

# Y. T. Jade Morton

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## CAREER SUMMARY

Dr. Jade Morton is a professor, Thomas Austin Faculty Fellow, the Director for Colorado Center for Astrodynamics Research (CCAR), and the head of the Satellite Navigation and Sensing (SeNSE) Laboratory in the Aerospace Engineering Sciences Department at the University of Colorado (CU), Boulder. Prior to joining CU in 2017, she was an electrical engineering professor at Colorado State University and at Miami University where she led the creation of the Electrical and Computer Engineering Department. Dr. Morton's research interests lie at the intersection of satellite navigation technologies and remote sensing of the Earth's space environment, atmosphere, and surface. She is an author of over 290 technical publications and the lead editor of a two-volume set of books on position, navigation, and timing technologies published by Wiley-IEEE Press. She has lead and participated in more than 40 projects sponsored by AFOSR, AFRL, ARMY, DARPA, DHS, NASA, NOAA, NSF, ONR, Lockheed Martin, Septentrio, etc.. She has advised and mentored more than 40 graduate students and post-docs, given more than 100 invited presentations, delivered over 50 short courses and tutorials for government labs, industry partners, and at professional conferences and workshops. She has provided numerous services to the navigation and the space science research communities, including being the Technical Editor of Navigation Systems for IEEE Transactions on Aerospace and Electronics Systems, an editor for Beidou Special Issue for Navigation, Journal of Institute of Navigation (ION), President of the ION, Program Chair and General Chair of numerous international conferences, and a founding member of the Consortium of Ohio Universities on Navigation and Timekeeping (COUNT). She is a distinguished lecturer of the IEEE Aerospace and Electronics Systems Society and a recipient of the ION Burka, Thurlow, and Kepler award, and the IEEE PLANS Richard Kershner award. Dr. Morton is a fellow of IEEE, ION, and the Royal Institute of Navigation (RIN).

## EDUCATION

Ph.D. (1991), Electrical Engineering, the Pennsylvania State University, University Park, PA  
M.S. (1987), Electrical Engineering, Case Western Reserve University, Cleveland, OH  
B.S. (1983), Physics, Nanjing University, Nanjing, China

## PROFESSIONAL POSITIONS

University of Colorado, Boulder, CO, Smead Aerospace Engineering Sciences Department  
Professor, Thomas F. Austin Faculty Fellow (2017 – Present)  
Director, Colorado Center for Astrodynamics (CCAR) (2019 – Present)  
Associate Chair for Graduate Programs (2018 – 2019)  
Colorado State University, Fort Collins, CO, Electrical & Computer Engineering Department  
Professor (2014 – 2017)  
Miami University, Oxford, OH, Electrical & Computer Engineering Department  
Professor (2009 – 2014), Associate Professor (2006 – 2009), Assistant Professor (2000 – 2006)  
The University of Michigan, Ann Arbor, MI  
Post-Doctoral Research Fellow (1991-1993), Space Physics Research Laboratories  
The Pennsylvania State University, University Park, PA  
Research Assistant (1987-1991), Electrical & Computer Engineering Department

Case Western Reserve University, Cleveland, OH  
Research Assistant (1986-1987), Electrical Engineering & Applied Physics Department  
Nanjing University, Nanjing, China  
Research Faculty (1983-1985), Physics Department

## PROFESSIONAL LEADERSHIP POSITIONS and SERVICES

- Affiliations and Membership
  - American Geophysical Union (AGU)
  - Institute of Electrical and Electronics Engineering (IEEE), Fellow (2014)
    - \* IEEE Aerospace and Electronic Systems Society
    - \* IEEE Geoscience and Remote Sensing
    - \* IEEE Signal Processing
    - \* IEEE Women in Engineering Society
  - Institute of Navigation (ION), Fellow (2015)
  - International Union of Radio Science (URSI)
  - Royal Institute of Navigation, Fellow (2019)
- Offices/Positions Held
  - ION Executive Committee (2017-Present)
  - ION President (2019-21)
  - ION Pacific Rim Collaboration Liaison (2014-20)
  - ION Executive Vice President (2017-19)
  - ION Award Committee Member (2017-19)
  - ION Satellite Division Executive Committee (2010-16)
  - Chair, ION GNSS+ Student Paper Award Committee (2014-16)
  - Chair, ION Satellite Division (2012-14)
  - Technical Committee Member, IEEE MTT Soc., Digital Signal Proc. Subgroup (2004-14)
  - Vice Chair, ION Satellite Division (2010-12)
  - Eastern Region Member-at-Large, ION (2012, 2009)
  - President, Chinese Professional in Global Positioning Systems (2010)
  - Chair, ION Outreach (2010-12)
  - Chair, Brad Parkinson Thesis Award Committee, ION (2008)
  - Chair, Award Committee, New Navigation Tech.& Innovations Conf., Beijing, China (2008)
  - Member, ION Council (since 2006)
  - Chair, ION Dayton Section (2006-7)
- Advisory Board Member
  - US DOT Transportation Center for Automated Vehicles Research with Multimodal AssurEd Navigation (CARMEN) (2020-22)
  - High Frequency Active Auroral Research Program, Alaska (2020-present)
  - Jicamarca Radio Observatory, Peru (2018-present)
  - Navmatic, US (2020-present)
- Conference/Workshop/Panel Organization
  - Coupling, Energetics, & Dynamics of Atmospheric Regions (CEDAR) Workshop, Session Co-Chair, *2018, 2019, 2021*
  - Session Co-Chair, USNC-URSI National Radio Science Meeting, *2019, 2021*
  - General Chair, ION Pacific Position, Navigation, & Timing Conf., *2019*
  - Session Co-Chair, ION International Technical Meeting, *2008, 2009, 2010, 2012, 2013, 2019*
  - NASA Living With A Star Institute, Working Group 5 Leader, *2018-19.*
  - Session Co-Chair, URSI Atlantic Radio Science Meeting, *2018*
  - Session Co-Chair, AGU Meeting, *2018*
  - Program Co-Chair, ION Pacific Position, Navigation, & Timing Conf., *2013, 2015, 2017*

- ION Technical Representative, GNSS+R Workshop, 2017
- Session Co-Chair, ION Global Navigation Satellite Systems+ Conf., 2005, 2009, 2015
- Conference Committee and Navigation Systems Track Chair, IEEE Radar Conf., 2014
- Scientific Committee, Ubiquitous Positioning, Indoor Nav., & Location Based Services, 2014
- General Chair, ION GNSS Conference, 2013
- Program Chair, ION GNSS Conference, 2012
- Section Co-Chair, Chinese Satellite Navigation Conference, 2011, 2012
- General Chair, ION International Technical Meeting, 2012
- Program Committee, Int. Conf. Ubiquitous Pos., Indoor Nav., & Location Based Service, 2012
- Program Chair, ION International Technical Meeting, 2011
- Co-Chair, Compass Workshop at ION GNSS Conference, 2010
- Session Co-Chair, CPGPS International Technical Forum, 2010
- Organizer, Focused Session on Adv. in Positioning Sys., IEEE Int. Microwave Sym., 2009
- Track Chair, ION GNSS Conference, 2007
- Session Co-Chair, ION Annual Meeting, 2003, 2007
- Session Co-Chair, ION National Technical Meeting, 2006, 2007
- Workshop Co-Organizer, IEEE International Microwave Symposium, 2005
- Workshop Organizer, AFOSR Communication & Navigation Program Review, 2005
- Session Co-Chair, IEEE Position, Location, & Navigation System (PLANS) Conf., 2004
- Session Chair, American Control Conference, 2002
- Panel Services
  - ESA NAVITEC, GNSS/PNT for Science and Exploration Panel, 2022.
  - US-ION Panel Co-Chair, Chinese Satellite Navigation Conf. (CSNC), 2012, 2013, 2014, 2018, 2019, 2021.
  - Silicon Flatirons Panel on Resilience in Position, Navigation, and Timing, 2020.
  - NASA Space Weather Operation-to-Research Review Panel, 2020.
  - NASA, Space Geodesy Research Review Panel, Washington DC, 2016.
  - NSF, National Center for Atmospheric Research Observing Facilities Review Panel, 2016.
  - NSF, Management and Operations of the Arecibo Observatory Review Panel, 2014.
  - NSF, Coupling, Energetics, & Dynamics of Atmospheric Regions Prog. Review Panel, 2014.
  - White House Office of Science and Technology Policy, Auroral Research Workshop, 2014.
  - National Academies of Science, The Role of High-Power, High Frequency-Band Transmitters in Advancing Ionospheric/Thermospheric Committee Panel, 2013.
  - NSF, ECS – Integrative, Hybrid & Complex Systems Panel, 2005.
- Editorial Services
  - Co-Editor, Special Issue on Beidou Satellite Navigation System, Journal of Navigation, 2019
  - Technical Editor, Navigation Systems, IEEE Trans. Aero. & Elec. Sys., 2014-18
  - Associate Editor, IEEE Trans. Aero. & Elec. Sys., 2008-18
  - Editorial board, Springer journal GPS Solutions, 2006-Present
- Journal Review: *EURASIP Journal on Advances in Signal Processing; Geophysical Research Letters; GPS Solutions; Journal of Aircraft; IEEE Communications Letters; IEEE Transactions on Aerospace & Electronics Systems; IEEE Transactions on Signal Processing; IEEE Transactions on Wireless; Journal of Atmospheric and Solar-Terrestrial Physics; Journal of Geophysical Research; Journal of Global Positioning Systems; Navigation, Journal of Institute of Navigation; Radio Science.*
- Book Review:
  - Kaplan, E. and C. Hegarty, Understanding GPS, Principles and Applications, 3<sup>rd</sup> ed., 2017.
  - Betz, J. W., *Engineering Satellite-Based Navigation and Timing: Global Navigation Satellite Systems, Signals, and Receivers*, Wiley-IEEE, 2016.

