Curriculum Vitae

Tzu-Wei Fang (方慈瑋)

University of Colorado at Boulder/Cooperative Institute for Research in Environmental Sciences
National Oceanic and Atmospheric Administration/Space Weather Prediction Center
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Education

2004	B. S.	Atmospheric Physics	National Central University, Taiwan
2009	Ph. D.	Space Physics	National Central University, Taiwan

Thesis Advisors:

Art Richmond (National Center for Atmospheric Research/High Altitude Observatory)
Jann-Yenq Liu (National Central University/Institute of Space Science)

Research Experience:

May 2014 – Present: Research Associate, Research Scientist II, CIRES University of Colorado at Boulder and NOAA Space Weather Prediction Center, Boulder, CO

Sep 2009 – Apr 2014: Research Associate, Postdoc and Research Scientist I, CIRES University of Colorado at Boulder and NOAA Space Weather Prediction Center, Boulder, CO

Oct 2006 – Aug 2009: Graduate Research Assistant, High Altitude Observatory, National Center for Atmospheric Research, Boulder, CO.

Research Accomplishment:

My PhD thesis was supported by the Newkirk Graduate Fellowship from the High Altitude Observatory at National Center for Atmospheric Research (NCAR) in USA. After receiving my PhD, I joined CIRES at University of Colorado at Boulder (CU) as a research associate. I am familiar with the physical processes of the Earth's ionosphere and thermosphere and have extensive experiences on numerical simulations using state-of-the-art models, including the NCAR TIE-GCM, NOAA Whole Atmosphere Model (WAM), Ionosphere-Plasmsphere-Electrodynamics (IPE) model, and NOAA CTIPe model. My recent research focuses on understanding the impact of waves/tides from the lower atmosphere on the ionosphere and quantifying the contributions of ionosphere variability from the lower atmosphere, solar, and geomagnetic activities. I am the key developer of the coupled WAM-IPE model, which is scheduled to be transitioned into operation in NOAA Space Weather Prediction Center for forecasting the space environment. In addition, I have experiences on analyzing results of the GPS total electron content (TEC) and FORMOSAT-3/COSMIC radio occultation observations. I am currently participating in a CubeSat mission called INSPIRESat, which is led by CU LASP and is

scheduled to be launched in 2019. I have been successful in receiving research grants and have served as PI and Co-I in several NSF and NASA funded research projects.

Teaching and Mentoring Experiences:

Oct 2016 – Present, Mentor of PostDoc – Tiju Joseph Mathew

The project focuses on investigating the unusual equatorial upward drift at dawn period that were observed by radar in India and incoherent radar in Peru. Several numerical experiments are carrying out in order to explain the causal mechanisms.

Apr 2016 – Present, Mentor of Graduate student – YenChieh Lin

The project using numerical models to investigate the physical mechanisms of several different ionospheric phenomena that occur in the nighttime equatorial region.

Feb 2016, Guest Lecture in Graduate Class – Department of Geological Sciences at University of Colorado Boulder

Topic: Time changes in the geomagnetic field -III. Time changes generated by the coupling of Earth's magnetosphere with solar wind

June 2015, co-Mentor of SOARS student – William Evonosky

The project used the TIEGCM-GIP to examine the relationship between accelerations terms in the thermospheric momentum equations and the formation of a vertical shear of neutral winds at low latitudes during the post-sunset period.

June 2010, co-Mentor of summer REU student – Anil Ganti

The project used the TIEGCM-GIP to examine the effects of changes in the nighttime ionization rates on the electron density height structure and the upward E×B drift in the early evening.

Sep 2004 – Sep 2006: Teaching and Research Assistant, Institute of Space Science, National Central University, Taiwan.

Academic Services:

Apr 2017 – Present: Committee member of AGU Space Weather and Nonlinear Waves Award

June 2017: Co-convener of 2017 CEDAR session on Low- and Middle Latitude Ionospheric Electrodynamics

May 2017: Co-convener of 2017 JpGU-AGU session on Mesosphere-Thermosphere-Ionosphere Coupling in the Earth's Atmosphere.

Nov 2016: Panelist, review panel of NASA Heliophyscis program, Washington DC.

Oct 2016: Candidate for session Secretary, Space Physics and Aeronomy, American Geophysical Union

Sep 2014 – Mar 2016: Organizer for seminars in NOAA/SWPC.

