Zhibin Sun

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Research interests:

- Application and development of data assimilation algorithms to Earth dynamical systems
- Large-scale numerical simulations of nonlinear dynamic systems
- Machine learning
- Remote sensing

Computing skills:

Fortran 77/90, C/C++, MPI, Matlab, Unix/Linux

Education:

PhD	Aug, 2007	University of Maryland, Baltimore County, Applied Mathematics Advisors: Dr. Weijia Kuang, Dr. Andrew Tangborn & Dr. Matthias K. Gobbert *Dissertation: "Geomagnetic Data Assimilation Using Ensemble Methods to Estimate Forecast Error Covariance"*
MS	May, 2004	University of Maryland, Baltimore County, Applied Mathematics
MS	Jun, 2000	Central South University, China, Applied Mathematics
BS	Jun, 1997	Central South University, China, Applied Mathematics

Employment History:

Research Scientist	Colorado State University	Apr, 2014 to present
Research Scientist	Universities Space Research Association	July, 2011 to Aug, 2013
Visiting Research Associate	Goddard Earth Sciences and Technology Center, University of Maryland, Baltimore County	Apr, 2010 to Jun,2011
Postdoctoral Research Associate	Atmospheric and Oceanic Sciences Program, Princeton University	Mar, 2008 to Mar, 2010
Postdoctoral Researcher	Joint Center for Earth Systems Technology, University of Maryland, Baltimore County	Sep, 2007 to Feb, 2008
Research Assistant	Joint Center for Earth Systems Technology,	Jan, 2004 to Aug,

	University of Maryland, Baltimore County	2007
Teaching Assistant	Department of Mathematics and Statistics, University of Maryland, Baltimore County	Aug, 2002 to Dec, 2003
Lecturer	School of Computer Engineering and Science, Shanghai University, China	July, 2000 to Jun, 2002

Professional affiliations and activities:

SPIE *Remote Sensing and Modeling of Ecosystems for Sustainability* conference committee (2014-2018)
Guest Editor for *Science of the Total Environment*
Referee for scientific papers for *Agricultural and Forest Meteorology, Atmospheric Science Letters, Atmosphere, Computers and Electronics in Agriculture, IEEE Systems Journal, IEEE Access, Remote Sensing, Science of the Total Environment, Soil & Tillage Research, Forest Ecology and Management*

Publications:

1. Liu, Y.*, Tang, A., **Sun, Z.***, Tang, W., Cai, F. and Wang, C., 2020. An Integrated Retrieval Framework for Similar Questions: Word-semantic Embedded Label Clustering-LDA with Question Life Cycle. Information Sciences. https://doi.org/10.1016/j.ins.2020.05.014
2. Yan, L.*, Zhang, S., Chang, Y., **Sun, Z.**, Sheng, Z., 2020. Quantum Secure Direct Communication Protocol with Mutual Authentication Based on Single Photons and Bell States. CMC-Computers, Materials & Continua, 63(3), 1297–1307.
3. Liu, Y.*, Tang, A., Cai, F., Ren, P. and **Sun, Z.**, 2019. Multi-feature based Question-Answerer Model Matching for predicting response time in CQA. Knowledge-Based Systems, 182, p.104794.
4. Chen, M.*, **Sun, Z.***, Davis, J.M., Liu, Y.A.*, Corr, C.A. and Gao, W., 2019. Improving the mean and uncertainty of ultraviolet multi-filter rotating shadowband radiometer in situ calibration factors: utilizing Gaussian process regression with a new method to estimate dynamic input uncertainty. Atmospheric Measurement Techniques, 12(2), pp.935-953.
5. **Sun, Z.***, Davis, J. and Gao, W., 2018. Estimating error covariance and correlation region in UV irradiance data fusion by combining TOMS-OMI and UVMRP ground observations. IEEE Transactions on Geoscience and Remote Sensing, 56(1), pp.355-370.
6. Mao, W., Zhao, X., **Sun, Z.***, Felton, A.J., Zhang, T., Li, Y. and Smith, M.D., 2018. Limiting similarity mediates plant community niche hypervolume across a desert-steppe ecotone of Inner Mongolia. Environmental and Experimental Botany, 153, pp.320-326.