- Tsui, J. B. Y., *Global Positioning System Receivers, A Software Approach*, 2<sup>nd</sup> edition, Wiley & Sons, 2004.
- Proposal Review: NSF, AFOSR, AFRL, NASA
- Tutorials and Short Courses Offered to Universities, Industries, and Government Agencies:
  - Consortium of Ohio Universities on Navigation and Timekeeping (COUNT) Short Courses:
    - Advanced GNSS Receivers, Webinar, 2020, 2021.
    - Advanced GNSS Receivers, Northrop Grumman, CA, 2019
    - Advanced GNSS Receivers, Dayton, OH, 2018, 2019
    - Ionospheric Scintillation Monitoring Receivers, Dayton, OH, 2016, 2017
    - Ionospheric Scintillation and GNSS Receivers, Dayton, OH, 2015
    - GNSS Remote Sensing, Dayton, OH, 2014
    - GNSS and Space Weather, Dayton, OH, 2013
    - High Sensitivity GNSS, Rockwell Collins, Cedar Rapids, IW, 2012
    - High Sensitivity GNSS Receivers, Dayton, OH, 2012
    - Ionospheric Scintillation, Honeywell, Minneapolis, MN, 2011
    - Ionospheric Scintillation, Dayton, OH, 2011
    - Ionospheric Effects on GNSS, Columbus, OH, 2009, 2010
    - Software Receiver Technologies, Dayton, OH, 2007, 2008
  - Position, Navigation, and Time (PNT) Workshop, South Korea, Seoul, 2016
    - Introduction to GNSS, Part 2: Receiver Processing
    - Ionosphere Effects
    - Remote Sensing Using GNSS Networks
  - Nanyang Technological University, Singapore, 2015
    - Software GNSS Receiver Algorithms
    - Atmospheric Remote Sensing Using GNSS
  - US-Singapore PNT Workshop, Maui, HI, 2014
    - Magnetic Field Modeling
    - Ionosphere Modeling
    - Introduction to Software-Defined Radio
  - Croucher Foundation, Hong Kong
    - Ionosphere Scintillation Monitoring Receivers, 2018
    - GNSS Software Receiver Algorithms and Applications, 2014
  - ION GNSS+ Conference
    - Ionospheric Effects, Monitoring, and Mitigation, St. Louis, MO, 2021
    - Beidou Navigation Satellite System (co-taught), Miami, FL, 2018
    - High Sensitivity GNSS, Nashville, TN, 2012
    - High Sensitivity GNSS, Portland, OR, 2011
  - IEEE National Aerospace & Electronics Conference
    - High Sensitivity GNSS, Dayton, OH, 2012
    - Software Receivers, Dayton, OH, 2008
  - Polar Aeronomy & Radio Science Workshop, HAARP, AK.
    - Ionospheric Effects on GNSS, 2008, 2009, 2010, 2011, 2012
  - AFOSR Singapore PNT Workshop, Honolulu, HI, 2010
    - GPS 101
    - High Sensitivity GPS
  - African GNSS Outreach Workshop, Trieste, Italy
    - Software-defined GNSS Receivers for Ionospheric Monitoring, 2017
    - Autonomous Vehicle GNC, 2009, 2010
    - Robotics Laboratory, 2009, 2010
  - Space Weather Effects on GNSS Operations at Low Latitudes, Trieste, Italy, 2018

- GNSS for Ionosphere and Space Weather Monitoring
  - Introduction to GNSS Receivers
  - GNSS Software Receiver Laboratory
- Ionospheric Forecasting for GNSS Operation in Developing Countries, Trieste, Italy, 2019
  - GNSS for Ionosphere and Space Weather Monitoring
- Air Force Research Laboratory, Wright Patterson Air Force Base, OH
  - Software Receiver Technologies, 2008, 2009

## SELECTED UNIVERSITY COMMITTEES AND SERVICES

- University of Colorado at Boulder
  - College of Engineering and Applied Sciences, Faculty Search Committee, 2020-21
  - Director for Colorado Center for Astrodynamics Research (CCAR), 2019 - Present
  - Associate Chair for Graduate Programs, Aerospace Engineering Sciences Dept., 2018- 2019
  - Aerospace Engineering Science Department Research Strategic Vision Committee, 2018
  - Executive Committee Member, Aerospace Engineering Sciences Dept., 2017-Present
  - Search Committee Member, Aerospace Engineering Sciences Dept., 2017-18
  - Committee member, Joint AES-EE MS degree program, 2017-18
  - Promotion and Tenure Evaluation Committee, 2017-present
  - Faculty Mentoring, 2017-Present
  - Senior Project Advisory Board, 2017-18
- Colorado State University
  - College of Engineering Strategic Plan Committee, Initiative 5 Enhance the Diversity of COE Students, Faculty and Staff, and Promote A Culture of Inclusiveness, 2016
  - Electrical and Computer Engineering Department, Faculty Promotion and Tenure (PNT) Committee, 2014-2017
- Miami University
  - Promotion & Tenure Committee, 2006-14
  - Mentor for Women Faculty, 2010-2014
  - President 2020 Plan Target Goal Team Member, 2012-13
  - Research Award Committee, 2005-7, 2009-13
  - Curriculum Committee, 2004-5, 2008-9, 2012-13
  - Panel member, Academic Success Workshop for International Students, 2010, 2011
  - Sigma Xi Researcher of Year Award Committee Member, 2011-12
  - Sigma Xi Researcher of Year Award Committee Chair, 2011
  - ABET Accreditation Committee, 2001-2011
  - Advisor, Society of Woman Engineers, 2008-2010
  - Administrator Evaluation Committee, 2006-7
  - Faculty Search Committee Chair, 2004-5, 2008-9
  - Research Council Member, 2005-7
  - Faculty Search Committee, 2000-2003, 2006-7
  - Search Committee, Vice President for Institutional Diversity, 2007
  - Chair, ECE Undergraduate Curriculum Committee, 2005-6
  - Search Committee Member, Associate Provost and Dean of Graduate School, 2005-6
  - Search Committee, Assistant to the President and Associate Provost for Diversity, 2004-5
  - Search Committee, ECE Program Director, 2004-5
  - New ECE Programs Undergraduate Curriculum Committee, 2000-2
  - Principle Investigator, the Presidential Fusion Project, 2001-2
- Community Outreach
  - URSI National Radio Science Meeting Student Paper Awards Judge, 2019
  - AGU Outstanding Student Presentation Awards Judge, 2018

- Co-host and organizer, STEM First Abilities outreach to high school female students, 2011-12
- Coach, Talawanda High School Robotics Competition Team, 2008-2010
- Speaker and workshop organizer for numerous Girl Scouts events, 2002-2010