Aug 2014: Invited Participant in NSF EarthCube workshop.

June 2010, 2011, 2012, 2014: Convener of Equatorial-PRIMO session in CEDAR workshop.

June 2013: Student Poster Judge in Coupling, Energetics and Dynamics of Atmospheric Regions workshop (CEDAR)

Mar 2012: Poster Judge and co-convener in 13th International Symposium on Equatorial Aeronomy workshop (ISEA-13)

Dec 2011: Poster Judge in American Geophysical Union fall meeting (AGU)

Aug 2009 – Present: Reviewer for NSF and NASA proposals, and for journals including *JGR Space Physics*, *Geophysical Research Letter, Annales Geophysicae*, *Journal of Atmospheric and Solar-Terrestrial Physics*, and *Advance in Space Research*, *Space Weather, Journal of Space Weather and Space Climate*.

Jan 2009: Executive Secretary, review panel of NASA GI Studies with C/NOFS, Washington DC.

Sep 2007 – Aug 2009: Student member of the Center for Integrated Space Weather (CISM).

Jun 2001 – Oct 2002: Weather Anchor, China Television Co., Taipei, Taiwan.

Awards and Honors:

2006 NCAR HAO Newkirk Graduate Fellowship, High Altitude Observatory, National Center for Atmospheric Research, USA. (PhD is sponsored by the fellowship)

2007 Elite Scholarship, National Central University, Taiwan.

2007 Honorable Mention, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) Workshop Student Poster Competition, USA.

2008 Honorable Mention, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) Workshop Student Poster Competition, USA.

2008 Outstanding Student Paper Award in Space Physics and Aeronomy Section, Fall AGU Meeting, San Francisco, USA.

2009 Honorable Mention, Heliophysics Postdoctoral Fellowship Awards, NASA Living with a Star program, USA.

2009 Invited seminar at Physics Department in Utah State University.

2011 Invited talk: Ionospheric model, AGU Chapman Conference on Modeling the Ionosphere/Thermosphere System, Charleston, South Carolina, USA.

2011 Invited seminar at Johns Hopkins University Applied Physics Laboratory

2011 Invited talk: Current Problems and Challenges in Ionospheric Modeling, Asia Oceania Geosciences Society (AOGS), Taipei, Taiwan.

2011 Invited talk: Equatorial-PRIMO (Problems Related to Ionosphere Model and Observation), Asia Oceania Geosciences Society (AOGS), Taipei, Taiwan.

2012 Invited talk: Impact of Planetary Waves on the Ionosphere during January 2009, 13th International Symposium on Equatorial Aeronomy, Paracas, Peru.

2012 Highlight on Young Scientist, Newsletter of Climate and Weather for Sun-Earth System– II (CAWSES- II) Task Group 4.

2013 Invited seminar at Institute of Space Science in National Central University, Taiwan.

2013 Invited seminar at National Center for Atmospheric Research High Altitude Observatory.

2013 Invited talk: Day-to-day and longitudinal variations in the ionosphere driven by lower atmosphere tidal forcing, Japan Geoscience Union Meeting (JpGU), Japan.

2013 Invited talk: Climatology and Morphology of the Early Morning Upward Drift, American Geophysical Union (AGU), San Francisco, USA.

2013 Invited talk: Approaches and Challenges of Simulating Low-latitude Ionosphere, American Geophysical Union (AGU), San Francisco, USA.

2015 Invited talk: Model Simulation of Ionospheric Responses to Sudden Stratospheric Warming Events, IUGG/IAGA, Prague, Czech Republic.

2016 Invited talk: Whole Atmosphere Model Developments and Studies, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, Santa Fe, USA.

2016 Invited talk: Impact of midnight thermosphere dynamics on the equatorial vertical drifts, IAGA/ICMA/SCOSTEP 6th Workshop on Vertical Coupling in the Atmosphere-Ionosphere System, Taipei, Taiwan.

2017 Invited talk: Model Development for the Next Generation Ionosphere and Plasmasphere Forecasting, Japan Geoscience Union Meeting (JpGU), Japan.

2017 Invited talk: Quantifying the Sources of Ionosphere Day-to-day Variability, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, Keystone, CO, USA.