7. Liu, Yan-An, **Zhibin Sun***, Maosi Chen, Hung-Lung Allen Huang, and Wei Gao*. "Assimilation of atmospheric infrared sounder radiances with WRF-GSI for improving typhoon forecast." *Frontiers of Earth Science* (2018): 1-11.
8. Wang, Y.*, Zhu, X., Bai, S., Zhu, T., Qiu, W., You, Y., Wu, M., Berninger, F., **Sun, Z.**, Zhang, H. and Zhang, X., 2018. Effects of forest regeneration practices on the flux of soil CO2 after clear-cutting in subtropical China. Journal of environmental management, 212, pp.332-339.
9. Chang, N.B., Mostafiz, C., **Sun, Z.**, Gao, W. and Chen, C.F., 2017, May. Developing a prototype satellite-based cyber-physical system for smart wastewater treatment. In 2017 IEEE 14th International Conference on Networking, Sensing and Control (ICNSC) (pp. 339-344). IEEE.
10. Chen, M., Davis, J.M., Liu, C., **Sun, Z.**, Zempila, M.M. and Gao, W., 2017, September. Using deep recurrent neural network for direct beam solar irradiance cloud screening. In Remote Sensing and Modeling of Ecosystems for Sustainability XIV (Vol. 10405, p. 1040503). International Society for Optics and Photonics.
11. **Sun, Z.**, Chang, N.B., Gao, W., Chen, M. and Zempila, M., 2017, September. Using input feature information to improve ultraviolet retrieval in neural networks. In Remote Sensing and Modeling of Ecosystems for Sustainability XIV (Vol. 10405, p. 1040506). International Society for Optics and Photonics.
12. VoPham, T.*, Hart, J.E., Bertrand, K.A., **Sun, Z.**, Tamimi, R.M. and Laden, F., 2016. Spatiotemporal exposure modeling of ambient erythemal ultraviolet radiation. Environmental Health, 15(1), p.111.
13. Wang, Y., Gu, C.*, Bai, S., **Sun, Z.**, Zhu, T., Zhu, X., Grit, D.H. and Tembrock, L.R., 2016. Cadmium accumulation and tolerance of Lagerstroemia indica and Lagerstroemia fauriei (Lythraceae) seedlings for phytoremediation applications. International journal of phytoremediation, 18(11), pp.1104-1112.
14. **Zhibin Sun**, John Davis and Wei Gao. "Analysis of ten years of surface UV observations from data fusion for the continental U.S.", Proc. SPIE 9975, Remote Sensing and Modeling of Ecosystems for Sustainability XIII, 99750B (September 19, 2016); doi:10.1117/12.2238058; http://dx.doi.org/10.1117/12.2238058.
15. **Sun, Z.*** and W. Kuang, An ensemble algorithm based component for geomagnetic data assimilation. *Terr. Atmos. Ocean. Sci.*, 26, 53-61, doi: 10.3319/TAO.2014.08.19.05(GRT), 2015.
16. **Sun, Z.**, Davis, J., and Gao, W., Combined UV Irradiance from TOMS-OMI satellite and UVMRP ground measurements across the continental US, *In SPIE Optical Engineering+ Applications (pp. 961004-961004), International Society for Optics and Photonics*, doi:10.1117/12.2188760, 2015.
17. Wang, Y., **Sun, Z.**, and Bai, S., A new method to classify hyperspectral data of Landsat TM image, *In SPIE Optical Engineering+ Applications (pp. 96100P-96100P), International Society for Optics and Photonics*, doi:10.1117/12.2187769, 2015.
18. Asao, S., **Sun, Z.**, and Gao, W., Effects of bias in solar radiation inputs on ecosystem model performance, *In SPIE Optical Engineering+ Applications (pp. 96100C-96100C), International Society for Optics and Photonics*, doi:10.1117/12.2188206, 2015.
19. Chen, M., Davis, J., **Sun, Z.**, and Gao, W., Two-stage reference channel calibration for collocated UV and VIS Multi-Filter Rotating Shadowband Radiometers, *In SPIE*

Optical Engineering+ Applications (pp. 96100L-96100L), International Society for Optics and Photonics, doi:10.1117/12.2185500, 2015.