## AWARDS AND HONORS

- Fellowships
  - Thomas F. Austin Faculty Fellow, University of Colorado Boulder, 2017-Present
  - Fellow, Royal Institute of Navigation (RIN), 2019
  - Fellow, Institute of Navigation (ION), 2015
  - Fellow, IEEE, 2014
  - Tan Chin Tuan Faculty Fellow, Nanyang Technological University, Singapore, 2014-15
  - National Research Council/AFOSR Summer Faculty Fellow, 2002, 2003, 2004
- General Recognition
  - ION Distinguished Service Award, 2021
  - IEEE Aerospace and Electronic Systems Society Distinguished Lecturer, 2019-21
  - Distinguished Performance Award, Aerospace Engineering Sciences Department, University of Colorado Boulder, 2019
  - GPS World Leadership Service Award, GPS World Magazine, 2015
  - Woman's Leadership Award, Miami University, 2013
  - Jennie Elder Suel Distinguished Woman of Color Award, Miami University, 2013
- Research Awards
  - University of Colorado Boulder, College of Engineering and Applied Sciences, Faculty Research Award, 2021
  - Johannes Kepler Award, Institute of Navigation, 2020
  - Richard B. Kershner Award, IEEE Aerospace and Electronic Systems Society, 2020
  - Best session paper, ION GNSS+ Conference, 2004, 2007, 2011, 2014, 2015, 2016, 2017(2), 2018, 2019, 2020(4)
  - Best student presentation co-author, International Sym. GNSS, 2017
  - Samuel M. Burka Award, Editorial Board, Navigation, Journal of ION, 2017
  - Best paper and best presentation, ION Autonomous Snowplow Competition, 2014
  - Thurlow Award, ION, 2013
  - Distinguished Scholar, Miami University, 2013
  - Best paper, Colloquium Sci. Fundamental Aspects Galileo Program, 2013
  - Best paper in track, IEEE/ION PLANS Conference, 2012
  - Outstanding Researcher, School of Eng. & Applied Sci., Miami U., 2005, 2011
  - Best paper, IEEE NAECON, 2011
  - Sigma Xi Researcher of the Year, Miami U., 2009
  - Shoupp Award, Miami University Research Advisory Council, 2001, 2006
  - Charles Ryan Award Nominee, AFRL, WPAFB, 2005
  - Best student paper award, CPGPS International Technical Forum, 2007
  - First place, Annual Graduate Research Exhibition, Penn State University, 1990
- Teaching Awards
  - Finalist, Outstanding Professor Award, Associated Student Gov., Miami Univ., 2012
  - Outstanding Professor Nominee, Associated Student Gov., Miami U., 2004, 2006, 2011
  - Teaching Excellence award, School of Engineering & Applied Sci., Miami U., 2007
  - Teaching Effective Award Nominee, Miami University Alumni Association, 2006, 2007
  - Teaching Excellence Award, Committee for Enhancement of Learning, Miami Univ., 2005
- Advisor for Student Team Competitions Awards
  - 3<sup>rd</sup> place team advisor, AIAA Student Paper Competition, 2018
  - 1<sup>st</sup> place team advisor, ION Autonomous Snowplow Competition, 2014

- 5<sup>th</sup> place Design Award, Intelligent Ground Vehicle Competition, 2013
- 2<sup>nd</sup> place team advisor, ION Autonomous Snowplow Competition, 2013
- 2<sup>nd</sup> place team advisor, ION Autonomous Lawnmower Competition, 2012
- 2<sup>nd</sup> place team advisor, ION Autonomous Snowplow Competition, 2012
- 1<sup>st</sup> place team advisor, Miami U. Interdisciplinary Tech. Dev. Competition (MUITDC), 2012
- 2<sup>nd</sup> place advisor, Int. Waveform Diversity & Design Conf. Student Paper Competition, 2012
- 1<sup>st</sup> place team mentor, MUITDC, 2011
- 2<sup>nd</sup> place team advisor, ION Autonomous Snowplow Competition, 2011
- 2<sup>nd</sup> place team mentor, ION MiniUrban Challenge Ohio Competition, 2010
- 1<sup>st</sup> place team mentor, ION MiniUrban Challenge Ohio Competition, 2009
- 2<sup>nd</sup> place & Best Production Plan advisor, ION Autonomous Lawnmower Competition, 2004

## COURSES TAUGHT

- University of Colorado
  - ASEN 3300 Aerospace Electronics and Communications
  - ASEN 4018/4028 Aerospace Senior Projects
  - ASEN 5090 Introduction to GNSS
  - ASEN 6091 GNSS Receiver Architecture
  - ASEN 6519 GNSS for Remote Sensing
- Colorado State University
  - ECE 511 Global Navigation Satellite Systems Receivers
  - ECE 581A6 Global Navigation Satellite Systems
- Miami University
  - ECE/EAS 102 Problem Solving and Design
  - ECE/MME 203 Electric Circuit Analysis I
  - ECE/MME 303 Computer-aided Experimentation
  - ECE 305 Electric Circuit Analysis II
  - ECE 306 Signals and Systems
  - ECE 448/449 Senior Capstone
  - ECE 465/565 Introduction to GPS
  - ECE 475/575 Software GPS Receivers

## THESIS ADVISING/CO-ADVISING

- PhD Theses
  1. *Brian Breitsch*, Characterization and Mitigation of GNSS Carrier Phase Cycle Slips, University of Colorado Boulder, 2021
  2. *Ian Collett*, GNSS Reflectometry for Ocean Surface Remote Sensing, University of Colorado Boulder, expected 2021.
  3. *Yang Wang*, Advanced GNSS Receiver Signal Processing for Remote Sensing Applications, University of Colorado Boulder, expected 2021.
  4. *Yunxiang Liu*, Machine Learning for GNSS-Based Remote Sensing Applications, University of Colorado Boulder, expected 2021.
  5. *Dongyang Xu*, GPS Equatorial Ionospheric Scintillation Signals Simulation, Characterization, and Estimation, Colorado State University, 2019.
  6. *Jun Wang*, Spaced-GNSS Receiver Techniques for Ionospheric Irregularity Drift Velocity and Height Estimation Based on High-Latitude GNSS Scintillation, Colorado State University, 2018
  7. *Yu Jiao*, Low-Latitude Ionospheric Scintillation Signal Simulation, Characterization, and Detection on GPS Signals, Colorado State University, 2017

8. *Bo Han*, GNSS Radio Occultation for Atmospheric Profiling, Visiting PhD student from Nanyang Technological University, Singapore, 2017
  9. *Chen Wang*, Study on GNSS-Based Ionospheric Model, Applications, and Service System, Tongji University, China, joint advising with Prof. Jiexiang Wang, 2014.
  10. *Nazlie Kassabian*, Design of Pilot Channel Tracking Loop Systems for High Sensitivity Balileo Receivers, Visiting PhD student from Politecnico di Torino, 2013.
  11. *Kyle Kauffman*, Radar Based Navigation in Unknown Terrain, Air Force Institute of Technology, joint advising with Professor John Raquet, 2012.
  12. *Senlin Peng*, A Multi-Constellation Multi-Frequency GNSS Software Receiver Design for Ionosphere Scintillation Studies, Visiting PhD student from Virginia Tech, 2012.
  13. *Hu Wang*, Research of Ground and Space Based GPS Ionospheric Inversion Technique and Their Application, Tongji University, China, joint advising with Prof. Jiexiang Wang, 2012.
  14. *Xin Chen*, Novel Multipath Mitigation Algorithms and Architectures in GNSS Receiver, Visiting PhD student from Politecnico di Torino, 2012.
- MS Theses
    1. *Brian Breitsch*, Linear Combinations of GNSS Phase Observables to Improve and Assess TEC Estimation Precision, Colorado State University, 2017.
    2. *Gregory Myer*, Ionospheric Scintillation Effects on GPS Measurements and Algorithms to Improve Positioning Solution Accuracy, Colorado State University, 2017.
    3. *Harrison Bourne*, An Algorithm for Accurate Ionospheric Total Electron Content and Receiver Bias Estimation Using GPS Measurements, Colorado State University, 2016.
    4. *Mark Carroll*, Advanced GPS Receiver Algorithms for Assured Navigation During Ionospheric Scintillation, Miami University, 2014.
    5. *Hang Yin*, An Adaptive Multi-Frequency GPS Tracking Algorithm, GPS CNAV Message Decoding, and Performance Analysis, Miami University, 2014.
    6. *Dongyang Xu*, Beidou and GPS Dual Constellation Vector Tracking During Ionospheric Scintillation At Equatorial Region, Miami University, 2014.
    7. *Ruihui Di*, A USRP-Based Flexible GNSS Signal Recording and Playback System: Performance Evaluation and Study, Miami University, 2013.
    8. *Brian Jameson*, A Novel Multi-Functional Software-Defined Radar: theory and Experiment, Miami University, Co-advised with Prof. Dmitriy Garmatyuk, 2013.
    9. *Yu Jiao*, High Latitude Ionospheric Scintillation Characterization, Miami University, 2013.
    10. *Jun Wang*, Spectral Characterization of Ionosphere Scintillation: Algorithms and Applications, Miami University, 2013.
    11. *Fei Niu*, Performances of GPS Signal Observables Detrending Methods for Ionospheric Scintillation Studies, Miami University, 2012.
    12. *Xiaolei Mao*, GPS Carrier Signal Parameters Estimation Under Ionosphere Scintillation, Miami University, 2011.
    13. *Praveen Vikram*, Event Driven GPS Data Collection System for Studying Ionospheric Scintillation, Miami University, 2011.
    14. *Jason Smith*, A Sensor Fault Detection Simulation Tool, Miami University, 2007.
  - Undergraduate Honors Theses
    1. *Brenna Royersmith*, Time Lag Between 2020 Geomagnetic Storms and Ionospheric Scintillation Detection, University of Colorado Boulder, 2021.