Funded Projects:

Title: CEDAR: The Climatology and Causal Mechanisms of the Early Morning Upward Plasma Drift at Equatorial Latitudes (PI)
Agency: NSF/ Division of Atmospheric and Geospace Sciences/CEDAR
Dates: 1 Nov 13 – 31 Oct 17
Amount: $ 230,102

Title: CEDAR Short-Term Variability of the Upper Atmosphere Across Scales During Stratospheric Sudden Warming Events (Co-I; PI: Hanli Liu)
Agency: NSF/ Division of Atmospheric and Geospace Sciences/CEDAR
Dates: 1 Dec 11 – 30 Nov 16
Amount: $ 118,891

Title: Predictability and Ensemble Modeling of the Space-Atmosphere Interaction Region (Co-I; PI: Tomoko Matsuo)
Agency: NASA Heliophysics (Heliophysics Grand Challenges Research)
Dates: 1 July 14 – 30 Jun 17
Amount: $ 1,182,721.00

Title: CEDAR: Collaborative Research: CEDAR: An Investigation of Midnight Temperature Maximum and Its Impact on the Ionosphere-Thermosphere System (PI)
Agency: NSF/ Division of Atmospheric and Geospace Sciences/CEDAR

Dates: 1 Sep 16 – 31 Aug 19
Amount: $ 225,296

Title: Collaborative Proposal: Investigation of the impact of lower atmosphere waves on ionospheric irregularities (Co-I; PI: Tim Fuller-Rowell)
Agency: NSF/ Division of Atmospheric and Geospace Sciences/CEDAR
Dates: 1 Feb 17 – 31 Jan 18
Amount: $ 10,000

Title: WAMII: A Whole Atmosphere Model for Ionospheric Irregularities (Co-I; PI: Tim Fuller-Rowell)
Agency: Office of Naval Research
Dates: 2 Jan 17 –1 Jan 20
Amount: $ 270,655

Title: Quantifying the variability of equatorial electrodynamics during disturbed geomagnetic conditions using first-principle models (PI)
Agency: NASA/Living with A Star Program
Dates: 1 Oct 17 – 30 Sep 21
Amount: $ 839,926

Journal Publications:

1. Liu, J. Y., C. H. Lin, Y. I. Chen, Y. C. Lin, T. W. Fang, C. H. Chen, Y. C. Chen, and J. J. Hwang (2006) Solar flare signatures of the ionospheric GPS total electron content, *J. Geophys. Res., 111*, A05308, doi:10.1029/2005JA011306. [link]
2. Lin, C. H., W. Wang, M. E. Hagan, C. C. Hsiao, T. J. Immel, M. L. Hsu, J. Y. Liu, L. J. Paxton, T. W. Fang, and C. H. Liu (2007) Plausible effect of atmospheric tides on the equatorial ionosphere observed by the FORMOSAT-3/COSMIC: Three-dimensional electron density structures, *Geophys. Res. Lett*., *34*, L11112, doi:10.1029/2007GL029265. [link]
3. Lin, C. H., J. Y. Liu, T. W. Fang, P. Y. Chang, H. F. Tsai, C. H. Chen, and C. C. Hsiao (2007), Motions of the equatorial anomaly crests imaged by the FORMOSAT-3/COSMIC, *Geophys. Res. Lett*., *34*, L19101, doi:10.1029/2007GL030741. [link]
4. Lin, C. H., J. Y. Liu, C. C. Hsiao, C. H. Liu, C. Z. Cheng, P. Y. Chang, H. F. Tsai, T. W. Fang, C. H. Chen, and M. L. Hsu (2008) Global ionospheric structure imaged by FORMOSAT-3/COSMIC: Early results, Terr. Atmos. Ocean. Sci., *20*(1), 171–179, doi:10.3319/TAO.2008.01.18.01. [link]
5. Fang, T. W., A. D. Richmond, J. Y. Liu, A. Maute, C. H. Lin, C. H. Chen, and B. Harper (2008) Model simulation of the equatorial electrojet in the Peruvian and Philippine sectors, *J. Atmos. Solar Terr. Phys*., *70*(17), 2203–2211. [link]
6. Chen, C. H., J. Y. Liu, K. Yumoto, C. H. Lin, and T. W. Fang (2008) Equatorial ionization anomaly of total electron content and equatorial electrojet in ground-based geomagnetic field strength, *J. Atmos. Solar Terr. Phys.*, *70*(17), 2172–2183, doi:10.1016/j.jastp.2008.09.021. [link]
7. Fang, T. W., A. D. Richmond, J. Y. Liu, and A. Maute (2008) Wind dynamo effects on ground

magnetic perturbation and vertical drifts, *J. Geophys. Res., 113*, A11313, doi:10.1029/2008JA013513. [link]