20. **Sun, Z.***, L.-Y. Oey and Y.-H. Zhou, Skill-Assessments of Statistical and Ensemble Kalman-Filter Data Assimilative Analyses using Surface and Deep Observations in the Gulf of Mexico, *Frontiers of Earth Science*, 7, 271-281, doi:10.1007/s11707-013-0377-8, 2013.
21. Warner, J. X.*, Yang, R., Wei, Z., Carminati, F., Tangborn, A., **Sun, Z.**, Lahoz, W., Attié, J.-L., El Amraoui, L., and Duncan, B.: Global carbon monoxide products from combined AIRS, TES and MLS measurements on A-train satellites, *Atmos. Chem. Phys. Discuss.*, 13, 15409-15441, doi:10.5194/acpd-13-15409-2013, 2013.
22. L.-Y. Oey*, Y.-L. Chang, **Z.-B. Sun** and X.-H. Lin, Topocaustics, *Ocean Modelling*, 29, 277-286, 2009.
23. Tangborn, A.*, R. Cooper, S. Pawson and **Z. Sun**, Chemical Source Inversion Using Assimilated Constituent Observations in an Idealized Two-dimensional System, *Monthly Weather Review*, 137, 3013-3025, 2009.
24. Kuang, W.*, A. Tangborn, W. Jiang, D. Liu, **Z. Sun**, J. Bloxham and Z. Wei, MoSST_DAS: the first generation geomagnetic data assimilation framework, *Communications in Computational Physics*, 3, 85-108, 2008.
25. **Sun, Z.**, A. Tangborn* and W. Kuang, Data Assimilation in a Sparsely Observed MHD System, *Nonlinear Processes in Geophysics*, 14, 1-12, 2007.
26. Kuang, W., **Z. Sun**, A. Tangborn, D. Liu, W. Jiang, Constructing numerical geodynamo with surface observations: a geomagnetic data assimilation approach, in *Proceedings of the First SWARM International Science Meeting* (ESA, WPP-261), 2006.
27. **Sun, Z.**, C.-I. Chang, H. Ren, JO Jensen, A least-squares approach to fully constrained linear spectral mixture analysis using linear inequality constraints, *Proceedings of SPIE*, 5159, 349, 2004.

Conference and Seminar Presentations:

2019 Fall AGU Meeting — Dec 9-13, 2019, San Francisco, CA

Title: *Temporal variability in surface irradiance at ultraviolet wavelengths from ground-based observations across the United States*

Authors: Sun, Z., Chen, M., Corr, C., Liu, Y. & Gao, W.

2019 SPIE Meeting — Aug 11-15, 2019, San Diego, CA

1. Title: *Reconstruct missing pixels of Landsat land surface temperature product using a CNN with partial convolution*

Authors: Chen, M., Newell, B., Sun, Z., Corr, C. & Gao, W.

2018 Fall AGU Meeting — Dec 10-14, 2018, Washington, DC

Title: *Retrieving temperature and relative humidity profiles from hyperspectral radiations via deep learning*

Authors: Chen, M., Liu, C., Sun, Z., & Gao, W.

2018 SPIE Meeting — Aug 19-23, 2018, San Diego, CA

1. Title: *Spatial interpolation of surface ozone observations using deep learning*

Authors: Chen, M., Sun, Z. & Davis, J.

2. Title: *Ensemble learning of satellite remote sensing images via integrating deep and fast learning algorithms for water quality monitoring*

Authors: Chang, N.-B., Sun, Z. & Gao, W.

2017 Fall AGU Meeting Dec 11-15, 2017

Title: *Retrieval of Surface Ozone from UV-MFRSR Irradiances using Deep Learning* New Orleans, LA

Authors: Chen, M., Sun, Z., Davis, J., Zempila, M., Liu, C. & Gao, W.

2017 SPIE Meeting Aug 6-10, 2017

1. Title: *Using input feature information to improve ultraviolet retrieval in neural networks* San Diego, CA

Authors: Chen, M., Davis, J., Liu, C., Sun, Z., Zempila, M. & Gao, W.

2. Title: *Using Input Feature Information to Improve Ultraviolet Retrieval in Neural Networks*

Authors: Sun, Z. Chang, N.-B., Gao, W., Chen, M. & Zempila, M.

2016 SPIE Meeting Aug 28- Sep 1, 2016

Title: *Analysis of Ten Years of Surface UV Observations from Dat Fusion for the Continental U.S.* San Diego, CA

Authors: Sun, Z., Davis, J. & Gao, W

2015 SPIE Meeting Aug 11-12, 2015

1. Title: *Combined UV Irradiance from TOMS-OMI satellite and UVMRP ground measurements across the continental US* San Diego, CA

Authors: Sun, Z., Davis, J. & Gao, W.

2. Title: *A new method to classify hyperspectral data of Landsat TM image*

Authors: Wang, Y., Sun, Z. & Bai, S.

3. Title: *In situ hyperspectral data analysis for canopy chlorophyll content estimation of an invasive species spartina alterniflora based on PROSAIL canopy radiative transfer model*

Authors: Ai, J., Gao, W., Shi, R., Zhang, C., Sun, Z., Chen, W., Liu, C. & Zeng, Y.

4. Title: Influence of canopy biochemical and biophysical variables on reflectance spectra based on canopy radiative transfer model with adding noise

Authors: Liu, P., Shi, R., Wang, H., Liu, C., Sun, Z. & Gao, W.