#### POSTDOCS

- Brian Breitch, 2021-Present.
- Lei Liu, 2020-Present.



- Carolyn Roesler, 2019-Present.
- Kirsten Strandjord (2020-2021). Assistant Professor, University of Minnesota.
- Pai Wang (2018-2021). Associate Professor, Shanghai Jiaotong University.
- Zhe Yang (2018-2020). Assistant Professor, Tongji University.
- Rong Yang (2017-2019). Assistant Professor, Shanghai Jiaotong University.
- Jun Wang (2017-2018). Professional Res. Associate, CIRES, University of Colorado boulder.
- Yanhong Kou (2009-2010), Associate Professor, Beihang University.

#### VISITING SCHOLARS

- Charles Rino (2015-2020). Rino Consulting, CA.
- Jieqing Yu (2019-2020). Associate Professor, China University of Mining & Technology, China.
- Byungwoon Park (2018-2020). Associate Professor, Sejong University, South Korea
- Hyeeyeon Chang (2019-2020). PhD student, KAIST, South Korea.
- Xiaoli Liu (2013-14). Associate Professor, Wuhan University, China.
- Hong Wu (2009-2010). Professor, Nankai University, China

#### SELECTED FUNDED RESEARCH PROJECTS

- Air Force Office for Scientific Research (AFOSR):
  1. Co-PI: DURIP – Deep learning laboratory system for space weather forecasting improvement. *\$430K, 2021-22.*
  2. PI: DURIP – Distributed small multi-GNSS arrays for ionospheric and space weather research. *\$430K, 2019-20.*
  3. PI: DURIP - Acquisition of a multi-constellation GNSS data collection array for high latitude ionospheric and space weather research. *\$146K. 2016-17.*
  4. PI: High latitude ionospheric scintillation studies using multi-constellation multi-band software GNSS receivers. *\$396K. 2014-17.*
  5. PI: Developing satellite signal parameter estimation algorithms for high-accuracy applications. *\$650K. 2010-13.*
  6. Co-PI: Precise GPS signal tracking in interference and multipath environment using a multi-channel software receiver. *\$288K. 2008-10.*
  7. PI: Three-frequency based high precision GPS receiver for navigation applications. *\$285K. 2007-10.*
  8. PI: DURIP - A multi-channel dual frequency radio frequency front end for anti-jamming software GPS receiver research. *\$223K. 2007-8.*
  9. PI: Integrated reconfigurable aperture, digital beam forming, and software GPS receiver for UAV navigation. *\$263K. 2004-7.*
  10. PI: Developing signal processing algorithms for weak GPS signal acquisition in urban environment. *\$50K. 2003-4.*
- Air Force Research Laboratory (AFRL):
  11. Co-PI: On-Demand PNT, *\$3.3M. 2020-23.*
  12. PI: Assured PNT through all modalities, *\$1M. 2019-22.*
  13. PI: Investigation of ionospheric effects on new satellite navigation signals. *\$450K. 2019-22.*
  14. PI: Capturing and characterization of the effects of plasma turbulence. *\$66K. 2018-19.*
  15. PI: Advanced novel spectrum warfare environment research. *\$1.521M. 2015-19.*
  16. Co-PI: Software-defined multi-functional LPI/LPD adaptive radar for network-centric applications. *\$255K. 2015-18.*
  17. PI: Collaborative research and development program on navigation and time-keeping with AFRL/RYRN. *\$890K. 2008-15.*
  18. Co-PI: Adaptive radar imaging with knowledge-based SAR. *\$58K. 2012-13.*

- 19. PI: LADAR EO GPS/INS Atomic Clock Navigation Demonstration and Worldwide Accurate Sensor Positioning System technical support. *\$120K. 2007-8.*
- 20. PI: An integrated spatial digital beam forming and adaptive periodogram technique for interference and jamming cancellation. *\$15K. 2006.*
- 21. PI: Integrated navigation reference systems for micro-UAV information applications. *\$65K. 2005-6.*
- 22. PI: Algorithm development for GPS interference cancellation. *\$10K. 2002.*
- Air Force Asian Office of Aerospace Research and Development (AOARD):
  - 23. Co-PI: Determination of precise satellite orbital position using multi-band GNSS signals. *\$100K. 2015-17.*
- Army:
  - 24. PI: Networked PNT solution (PNT-Net) for GPS-denied navigation, Phase I, *\$40K* subcontract from QuNav, 2020.
- DARPA:
  - 25. Co-PI: HEARTBEAT – Heliosphere to Earth Atmosphere Rendering Through Building Excellent Artificial-intelligence Training. *\$853,413. 2019-21.*
- Dayton Area Graduate Studies Institute:
  - 26. PI: Multi-domain analysis of GNSS signals. *\$43.5K. 2013-14.*
  - 27. PI: Space weather effects on GNSS. *\$43.5K. 2013-14.*
  - 28. Co-PI: Physics-based modeling of sensor environment. *\$43.5K. 2013-14.*
  - 29. PI: Advanced GPS receiver algorithms for assured navigation. *\$80K. 2011-13.*
  - 30. Co-PI: Cognitive radar for autonomous systems. *\$95K. 2011-13.*
  - 31. PI: High accuracy GPS receiver algorithms for navigation. *\$73K. 2008-10.*
  - 32. PI: Multi-channel RF receiver/exciter systems. *\$59K. 2006-7.*
  - 33. PI: Intelligent sensing and control for autonomous vehicles. *\$43K. 2005-6.*
- DHS:
  - 34. PI: Networked GPS spoofing detection for power systems. Subcontract from University of Illinois Urbana-Champaign. *\$40K. 2017-18.*
- Department of Education
  - 35. Co-PI: Graduate Assistantships in Areas of National Need (GAANN) Critical Aerospace Technologies. *\$1.189M* total, *\$99K* per Co-PI. *2019-20.*
- JPL
  - 36. CU PI: A new phase in GNSS-R: using coherent phase measurements to estimate surface parameters. *\$52K. 2019-20.*
- NASA:
  - 37. PI: Spire GNSS radio occultation measurement analysis. *\$252K, 2021-2022.*
  - 38. PI: Inland water mask and surface gradient mapping based on coherent carrier phase tracking of CYGNSS raw IF data. *\$570K, 2021-23.*
  - 39. Co-PI: Ionospheric gravity wave decoupling from Tsunamis and applications. Subaward from JPL. *\$100K, 2021-23.*
  - 40. PI: Spire CubeSat GNSS-R Measurements for Physical Oceanography Research: A Comprehensive Analysis. *\$140K, 2020-21.*
  - 41. Co-PI: Phase-delay altimetry from reflected GNSS signals for resolving mesoscale ocean circulation features. *\$623K, 2019-22.*
  - 42. PI: Multi-GNSS radio occultation algorithms development for ionosphere irregularity studies with augmentation from ground-based GNSS networks. *\$800K. 2015-20.*

- NOAA:
  - 37. PI: Low elevation multi-GNSS signal processing for remote sensing. \$532K. 2021-22.
- NSF:
  - 38. PI: MRI - Acquisition of multi-constellation GNSS data collection arrays for low latitude ionospheric effects studies. \$253K. 2014-17.
  - 39. Co-PI: A study on the circulation and structure of metallic ions in the mid-latitude ionosphere. \$342K. 2007-12.
  - 40. Co-PI: Dual-beam incoherent scatter radar study of the mesosphere. \$210K. 2003-6.
- Office of Naval Research (ONR):
  - 41. Co-PI: STTR – Novel Nanosat Payloads for Naval Weather Needs. Subcontract from ASTRO. Phase I, \$45K. 2017-18. Phase II, \$365K, 2019-21.
- Private Industries
  - 42. PI: GNSS Skydel software and simulation tool, in-kind donation, Orolia, \$293K. 2020.
  - 43. PI: GPS Signal monitoring via machine learning, Lockheed Martin, \$100K. 2019-20.
  - 44. PI: Septentrio, Corporate Gift Fund, \$13K. 2020.
  - 45. PI: Consortium of Ohio Universities on Navigation and Timekeeping (COUNT) industrial affiliates. \$248K. 2007-Present.
  - 46. PI: Honeywell, Ionosphere error research for Ground-Based Augmentation Systems (GBAS). Corporate Gift Fund, \$35K. 2016-17.
  - 47. PI: Equipment donations from Freewave Technologies, John Deere/NavCom, Novetal, NPC, Snapper, Symmetricom (now Microsemi), Topcon, and Trimble Navigation. ~\$400K. 2004 - Present.