8. Kil, H., S. J. Oh, L. J. Paxton, and T.-W. Fang (2009) High-resolution vertical **E × B** drift model driven from ROCSAT-1 data, *J. Geophys. Res.*, *14*, A10314, doi:10.1029/2009JA014324. [link]
9. Fang, T.-W., H. Kil, G. Millward, A. D. Richmond, J. Y. Liu, and S. J. Oh, (2009) Causal link of the wave-4 structures in plasma density and vertical plasma drift in the low-latitude ionosphere, *J. Geophys. Res., 114*, A10315, doi:10.1029/2009JA014460. [link]
10. Chang, L. C., S. E. Palo, H.-L. Liu, T.-W. Fang, and C. S. Lin (2010), Response of the thermosphere and ionosphere to an ultra fast Kelvin wave, *J. Geophys. Res., 115*, A00G04, doi:10.1029/2010JA015453. [link]
11. Fuller-Rowell, T., F. Wu, R. Akmaev, T.-W. Fang, and E. Araujo-Pradere (2010) A whole atmosphere model simulation of the impact of a sudden stratospheric warming on thermosphere dynamics and electrodynamics, *J. Geophys. Res.,* 115, A00G08, doi:10.1029/2010JA015524. [link]
12. Fuller-Rowell, T., H. Wang, R. Akmaev, F. Wu, T.-W. Fang, M. Iredell, and A. Richmond (2011), Forecasting the dynamic and electrodynamic response to the January 2009 sudden stratospheric warming, *Geophys. Res. Lett., 38*, L13102, doi:10.1029/2011GL047732. [link]
13. Pedatella, N. M., J. M. Forbes, A. Maute, A. D. Richmond, T.-W. Fang, K. M. Larson, and G. Millward (2011), Longitudinal variations in the *F* region ionosphere and the topside ionosphere-plasmasphere: Observations and model simulations, *J. Geophys. Res., 116*, A12309, doi:10.1029/2011JA016600. [link]
14. Fang, T.-W., and J. M. Forbes (2012), Ionosphere response to recurrent geomagnetic activity in 1974, *J. Geophys. Res.*, *117*, A01318, doi:10.1029/2011JA017017. [link]
15. Fang, T. W., T. Fuller-Rowell, R. Akmaev, F. Wu, H. Wang, and D. Anderson (2012), Longitudinal variation of ionospheric vertical drifts during the 2009 sudden stratospheric warming, *J. Geophys. Res., 117*, A03324. doi:10.1029/2011JA017348. [link]
16. Araujo-Pradere, E. A., T.-W. Fang, D. N. Anderson, M. Fedrizzi, and R. Stoneback (2012), Modeling the daytime, equatorial ionospheric ion densities associated with the observed, four-cell longitude patterns in **E × B** drift velocities, *Radio Sci.*, *47*, RS0L12, doi:10.1029/2011RS004930. [link]
17. Pedatella, N. M., H.-L. Liu, A. D. Richmond, A. Maute, and T.-W. Fang (2012), Simulations of solar and lunar tidal variability in the mesosphere and lower thermosphere during sudden stratosphere warmings and their influence on the low-latitude ionosphere, *J. Geophys. Res*., *117*, A08326, doi:10.1029/2012JA017858. [link]
18. Fang, T.-W., R. Akmaev, T. Fuller-Rowell, F. Wu, N. Maruyama, G. Millward (2013), Longitudinal and day-to-day variability in the ionosphere from lower atmosphere tidal forcing, *Geophys. Res. Lett., 40*(11), 2523–2528, doi:10.1002/grl.50550. [link]
19. Fang, T.-W., D. Anderson, T. J. Fuller-Rowell, R. Akmaev, M. Codrescu, G. Millward, J. Sojka, L. Scherliess, V. Eccles, J. Retterer, J. Huba, G. Joyce, A. D. Richmond, A. Maute, G. Crowley, A.