2014 SPIE Meeting Aug 18-20, 2014

1. Title: *Assimilation of remote sensing data into crop growth model to improve the estimation of regional winter wheat yield* San Diego, CA

Authors: Liu, C., W. Gao, P. Liu & Z. Sun

2. Title: *Evaluation of CALIPSO aerosol optical depth using AERONET and MODIS data over China*

Authors: Liu C., X. Shen, W. Gao, P. Liu & Z. Sun

2012 CIG Geodynamo Developer Meeting Oct 8-10, 2012,
Title: *Enabling CIG geomagnetic data assimilation: Algorithm, Framework and Implementation* Boulder, CO
Authors: Kuang, W; Sun, Z; Jiang, W & Tangborn, A

2011 AGU Fall Meeting Dec 5 - 9, 2011,
Title: *Magnetic fields of the solar system: A comparative planetology toolkit* San Francisco, CA
Authors: Joseph B Nicholas, Michael E Purucker, Catherine L Johnson, Terence J Sabaka1, Nils Olsen, Zhibin Sun, Manar Al Asad, Brian Jay Anderson, Haje Korth, James A Slavin, Igor I Alexeev, Elena Semenovna Belenkaya, Roger J Phillips, Sean C Solomon, Robert J Lillis, Benoit Langlais, Reka Moldovan Winslow, Christopher T Russell, Michele Karen Dougherty, Maria T Zuber

2007 AGU Fall Meeting Dec 10 - 14, 2007,
Title: *Application of Ensemble Techniques in Geomagnetic Data Assimilation* San Francisco, CA
Authors: Sun, Z; Tangborn, A & Kuang, W

NASA/GMAO Seminar at NASA/GSFC **(invited talk)** Oct 25, 2007,
Title: *Geomagnetic data Assimilation* Greenbelt, MD

Differential Equations Seminar at University of Maryland, Baltimore County **(invited seminar)** Apr 9, 2007,
Baltimore, MD
Title: *Geomagnetic data Assimilation*

2006 AGU Fall Meeting Dec 11 - 15, 2006,
Title: *Geomagnetic Data Assimilation* **(talk)** San Francisco, CA
Authors: Sun, Z; Tangborn, A & Kuang, W

10th Symposium of SEDI July 9 -14, 2006，
1. Title: *Error Covariances Derived from MoSST Core Dynamics Model* Prague, Czech Republic
Authors: Zhibin Sun, Andrew Tangborn, Weijia Kuang, Don Liu & Weiyuan Jiang
2. Title: *MoSST$_{DAS}$: The First Generation Geomagnetic Data Assimilation Framework*
Authors: Weijia Kuang, Andrew Tangborn, Weiyuan Jiang, Don Liu & Zhibin Sun

2006 Joint Assembly Meeting May 23 - 26, 2005，
1. Title: *Geomagnetic Data Assimilation in MoSST Core Model* Baltimore, MD
Authors: Sun, Z; Tangborn, A & Kuang, W
2. Title: *Observing System Simulation Experiments in Geomagnetic Data Assimilation*
Authors: Liu, D; Kuang, W; Tangborn, A; Sun, Z; Jiang, W & Bloxham, J

First Swarm International Science Meeting May 3 - 5, 2006，
Title: *Geomagnetic Data Assimilation with MoSST Core Model* Nantes, France
Authors: Z. Sun, A. Tangborn, W. Kuang & W. Jiang

2005 AGU Fall Meeting Dec 5 - 9, 2005，
1. Title: *Geomagnetic Data Assimilation Using Ensemble Error* San Francisco, CA

Covariance Estimation

Authors: Sun, Z; Tangborn, A; Kuang, W; Liu, D & Jiang, W

2. Title: *Scalable Numerical Dynamo Model Developed as a Component of Geomagnetic Data Assimilation Framework*

Authors: Jiang, W; Kuang, W; Sun, Z; Liu, D & Tangborn, A

3. Title: *Studies of Synthetic Observation Data Assimilation into Geodynamo Solutions: Understanding the Effects of Rayleigh Number and Changes in Solution Error Due to Data Assimilation*

Authors: Liu, D; Kuang, W; Tangborn, A; Sun, Z; Jiang, W & Bloxham, J

4. Title: *Development of Geomagnetic Data Assimilation Framework: the Challenges and Progress*

Authors: Kuang, W; Tangborn, A; Sun, Z; Liu, D; Jiang, W; Sabaka, T & Bloxham, J

2005 Joint Assembly Meeting May 23 - 27, 2005，New Orleans, LA

Title: *Ensemble Calculation of Error Covariances in the MoSST Core Dynamics Model*

Authors: Sun, Z; Liu, D; Jiang, W; Tangborn, A & Kuang, W

2004 AGU Fall Meeting Dec 13 - 17, 2004，San Francisco, CA

Title: *Geomagnetic Data Assimilation: A Method for Determining Error Covariances*

Authors: Sun, Z; Don, L; Tangborn, A & Kuang, W