#### SELECTED invited PRESENTATIONS:

1. NOAA: Low elevation multi-GNSS signal processing for remote sensing applications, June 2021.
2. JPL: A leap of phase – recent progress in high precision GNSS-R development and applications, May 2021.
3. Chinese Satellite Navigation Conference: GNSS as signals-of-opportunity for remote sensing of ionosphere, troposphere, and Earth surface, May 2021.
4. Space Weather Workshop: Ionosphere impact on GNSS, Jan. 2021.
5. Institute of Navigation Webinar: Automatic detection of ionospheric scintillation-like GNSS satellite oscillator anomaly using a machine-learning algorithm, Dec. 2020.
6. IEEE AES Distinguished Lecture: GPS As Signals-of-Opportunity for Ionosphere, Atmosphere, Ocean Surface, and Land Cover Remote Sensing, Virtual Lecture, Dec. 2020.
7. TREASURE Conference: GNSS Carrier Cycle Slips: Causes, Detection and Mitigation, Virtual, Oct. 2020.
8. European Navigation Conference, Invited Presentation: Expected and unexpected findings in mining massive GNSS data for ionospheric effects, Virtual, Nov. 2020.
9. IEEE International Geoscience and Remote Sensing Symposium (IGARSS): Coherent GNSS Reflection Signal Processing, Virtual, October 2020.
10. Zonta District 12, Amelia Earhart Event: Navigating Beyond Borders with GPS, Feb. 2020.
11. IEEE AESS Distinguished Lecture: Satellite Navigation and Sensing, Singapore, January 2020.
12. International Navigation Conference, Keynote presentation: Satellite Navigation and Sensing – A Match Made in Heaven, Edinburgh, UK, 2019.
13. AFOSR: Satellite Navigation and Sensing – A Match Made in Heaven, Washington DC, November 2019.
14. NASA Earth Surface and Interior Workshop Lightning Talk: Multi-GNSS for Remote Sensing Applications, San Diego, CA, November 2019.

15. Stanford PNT Symposium: Synergy between Satellite Navigation and Remote Sensing, Palo Alto, CA, October 2019.
16. NASA Living With A Star Institute: Ionospheric Effects, Impacts, and Mitigation, Jackson, WY, October 2019.
17. Tsinghua University: "Position, Navigation, and Timing Technologies in the 21<sup>st</sup> Century: Update on the New PNT Books," Beijing, China, May 2019.
18. Workshop on Ionospheric Forecasting for GNSS Operations in Developing Countries - Findings and Challenges: GNSS for ionosphere and scintillation monitoring, Trieste, Italy, May 2019.
19. University of Michigan: Satellite Navigation and Sensing – A Match Made in Heaven, Ann Arbor, MI, March 2019.
20. Nanyang Technological University: Advanced GNSS Receiver Technologies for Radio Occultation Signals Propagating through Ionosphere and Troposphere Structure, Singapore, January 2019.
21. Joint GEM-CEDAR Workshop: GNSS Data Processing Techniques for Ionosphere Monitoring. Santa Fe, NM, June 2018.
22. CEDAR Workshop: What Are the Goals of Predicting Ionospheric Disturbances from A GPS Perspective? Santa Fe, NM, June 2018.
23. URSI Atlantic Radio Science Meeting: Scintillation Monitoring and Analysis Using Multi-Frequency GNSS Measurements, Gran Canarias, May 2018.
24. Chinese Satellite Navigation Conference, CSNC-ION Panel: Satellite Navigation and Sensing – A Match Made in Heaven, Harbin, China, May 2018.
25. Politecnico di Torino, Natural and Artificial Threats to GNSS Workshop, Keynote Presentation: Satellite Navigation and Sensing – A Match Made in Heaven, Torino, Italy, May 2018.
26. Future Engineering and Global Women's Symposium: A Better Future Created by Engineering – Ethical Implications of Scientific and Engineering Advances, Changsha, China, April 2018.
27. University of Arizona: Satellite Navigation and Sensing – A Match Made in Heaven, Tucson, AZ, February 2018.
28. URSI National Radio Science Meeting, Plenary Presentation: Radio Navigation Systems – New Challenges and Opportunities, Boulder, CO, January 2018.
29. International Technical Symposium on Navigation and Timing, keynote presentation: Satellite Navigation and Ionosphere Monitoring – Turning a Threat into Signals-of-Opportunity, Toulouse, France, November 2017.
30. URSI General Assembly: Advances in Ionospheric Remote Sensing Using New GNSS Signals. Montreal, Canada, August 2017.
31. Stanford University: Satellite-based Navigation and Sensing – A Match Made in Heaven. Stanford, CA, March 2017.
32. NOAA: GNSS for Space Weather Monitoring. Boulder, CO, Feb. 2017.
33. Science Highlight Presentation at NSF Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Workshop: GNSS for Ionosphere Remote Sensing. Santa Fe, NM, June 2016.
34. Stanford University: GNSS for Remote Sensing Applications. Palo Alto, CA, May 2016.
35. AFRL, GNSS Remote Sensing, Kirkland AFB, NM, May 2016.
36. AFRL, Ionospheric Correction for GPS, Kirkland AFB, NM, May 2016.
37. AFRL, Novel Satellite Navigation Signals Design, Albuquerque, NM, May 2016.
38. HAARP Workshop: Ionosphere Heating Effects on Space-Based System. Albuquerque, NM. May 2016.
39. RF Ionosphere Interaction Workshop: Capturing Artificial Heating Effects on GPS Signals and Their Potential Applications. Albuquerque, NM. May 2016.
40. University of Colorado Boulder, Aerospace Engineering Science Department: GNSS for Remote Sensing. Boulder, CO. April 2016.
41. American Geophysical Union (AGU) Meeting: Multi-GNSS for Space Weather Monitoring and Forecasting. San Francisco, CA. December 2015.

42. ION Southern California Section: Multi-GNSS for Distributed Atmospheric Remote Sensing. Los Angeles, CA. November 2015.
43. International Symposium on Equatorial Aeronomy: Longitudinal Dependence of Equatorial Ionospheric Effects Based on an Event-Driven Multi-GNSS Data Collection System. Bahir Dar, Ethiopia. October 2015.
44. CEDAR Workshop: Comparative Characteristics of Equatorial Scintillation Based on Measurements from Jicamarca, Hong Kong, Singapore, Alaska, and Ascension Island. Seattle, WA. June 2015.
45. UNAVCO: Multi-GNSS for Ionospheric Monitoring. Boulder, CO. June 2015.
46. Ionospheric Effects Symposium: High-latitude and Equatorial Ionospheric Scintillation Based on an Event-Driven Multi-GNSS Data Collection System. Alexandria, VA. May 2015.
47. Colorado State University, College of Engineering: Global Navigation Satellite Signals for Space Weather Monitoring. Fort Collins, CO, May 2015.
48. Singapore DSO: Software Defined GNSS Receivers for Atmospheric Remote Sensing. Singapore, January 2015.
49. Jet Propulsion Laboratory: Challenges and Opportunities in Using GNSS for Ionosphere Monitoring. Pasadena, CA, September 2014.
50. The International Union of Radio Science (URSI) General Assembly and Scientific Symposium (GASS): Multi-constellation GNSS observations of equatorial ionospheric scintillation. Beijing, China, August 2014.
51. NAECOM Keynote Presentation: Sensing and Navigation Using Global Navigation Satellite Systems Signals. Dayton, OH, July 2014.
52. The 20<sup>th</sup> Annual RF Ionospheric Interactions Workshop: GNSS - A Diagnostics Tool for Ionosphere Modification Effects. Arecibo Observatory, Puerto Rico, April 2014.
53. Arecibo Observatory Seminar: Challenges and Opportunities of GNSS in Ionosphere Measurements. Arecibo Observatory, Puerto Rico, April 2014.
54. White House Office for Science and Technology Auroral Workshop: Research and Education on Global Navigation Satellite Signals (GNSS) using HAARP. Washington DC, January 2014.
55. The International Union of Radio Science (URSI) National Radio Science Meeting: Multi-constellation Multi-frequency GNSS Scintillation. Boulder, CO, January 2014.
56. Stanford University PNT Symposium: International Monitoring of Ionosphere. Palo Alto, CA, November 2013.
57. National Academy of Science: Overview of Basic Issues Related to Ionospheric Modification: GNSS Scintillation. Washington DC, May 2013.
58. NOAA: Satellite Navigation Signals for Ionospheric Remote Sensing Applications. Washington DC, May 2013.
59. Plenary Presentation at the Chinese Satellite Navigation Conference: Global Navigation Satellite Signals for Space Weather Research. Wuhan, China, May 2013.
60. Colorado State University: Global Navigation Satellite Systems and Ionospheric Remote Sensing. Fort Collins, CO, April 2013.
61. The Ohio State University: GNSS for Space Weather Studies. Columbus, OH, Feb. 2013.
62. American Geophysical Union (AGU) Meeting: Characteristics of High Latitude Ionosphere Scintillations. San Francisco, CA, Dec. 2012.
63. Stanford University, GPS Lab: Ionosphere Scintillation - Measurement and Analysis, Palo Alto, CA, Dec. 2012.
64. Jicamarca Radio Observatory: Ionosphere Effects on GNSS, Peru, Nov. 2012.
65. Illinois Institute of Technology: Ionosphere Scintillation of GNSS Signals. Chicago, IL, Oct. 2012.
66. Polar Aeronomy and Radio Science Workshop: GPS research at HAARP. HAARP, AK, Aug. 2012.
67. AFRL/RYP: GPS Multipath - A Nuisance or Signals-Of-Opportunity? Dayton, OH, July 2012.