Ridley, G. Vichare (2013), Comparative studies of theoretical models in the equatorial ionosphere, in *Modeling the Ionosphere-Thermosphere, Geophys. Monogr. Ser*., vol. 201, edited by J. D. Huba, ISBN: 978-0-87590-491-7, 360 pp., AGU, Washington, D.C. [link]

20. Wang, H., R. Akmaev, T.-W. Fang, T. J. Fuller-Rowell, F. Wu, N. Maruyama, M. D. Iredell (2014), First forecast of a sudden stratospheric warming with a coupled whole-atmosphere/ionosphere model IDEA, *J. Geophys. Res*, 119, 2079-2089, doi: 10.1002/2013JA019481. [link]
21. Fang, T.-W, T. Fuller-Rowell., H. Wang, R. Akmaev, F. Wu (2014), Ionospheric response to Sudden stratospheric warming events at low and high solar activity, J. *Geophys. Res. Space Physics, 119,* doi:10.1002/2014JA020142. [link]
22. Anderson, D. and T.-W. Fang, Determining the Longitude Dependence of Vertical E×B Drift Velocities Associated with the 4-cell, Non-migrating Tidal Structure (2014), AGU *Geophys. Monogr. Ser.*, edited by T. J. Fuller-Rowell.
23. Richmond A. D., T.-W. Fang, A. Maute (2015), Electrodynamics of the equatorial evening ionosphere, I. Importance of winds in different regions, *J. Geophys. Res. Space Physics, 120*, doi:10.1002/2014JA020934. [link]
24. Richmond A. D., T.-W. Fang (2015), Electrodynamics of the equatorial evening ionosphere, II. Conductivity influences on convection, current, and electrodynamic energy flow, *J. Geophys. Res. Space Physics, 120*, doi:10.1002/2014JA020935. [link]
25. Fuller-Rowell, T., T.-W. Fang, H. Wang, V. Matthias, P. Hoffman, K. Hocke, and S. Studer (2015), Impact of Migrating Tides on Electrodynamics During the January 2009 Sudden Stratospheric Warming, AGU *Geophys. Monogr. Ser.*, edited by T. J. Fuller-Rowell.
26. Maruyama, N., Y.-Y. Sun, P. G. Richards, J. Middlecoff, T.-W. Fang, T. J. Fuller-Rowell, R. A. Akmaev, J.-Y. Liu, and C. Valladares (2016), A new source of the midlatitude ionospheric peak density structure revealed by a new Ionosphere-Plasmasphere model, *Geophys. Res. Lett., 43*, doi:10.1002/ 2015GL067312. [link]
27. Fang, T.-W., R. Akmaev, R. A. Stoneback, T. Fuller-Rowell, H. Wang, and F. Wu (2016), Impact of midnight thermosphere dynamics on the equatorial ionospheric vertical drifts, *J. Geophys. Res. Space Physics, 121*, 4858–4868, doi:10.1002/2015JA022282. [link]
28. Evonoskey, W., A. D. Richmond, T.-W. Fang, A. Maute (2016), Ion-neutral coupling effects on low-latitude thermospheric evening winds, *J. Geophys. Res. Space Physics, 121*, 4638–4646, doi:10.1002/2016JA022382. [link]
29. Negrea, C., N. Zabotin, T. Bullett, T. Fuller-Rowell, T.-W. Fang, M. Codrescu (2016), Characteristics of acoustic gravity waves obtained from dynasonde data, *J. Geophys. Res. Space Physics, 121*, 3665–3680, doi:10.1002/2016JA022495. [link]
30. Pedatella N. M., T.-W. Fang, H. Jin, F. Sassi, H. Schmidt, J. L. Chau, T. A. Siddiqui, and L. Goncharenko (2016), Multi-model comparison of the ionosphere variability during the 2009 sudden stratosphere warming, *J. Geophys. Res. Space Physics, 121*, 7204–7225, doi:10.1002/2016JA022859. [link]

Conference Presentations (2006-2017):

