coatings on fossils. *Journal of Sedimentary Research A*, v. 68, p. 273-287.

1997 and earlier (selected)

Shen, J.W., Yu, C.M., and **Bao, Huiming**, 1997, A Late-Devonian (Famennian) Renalcis-epiphyton reef at Zhaijiang, Guilin, South China. *Facies*, 37: p. 195-209.

Wu, Qingyu, Mu, Xinan; and **Bao, Huiming**, 1994, Gaseous and liquid hydrocarbons produced from thermal degradation of two kinds of calcareous algae. *Acta Micropalaeontologica Sinica*, 11(1). DOI: CNKI:SUN:WSGT.0.1994-01-008

Bao, Huiming, 1993, Some crypt habitats and cryptobionts in Late Devonian algal mounds in Guilin, south China. *Acta Micropalaeontologica Sinica*, 10(2): 181-190.

Sha, J., Zhang, L., Hui, L., Xu, S. and **Bao, Huiming**, 1992, The closure age of the late Paleozoic rift in Hohxil, Qinghai. *Acta Micropalaeontologica Sinica*, 9, 177-182.

Bao, Huiming, 1992, Middle Devonian Rothpletzella stromatolites from Yangshuo, Guangxi (China). *Acta Micropalaeontologica Sinica*, 9(4): 397-407.

* Student authored paper

MEETINGS AND CONFERENCES

2010, Huiming Bao, *Triple Oxygen Isotope Composition of Sulfate: A time capsule for Earth's O₂, O₃, and H₂O*. AGU Fall Meeting 2010, **Oral presentation**.

2009, Huiming Bao, *Look at Marinoan global glaciation from an extra dimension: the ¹⁷O anomaly*. AGU Fall Meeting, **Invited Poster**.

2009, Chuanming Zhou, Huiming Bao, Xunlai Yuan, *The origin of ¹⁷O-depleted barite in Neoproterozoic cap carbonates in South China: A sedimentological perspective*. AGU Fall Meeting, **Poster**.

2009, Yongbo Peng, Huiming Bao, Chuanming Zhou, Xunlai Yuan, *A large variation of the triple oxygen isotope composition of barite from a Neoproterozoic cap carbonate, South China*. AGU Fall Meeting, **Poster**.

2009, Huiming Bao, *How to make other-worldly oxygen isotope signatures on Earth?* NASA Lunar and Planetary Science Conference, March, Woodlands, TX, USA, **Talk**.

2008, Goldschmidt Conference at Vancouver, July: **Oral presentation**: Extraordinary Neoproterozoic conditions implicated by sulfate of extraordinary oxygen isotopic compositions.

2007, AGU Annual Fall Meeting at San Francisco; **Poster**: Negative sulfate ¹⁷O anomalies and an extraordinary temporal spike at the immediate aftermath of Marinoan 'snowball' Earth.

2007, 7th International Symposium on Applied Isotope Geochemistry, Stellenbosch, South Africa, Sept. 8-14,; **Invited Keynote speaker**: Complex oxidation pathways of volcanic SO₂ recorded in ancient tuffaceous deposits.

- 2007, 17th Goldschmidt at Cologne, Germany, Aug. 19-24.; **Poster presentation:** Negative sulfate ¹⁷O anomalies as positive evidence for “snowball Earth” hypothesis.
- 2006, IAVCEI (International Association of Volcanology and Chemistry of Earth's Interior, International Conference on Continental Volcanism, May, Guangzhou, P. R. China; **Oral presentation:** Multiple extreme sulfate-haze events in the Cenozoic North America
- 2006, Astrobiology Science Conference, NASA, Washington DC, March; **Oral presentation:** Quantifying multiple sulfate components in hyperarid deserts.
- 2005, Workshop on “Focus on perchlorate”-International Society of Environmental Forensics, Santa Fe, New Mexico, Sept.; **Invited speaker:** Total stable isotope measurement of perchlorate.
- 2005, 15th Goldschmidt Conference at Moscow, Idaho, USA, April; **Invited talk:** ¹⁷O anomaly in terrestrial rocks: An update.
- 2004, AGU Fall Meeting -San Francisco: **Oral presentation:** Bao and Marchant, High-resolution sulfate oxygen and sulfur isotope profiles for soils in Antarctica Dry Valleys.
- 2004, GSA Annual Meeting Denver: **Oral presentation:** High spatial heterogeneity of a cap-carbonate's stable isotope signatures: a stagnant Late Neoproterozoic ocean basin.
- 2004, ACS National Meeting at Philadelphia; **Invited talk:** Unique oxygen isotope composition for natural perchlorate.
- 2003, AGU Annual Fall Meeting at San Francisco; **Poster:** Widespread sulfate oxygen-17 anomaly in Cenozoic ash beds in North America High Plains: What could be the cause(s)?
- 2003, 13th Goldschmidt Conference at Kurashiki, Japan, Sept.; **Invited talk:** Increasing sulfate oxygen-17 anomaly with depth in hyperarid regolith profiles.
- 2002, AGU Chapman Conference on Volcanism and the Earth's Atmosphere, Santorini, Greece, June; **Talk + Poster:** Sulfur and Oxygen Isotopic Records on Atmospheric Chemistry of Volcanic Gases.
- 2001, 11th Goldschmidt Conference at Hot Spring, Virginia, May.; **Co-chair of a session + Oral presentation:** Basal Miocene volcanic ashes in mid-North America: An isotopic mystery.

Active Funding

1. PI

NSF Low-Temperature Geochemistry Program (EAR-0952057)

Title: “**The origin of ¹⁷O-depleted barite in Neoproterozoic cap carbonates in South China**”

Amount: US\$269,644

Duration: 07-01-2010 to 06-31-2013

2. PI:

Visiting Scholar Grant, State Key laboratory on Ore Deposits, Institute of Geochemistry, Chinese Academy of Science

Title: “**The purple Nantuo diamictite in central Guizhou and eastern Yunnan: Copper enrichment and the Neoproterozoic ‘snowball’ Earth**”

Amount: ¥200,000 (~ US\$30,000)

Duration: 06-01-2010 to 05-31-2011

3. PI

Petroleum Research Fund - Type AC (48343-AC2)
Title: “**Experimental sulfate triple oxygen isotope geochemistry**”
Amount: \$100,000
Duration: 07-2008 to 08-2011

GRADUATE STUDENTS ADVISED

Kathryn Jenkins, M.Sc., Graduated 2005
Katie Howell, M.Sc., Graduated 2006
Issaku Kohl, PhD, graduated 2011; currently JPL postdoc
Yongbo Peng, PhD, graduated 2011; currently Univ. of Maryland research associate/lab manager
Tao Sun, PhD, current (awarded NASA Postdoc Fellowship to begin in fall 2011)
Changjie Liu, M. Sc, current.
Bryan Killingsworth, M. Sc., current
Justin Hayles, M. Sc, current

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Geophysical Union (AGU)
Geochemical Society
Geological Society of America
International Association of GeoChemistry
AAAS