68. Coupling, Energetics, and Dynamics of Atmospheric Regions Workshop: Time-Frequency Analysis of GPS Scintillations at HAARP. Santa Fe, NM, June, 2012.
69. New GNSS Algorithms and Techniques for Earth Observations Workshop: How GNSS Signal Processing Alters Signal Parameters: A Cautionary Tale in Using GNSS for Remote Sensing Applications. Hong Kong, May 2012.
70. Ionosphere Interactions Workshop: Capturing GNSS Scintillations at HAARP. Santa Fe, NM, April 2012.
71. Nanyang Technological University: GNSS Ionospheric Scintillation. Singapore, March 2012.
72. Hong Kong Polytechnic University: GNSS Research. Hong Kong, January 2012.
73. ION North Star Section: Ionosphere Effects and GNSS and RF Navigation Research. Nov. 2011.
74. CEDAR Workshop: Multiband GNSS Scintillation. Santa Fe, NM, June 2011.
75. AFOSR Program Review: Ionosphere Scintillation Effects on GNSS Receivers. Eglin AFB, June 2011.
76. Chinese Satellite Navigation Conference: GNSS Receivers for Ionosphere Scintillation Studies. Shanghai, China, May 2011.
77. Miami University Farmer Business School: Chinese Science and Technology - History, Recent Development, and Future Outlook. Oxford, OH, Feb. 2011.
78. AFOSR Singapore PNT Workshop: Ionosphere Effects. Honolulu, Hawaii, Dec. 2010.
79. Washington University, Electrical and Systems Engineering Department: A GPS Multipath Estimation and Mitigation Technique for High Accuracy Applications. St. Louis, MO, Oct. 2010.
80. AFRL, Next Generation Radar Workshop: Overview of Miami University Current Radar and Navigation Research Efforts. Dayton, OH, Aug. 2010.
81. CEDAR Workshop: GPS Receivers Measurements of L-Band Ionosphere Scintillations at HAARP, Alaska. Boulder, CO, June 2010.
82. AFOSR Program Review: GPS Multipath Detection, Estimation, and Mitigation Using Multi-Channel Software Receivers. Waltham, MA, June 2010.
83. International Antarctic Science Workshop: Arctic GPS. Albany, NY, May 2010.
84. Virginia Tech: Ionosphere Effect on GPS Measurements and GPS Receiver Algorithms for High Accuracy Applications. Blacksburg, VA, Dec. 2009.
85. Miami University Sigma Xi Researcher of the Year Presentation: The Global Positioning System - Past, Present, and Future. Oxford, OH, Sep. 2009.
86. Johns Hopkins University Applied Physics Research Laboratory: Higher Order Ionosphere Error in GPS Measurements. Laurel, MD, Aug. 2009.
87. University of Calgary: GPS Self-Interference and Mitigation. Calgary, Canada, Jun. 2009.
88. Istituto Superiore Mario Boella: Recent Position, Location, and Navigation Research Activities at Miami University. Torino, Italy, Apr. 2009.
89. Miami University SEAS 50th Anniversary: Position, Location, and Navigation – Anywhere, Anytime. Oxford, OH, Apr. 2009.
90. Stanford University, GPS Lab: Navigation Research at Miami. Palo Alto, CA, May 2008.
91. NAVAIR: Second Order Ionosphere Error Assessment and Low Power Short Delay Multipath Detection. Paxton River, MD, May 2008.
92. ION Dayton Section, Dayton: High Order Ionosphere Error. Dayton, OH, Mar. 2008.
93. IEEE IMS Workshop on Quality of Automotive RF Systems: Evaluation of GPS receivers. San Francisco, CA, Jun. 2006.
94. Department of Mathematics, Miami University: Some Applied Mathematical Problems in Navigation. Oxford, OH, Apr. 2006.
95. Pi Mu Epsilon National Mathematics Society, Miami Chapter: Integrating Digital Beam Forming and Software Receivers for UAV Application. Oxford, OH, Sept. 2005.
96. Nanjing University: Software GPS Receiver. Nanjing, China, June 2005.
97. IEEE IMS Workshop on Software Defined Radio: Integrating Beam Forming and A Software GPS Receiver. Long Beach, CA, Jun. 2005.

98. Miami University Research Advisory Council: Software-Based Global Positioning Systems Receiver and Applications. Oxford, OH, Apr. 2005.
99. Illinois Institute of Technology, ECE Distinguished Speaker Seminar Series: Software GPS Receivers and Applications. Chicago, IL, Dec. 2004.
100. IEEE Cincinnati Chapter: The Miami Red Blade - An Autonomous Lawn Mower. Cincinnati, OH, Oct. 2004.
101. Embry Riddle Aeronautics University: Software GPS Receiver. Daytona Beach, FL., Feb. 2003.
102. Embry Riddle Aeronautics University: Modeling and Measurements of the Upper Atmosphere Electron Density Irregularities. Daytona Beach, FL., Feb. 2003.

PUBLICATONS (Students, post-docs, and research staff names are italicized)

- J1. *Wang, Y., Y. Morton*, "Coherent GNSS reflection signal processing for high-precision and high-resolution spaceborne applications," *IEEE Trans. Geosci. Remote Sensing*, doi:10.1109/TGRS.2020.2993804, 2021.
- J2. *Breitsch, B., Y. Morton, C. Rino, D. Xu*, "GNSS carrier phase transitions due to diffractive ionosphere scintillation: simulation and characterization," *IEEE Trans. Aero. Elec. Sys.*, DOI:10.1109/TAES.2020.2979025, 2020.
- J3. *Chen, X., Y. Morton, W. Yu, T-K Truong*, "GPS L1CA/BDS B1I multipath channel measurements and modeling for dynamic land vehicles in Shanghai dense urban area," *IEEE Trans. Vehicular Tech.*, 69(12):14247-14263, doi:10.1109/TVT.2020.3038646, 2020.
- J4. *Collett, I., Y. Morton, Y. Wang, B. Breitsch*, "Characterization and mitigation of interference between GNSS radio occultation and reflectometry signals for low altitude occultations," *Navigation, J. Institute of Navigation*, <https://doi.org/10.1002/navi.375>, 2020.
- J5. *Liu, Y., Y. Morton*, "Automatic detection of ionospheric scintillation-like GNSS satellite oscillator anomaly using a machine learning algorithm," *Navigation, J. Institute of Navigation*, <http://doi.org/10.1002/navi.385>, 2020.
- J6. *Rino, C., B. Breitsch, Y. Morton, D. Xu, C. Carrano*, "GNSS signal phase, TEC, and phase scintillation," *Navigation, J. Institute of Navigation*, <http://doi.org/10.1002/navi.396>, 2020.
- J7. *Wang, P., Y. Morton*, "Performance comparison of time-of-arrival estimation techniques for LTE signals in realistic multipath propagation channels," *Navigation, J. of Institute of Navigation*, 67:691-712, <http://doi.org/10.1002/navi.395>, 2020.
- J8. *Wang P., Y. Morton*, "Multipath estimating delay lock loop for LTE signal TOA estimation in indoor and urban environments," *IEEE Trans. Wireless Comm.*, 19(8), 5518-5530, doi: [10.1109/TWC.2020.2994037](https://doi.org/10.1109/TWC.2020.2994037), 2020.
- J9. *Wang, P., Y. Morton*, "Efficient weighted centroid technique for crowdsourcing GNSS RFI localization using differential RSS," *IEEE Trans. Aero. Elec. Sys.*, 56(3):2471-2477, doi:10.1109/TAES.2019.2917577, 2020.
- J10. *Wang, Y., B. Breitsch, Y. Morton*, "A state-based method to simultaneously reduce cycle slips and noise in coherent GNSS-R phase measurements from open-loop tracking," *IEEE Trans. Geosci. Remote Sensing*, doi:10.1109/TGRS.2020.3036031, 2020.
- J11. *Wang, Y., R. Yang, Y. Morton*, "Kalman filter-based robust closed-loop carrier tracking of airborne GNSS radio-occultation signals," *IEEE Trans. Aero. Elec. Sys.*, doi:10.1109/TAES.2020.2972248, 2020.
- J12. *Xu, D., Y. Morton, C. Rino, C. Carrano, Y. Jiao*, "A two-parameter multifrequency GPS signal simulator for strong equatorial ionospheric scintillation: modeling and parameter characterization," *Navigation, J. Institute of Navigation*, 67:181-195, <http://doi.org/10.1002/navi.350>, 2020.
- J13. *Yang, Z., Y. Morton*, "Low-latitude ionospheric scintillations of multi-constellation GNSS signals in relation to magnetic field orientation," *J. of Geodesy*, 94(6):1-15, <https://doi.org/10.1007/s00190-020-01391-7>, 2020.