1. Fang, T. W., C. H. Chen, J. Y. Liu, C. H. Lin, and H. F. Tsai, Seasonal Variations of the Equatorial Ionization Anomaly–GPS Observations and Model Simulations, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, LTRV.02, New Mexico, USA, 2006.
2. C. H. Lin, J. Y. Liu, C. C. Hsaio, T. W. Fang, M. L. Hsu, P. Y. Chang, and C. Z. Cheng, Global Ionospheric Structure Monitored by the FORMOSAT-3/COSMIC: Seasonal Effects and Coupling with the Atmospheric Tides, FORMOSAT-3/COSMIC Workshop 2006 – Early Results and IOP Campaigns, Taipei, 2006.
3. C. H. Lin, J. Y. Liu, C. C. Hsaio, T. W. Fang, A. D. Richmond, and C. Z. Cheng, Observations of Global Ionospheric Structure by FORMOSAT-3/COSMIC, First Formosat-3/COSMIC Data Users Workshop, Boulder, Colorado, 2006.
4. Chang, P. Y., T. W. Fang, and J. Y. Liu, Ionospheric Radio Occultation Observation by FORMOSAT-3/COSMIC (in Chinese), The Seventh Cross-Strait Space Sciences Workshop (CSSSW7), Taoyuan, Taiwan, 2006.
5. C. H. Lin, J. Y. Liu, T. W. Fang, H. F. Tsai , and C. Cheng, Global Ionospheric Structures Observed by FORMOSAT-3/COSMIC Satellites, American Geophysical Union Fall Meeting, San Francisco, California, 2006.
6. Fang, T. W., J. Y. Liu, Art Richmond, P. Y. Chang, C. H. Lin, Seasonal Variation of the Global Ionosphere, American Geophysical Union Fall Meeting, San Francisco, California, 2006.
7. Fang T. W., A. D. Richmond, M. Hagan, T. Yokoyama, J. Y. Liu, Equinoctial Asymmetry of the Vertical Drift in Pre-reversal Enhancement, Taiwan Geosciences Assembly, Taoyuan, Taiwan, 2007.
8. Fang T. W., A. D. Richmond, M. Hagan, T. Yokoyama, J. Y. Liu, Equinoctial Asymmetry of the Vertical Drift in Pre-reversal Enhancement, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, New Mexico, USA, 2007.
9. P. Y. Chang, J.Y. Liu, C. H. Lin, T. W. Fang, Ionospheric electron density observed by FORMOSAT-3/COSMIC, Second FORMOSAT-3/COSMIC Data Users Workshop, Boulder, Colorado, USA, 2007.
10. T. W. Fang, A. D. Richmond, J. Y. Liu, A. Maute, C. H. Lin, C. H. Chen, B. Harper, Model Simulation of the Equatorial Electrojet in the Peruvian and Philippine Sectors. American Geophysical Union Fall Meeting, San Francisco, California, USA, 2007.
11. T. W. Fang, A. D. Richmond, J. Y. Liu, A. Maute, Model Simulation of the Equatorial Electrojet and Vertical Drift, Union Radio Scientifique Internationale/ National Radio Science Meeting, Boulder, Colorado, USA, 2008.
12. T. W. Fang, A. D. Richmond, H. Kil, G. Millward, J. Y. Liu, Model simulation of longitudinal structure in the equatorial ionosphere, 12th International Symposium on Equatorial Aeronomy, Crete, Greece, 2008.
13. T. W. Fang, A. D. Richmond, J. Y. Liu, A. Maute, Wind Dynamo Effects on Ground Magnetic Perturbations and Vertical Drifts, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, New Mexico, USA, 2008.
14. T. W. Fang, A. D. Richmond, J. Y. Liu, A. Maute, Spatial Variation of the Pre-reversal Enhancement – Model Results, American Geophysical Union Fall Meeting, San Francisco,

California, USA, 2008.

15. T. W. Fang, A. D. Richmond, J. Y. Liu, A. Maute, Spatial Variation of the Pre-reversal Enhancement – Model Results, Union Radio Scientifique Internationale/ National Radio Science Meeting, Boulder, Colorado, USA, 2009.

16. T. W. Fang, H. Kil, G. Millward, A. D. Richmond, J. Y. Liu, S. J. Oh, Causal link of the wave-4 structures in plasma density and vertical plasma drift in the low-latitude ionosphere, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, New Mexico, USA, 2009.

17. T. W. Fang, A. D. Richmond, A. Maute, J. Y. Liu, Current system in the daytime and post-sunset ionosphere, IAGA 11th Scientific Assembly, Sopron, Hungary, 2009..

18. T. W. Fang, A. D. Richmond, A. Maute, Current system in the daytime and post-sunset ionosphere, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2009.