- J14. Yang, Z., Y. Morton, I. Zakharenkova, I. Cherniak, S. Song, W. Li, “Global view of ionospheric disturbances impacts on kinematic GPS positioning solutions during the 2015 St. Patrick’s Day storm,” *J. Geophys. Res., Space Sci.*, DOI: 10.1029/2019JA027681, 2020.
- J15. Han, B., Y. Morton, E. Gunawan, D. Xu, “Planetary boundary layer height detection using mountain-based radio occultation signal amplitude,” *IEEE Trans. Geosci. Remote Sensing*, 57(7), 4332-4348, DOI: 10.1109/TGRS.2018.2890676, 2019.
- J16. Liu, Y., I. Collett, Y. Morton, “Application of neural network to GNSS-R wind speed retrieval,” *IEEE Trans. Geosci. Remote Sensing*, 57(12), 9756-9766, DOI:10.1109/TGRS.2019.2929002, 2019.
- J17. Liu, Z., Z. Yang, D. Xu, Y. J. Morton “On inconsistent ROTI derived from multi-constellation GNSS measurements of globally distributed GNSS receivers for characterizing ionospheric irregularities,” *Radio Sci.*, 10.1029/2018RS006596, 2019.
- J18. Rino, C., Y. Morton, B. Breitsch, C. Carrano, “Stochastic TEC structure characterization,” *J. Geophys. Res., Space Phys.*, <https://doi.org/10.1029/2019JA026958>, 2019.
- J19. Wang, J., Y. Morton, “A hybrid correlation model for the space-receiver technique,” *Radio Sci.*, 54(3), 281-297, <https://doi.org/10.1029/2018RS006662>, 2019.
- J20. Yang, R., D. Xu, Y. Morton, “Generalized multi-frequency GPS carrier tracking architecture: design and performance analysis,” *IEEE Trans. Aero. Elec. Sys.*, DOI:10.1109/TAES.2019.2948535, 2019.
- J21. Betz, J. W., M. Lu, Y. T. J. Morton, Y. Yang, “Introduction to the special issue on Beidou navigation system,” *Navigation, J. Institute of Navigation*, 66(1): 3-5, <https://doi.org/10.1002/navi.293>, 2019.
- J22. Jiao, Y., D. Xu, C. Rino, Y. Morton, C. Carrano, “Multi-frequency GPS signal strong equatorial ionospheric scintillation simulator: algorithm, performance, and characterization,” *IEEE Trans. Aero. Elec. Sys.*, 65(2), 263-274, DOI:10.1109/TAES.2018.2805232, 2018.
- J23. Jiao, Y., C. Rino, Y. Morton, “Ionospheric scintillation simulation on equatorial GPS signals for dynamic platforms,” *Navigation, J. Institute of Navigation*, 65(2), 263-274, doi:10.1002/navi.231, 2018.
- J24. Mahmoudian, R., W. Scales, S. Taylor, Y. Morton, P. A. Bernhardt, S. J. Briczinski, S. Ghader, “Artificial ionospheric GPS phase scintillation excited during high-power radiowave modulation of the ionosphere,” *Radio Sci.*, 53, 775-789, DOI:10.1029/2017RS006517, 2018.
- J25. Rino, C., B. Breitsch, Y. Morton, Y. Jiao, D. Xu, C. Carrano, “A compact multi-frequency GNSS scintillation model,” *Navigation, J. Institute of Navigation*, 65(3), 563-569, DOI: 10.1002/navi.263, 2018.
- J26. Wang, J., Y. Morton, “Ionospheric irregularity drift velocity estimation using multi-GNSS spaced-receiver array during high latitude phase scintillation,” *Radio Sci.*, DOI: 10.1002/2017RS006470, 2018.
- J27. Xu, D., Y. Morton, “GPS navigation data bit decoding error during strong equatorial scintillation,” *GPS Solutions*, 22:110, <https://doi.org/10.1007/s10291-018-0775-1>, 2018.
- J28. Jiao, Y., J. Hall, Y. Morton, “Performance evaluation of an automatic GPS ionospheric phase scintillation detector using a machine-learning algorithm,” *Navigation, J. Institute of Navigation*, 64(3):391-402, DOI:10.1002/navi.188, Summer 2017.
- J29. Jiao, Y., J. Hall, Y. Morton, “Automatic equatorial GPS amplitude scintillation detection using a machine learning algorithm,” *IEEE Trans. Aero. Elec. Sys.*, 53(1): 405-418, DOI:10.1109/TAES.2017.2650758, Online ISSN 1557-9603, 2017.
- J30. Lee, J., Y. Morton, J. Lee, H-S. Moon, J. Seo, “Monitoring and mitigation of ionospheric anomalies for GNSS-based safety critical systems: A review of up-to-date signal processing techniques,” Special issue on Advances in Signal Processing for Global Navigation Satellite Systems, *IEEE Signal Proc. Magazine*, 34(5):96-110, DOI: 10.1109/MSP.2017.2716406, 2017.



- J31. Xu D., Y. Morton, "Semi-open loop estimation of GPS carrier phase variations during deep amplitude fading of equatorial ionospheric scintillation," *IEEE Trans. Aero. Elec. Sys.*, DOI: 10.1109/TAES.2017.2764778, PP(99), 2017.
- J32. Wang, J., Y. Morton, "A comparative study of ionospheric irregularity drift velocity derived from a GNSS receiver array and PFISR measurements during high latitude ionospheric scintillation," *J. Geophys. Res.*, 122(6): 6858-6881, DOI:10.1002/2017JA024015, 2017.
- J33. Yang, R., K. Ling, E. Poh, Y. Morton, "Generalized GNSS signal carrier tracking in challenging environments: part I – modeling and analysis," *IEEE Trans. Aero. Elec. Sys.*, 53(4):1782-1797, DOI:10.1109/TAES.2017.2673998, 2017.
- J34. Yang, R., Y. Morton, K. Ling, E. Poh, "Generalized GNSS signal carrier tracking in challenging environments: part II - optimization and implementation," *IEEE Trans. Aero. Elec. Sys.*, 53(4):1798-1811, DOI:10.1109/TAES.2017.2674198, 2017.
- J35. Chen, X., Y. Morton, "Iterative subspace alternating projection method for GNSS multipath DOA estimation," *IET Radar, Sonar & Navigation*, DOI: 10.1049/iet-rsn.2015.0508, Online ISSN 1751-8792, 2016.
- J36. Jiao, Y., D. Xu, Y. Morton, C. Rino, "Equatorial scintillation amplitude fading characteristics across the GPS frequency bands," *Navigation, J. Institute of Navigation*, 63(3), 267-281, 2016. (Burka Award Winner)
- J37. Jiao, Y., Y. Morton, "Comparison of the effects of high-latitude and equatorial ionospheric scintillation on GPS signals during the maximum of solar cycle 24," *Radio Sci.*, 50(9), 886-903, DOI:10.1002/2015RS005719, 2015.
- J38. Najmi, A., G. Milikh, Y. M. Yampolski, A. V. Koloskov, A. A. Sopin, A. Zalizovski, P. Pernhardt, S. Briczinski, C. Siefring, K. Chiang, Y. Morton, S. Taylor, A. Mahmoudian, W. Bristow, M. Rohoniemi, and K. Kapadopoulos, "Studies of the ionospheric turbulence excited by the fourth gyroharmonic at HAARP," *J. Geophys. Res., Space Sci.*, 120(8), 6646-6660, 2015.
- J39. Prikryl, P., R. Ghoddousi-Fard, E. G. Thomas, J. M. Ruohoniemi, S. G. Shepherd, P. T. Jayachandran, D. W. Danskin, E. Spanswick, Y. Zhang, Y. Jiao, Y. T. Morton, "GPS phase scintillation at high latitudes during geomagnetic storms of 7-17 March 2012 – Part 1: The North American sector," *Ann. Geophys.*, 33(6), 637-656, 2015.
- J40. Prikryl, P., R. Ghoddousi-Fard, L. Spogli, C. N. Mitchell, G. Li, B. Ning, P. J. Cilliers, V. Sreeja, M. Aquino, M. Terkildsen, P. T. Jayachandran, Y. Jiao, Y. T. Morton, J. M. Ruohoniemi, E. G. Thomas, Y. Zhang, A. T. Weatherwax, L. Alfonsi, G. De Franceschi, V. Romano, "GPS phase scintillation at high latitudes during geomagnetic storms of 7-17 March 2012 – Part 2: Interhemispheric comparison," *Ann. Geophys.*, doi: 10.1002/2015JA021341, 2015.
- J41. Wang, J., Y. Morton, "High latitude ionospheric irregularity drift velocity estimation using spaced GPS receiver carrier phase time-frequency analysis," *IEEE Trans. Geosci. Remote Sensing*, 53(11), 6099-6113, doi:10.1109/TGRS.2015.2432014, 2015.
- J42. Yin, H., Y. Morton, M. Carroll, E. Vinande, "Performance analysis of L2 and L5 CNAV broadcast ephemeris for orbit calculation," *Navigation, J. Institute of Navigation*, 62(2), 121-140, Summer 2015.
- J43. Garmatyuk, D., B. Jameson, R. Cole, Y. Morton, S. Mudaliar, "Target scene frequency diversity exploitation with UWB OFDM radar," *IET Radar, Sonar, Navigation*, 8(9), 1247-1254, 2014.
- J44. Liu, X., M. Liang, Y. Morton, P. Closas, T. Zhang, and Z. Hong, "Performance evaluation of MSK and OFDM modulations for future GNSS signals," *GPS Solutions*, doi 10.1007/s10291-01400368-6, 1-13, 2014.
- J45. Park, J., D. Grejner-Brzezinska, R. von Frese, Y. Morton, "GPS discrimination of traveling ionospheric disturbances from underground nuclear explosions and earthquakes," *Navigation, J. Institute of Navigation*, 61(2), 125-134, 2014.
- J46. Kou, Y., Y. Morton, "Oscillator frequency offset impact on software GPS receivers and correction algorithms," *IEEE Trans. Aero. Elec. Sys.*, 49(4), 2158-2178, 2013.

- J47. Chen, X., Y. Morton, F. Doyis, "A computationally efficient iterative MLE for GPS AOA estimation," *IEEE Trans. Aero. Elec. Sys.*, 49(4), 2707-2716, 2013.
- J48. Chen, X., F. Doyis, S. Peng, Y. Morton, "Comparative studies of GPS multipath mitigation methods performance," *IEEE Trans. Aero. Elec. Sys.*, 49(3), 1555-1568, 2013.
- J49. Jiao, Y., Y. Morton, S. Taylor, W. Pelgrum, "Characterization of high latitude ionospheric scintillation of GPS signals," *Radio Sci.*, 48, doi:10.1002/2013RS005259, 2013.
- J50. Kauffman, K., J. Raquet, Y. Morton, D. Garmatyuk, "Real-time UWB-OFDM radar based navigation in unknown terrain," *IEEE Trans. Aero. Elec. Sys.*, 49(3), 1453-1466, 2013.
- J51. Zhang, L., Y. Morton, "GPS carrier phase spectrum estimation for ionospheric scintillation studies," *NAVIGATION, J. Institute of Navigation*, 60(2), 113-122, Summer 2013.
- J52. Peng, S., Y. Morton, "A USRP2-based reconfigurable multi-constellation multi-frequency GNSS software receiver front end," *GPS Solutions*, DOI: 10.1007/s10291-012-0263-y, 2012.
- J53. Xu, R., Z. Liu, M. Li, Y. Morton, W. Chen, "An analysis of low-latitude ionospheric scintillation and its effects on precise point positioning," *J. Global Positioning Sys.*, 11(1), 22-32, doi:10.5081/jgps.11.1.22, 2012.
- J54. Garmatyuk, D., Y. Morton, X. Mao, "Radar and GPS system inter-operability with UWB-OFDM signals," *IEEE Trans. Aero. Elec. Sys.*, 47(1), 265-274, 2011.
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- C2. Wang, Y. and Y. Morton, "Evaluation of GNSS-R retrieved sea ice surface height using ICESat-2 ice freeboard measurements," *Proc. IGARSS*, 2021.
- C3. Jakowski, N., M. M. Hoque, J. Morton, "Instantaneous GNSS-based indices for estimating spatial structures and dynamics of the ionosphere," *Proc. of COSPAR*, Jan.-Feb. 2021.
- C4. Morton, Y., Y. Liu, Z. Yang, Y. Wang, B. Breitsch, H. Bourne, S. Taylor, "Expected and unexpected findings in mining massive GNSS data for ionospheric effects," *Proc. European Navigation Conference*, Virtual, 2020. (Invited)
- C5. Breitsch, B., Y. Wang, Y. Morton, "Performance of cycle slip filtering algorithm during ionosphere scintillation," *Proc. ION GNSS+*, 3132-3139, Virtual, Sept. 2020.
- C6. Chang, H., J. Lee, Y. Wang, B. Breitsch, Y. Morton, "Preliminary assessment of CICERO radio occultation by comparing with COSMIC I data," *Proc. ION GNSS+*, 3888-3900, Virtual, Sept. 2020.
- C7. Liu, Y., Y. Morton, "Improved Automatic Detection of GPS Satellite Oscillator Anomaly Using a Machine Learning Algorithm," *Proc. ION GNSS+*, 3567-3580, Virtual, Sept. 2020. (Best Presentation)
- C8. Yang, R., X. Zhan, J. Huang, Y. Morton, "GNSS multi-frequency carrier tracking with cycle slip detection and mitigation under strong ionosphere scintillation," *Proc. ION GNSS+*, 2795-2802, Virtual, Sept. 2020.
- C9. Yang, Z., Y. Morton, "Time lags in ionospheric scintillation response to geomagnetic storms: Alaska observations," *Proc. ION GNSS+*, 3494-3501, Virtual, Sept. 2020. (Best presentation)
- C10. Yun J., B. Park, J. Morton, "Detecting ionospheric irregularity based on ROT variation using Android devices cloud system," *Proc. ION GNSS+*, 1850-1872, Virtual, Sept. 2020. (Best presentation)
- C11. Wang, P., Y. Morton, "Carrier phase tracking architecture for positioning in LTE networks under channel fading conditions," *Proc. ION GNSS+*, 2605-2617, Virtual, Sept. 2020.
- C12. Wang, Y., Y. Morton, "Coherent and semi-coherent spaceborne GNSS-R for land surface altimetry applications," *Proc. ION GNSS+*, 3901-3908, Virtual, Sept. 2020. (Best presentation)
- C13. Collett, I., Y. Wang, R. Shah, C. Roesler, Y. Morton, "GPS signal land reflection coherence dependence on water extent and surface topography using CYGNSS measurements," *Proc. IGARSS, Virtual, Oct. 2020*.
- C14. Morton, Y., Y. Wang, R. Yang, "Coherent GNSS reflection signal processing for precision altimetry applications," *Proc. IGARSS, Virtual, Oct. 2020. (invited)*
- C15. Roesler, C., Y. Wang, Y. Morton, R. S. Nerem, "Coherent GPS reflections over ocean surface," *Proc. IGARSS, Virtual, Oct. 2020*.
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- C17. Wang, Y., Y. Liu, Y. Morton, "Detection of coherent GNSS-R measurements using a Support Vector Machine," *IGARSS, Virtual, Oct. 2020*.
- C18. Breitsch, B., Y. Morton, D. Xu, R. Yang, "Triple-Frequency GNSS Cycle Slip Detection Performance in the Presence of Diffractive Ionosphere Scintillation," *Proc. IEEE/ION PLANS meeting*, 263-269, Virtual, 2020.
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