19. A. D. Richmond and A. Maute, G. Millward and T.W. Fang, Art Richmond, Physics of Equatorial Ionospheric Drifts, C/NOFS Workshop, Breckenridge, CO, USA, 2010.

20. T. Fuller-Rowell, T. W. Fang, R. Akmaev, M. Codrescu, F. Wu, H. Wang, Sources of thermosphere ionosphere structure and variability at low and mid latitudes, COSPAR, Bremen, Germany, 2010

21. T. W. Fang, J. Forbes, Ionosphere Response to Recurrent Geomagnetic Activity during Solar Cycle 19-22, High Speed Solar Wind Workshop, Boulder, Colorado, USA, 2010.

22. T. W. Fang, et al., Equatorial-PRIMO (problems related to ionospheric model and observation). American Geophysical Union Fall Meeting, San Francisco, California, USA, 2010.

23. T. W. Fang, Ionosphere Models, AGU Chapman Conference, Charleston, South Carolina, 2011. **(Invited)**

24. T. W. Fang, T. J. Fuller-Rowell, D. Anderson, R. A. Akmaev, and F. Wu, Impact of Atmospheric Tides on Ionosphere-Thermosphere System, AGU Chapman Conference, Charleston, South Carolina, 2011.

25. T. W. Fang, T. J. Fuller-Rowell, D. Anderson, R. A. Akmaev, and F. Wu, A comparison of ionosphere models: Current Problems and Challenges in Ionospheric Modeling, IUGG-IAGA meeting, Melbourne, Australia, 2011.

26. T. W. Fang, et al., Equatorial-PRIMO (problems related to ionospheric model and observation). Asia Oceania Geosciences Society, Taipei, Taiwan, 2011. **(Invited)**

27. T. W. Fang, T. J. Fuller-Rowell, and D. Anderson, Current Problems and Challenges in Ionospheric Modeling. Asia Oceania Geosciences Society, Taipei, Taiwan, 2011. **(Invited)**

28. T. -W Fang, T. J. Fuller-Rowell, R. Akmaev, F. Wu, H. Wang, and D. Anderson, Longitudinal Variation of Ionospheric Vertical Drift during Sudden Stratosphere Warming Event, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2011.

29. T. -W Fang, T. J. Fuller-Rowell, R. Akmaev, F. Wu, H. Wang, Impact of Planetary Waves on the Ionosphere during January 2009. 13th International Symposium on Equatorial Aeronomy, Paracas, Peru, 2012. **(Invited)**

30. T. -W Fang, et al., Equatorial-PRIMO (problems related to ionospheric model and observation). Paracas, Peru, 2012.

31. T.-W Fang, A. D. Richmond, T. Fuller-Rowell, N. Maruyama, A. Maute, Model Simulation of Plasma Flow in the Topside Ionosphere, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2012.

32. T.-W Fang, Model Simulation of the Coupled Thermosphere-Ionosphere System, Institute of Space Science, National Central University, Taiwan, 2013. **(Invited)**

33. T.-W Fang, A. D. Richmond, B. Emery, A. Maute, Model Study of the Pre-reversal Enhancement, C/NOFS workshop, Albuquerque, NM, 2013.

34. T.-W Fang, R. Akmaev, T. Fuller-Rowell, F. Wu, N. Maruyama, G. Millward, Day-to-day and longitudinal variations in the ionosphere driven by lower atmosphere tidal forcing, Japan Geoscience Union Meeting (JpGU), Japan, 2013 **(Invited)**

35 T. J. Fuller-Rowell, T.-W. Fang, H. Wang, F. Wu, R. A. Akmaev, Ionospheric Response to a Sudden Stratospheric Warming at High Solar Activity, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2013.

36. T.-W. Fang, A. D. Richmond, R. Stoneback, H. Wang, F. Wu, Climatology and Morphology of the Early Morning Upward Drift, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2013. **(Invited)**

37. T.-W. Fang, Approaches and Challenges of Simulating Low-latitude Ionosphere, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2013. **(Invited)**

38. T. W. Fang, T. Fuller-Rowell., H. Wang, R. Akmaev,, F. Wu, Ionospheric response to Sudden stratospheric warming events at low and high solar activity, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, Seattle, USA, 2014.

39. T. W. Fang, R. Akmaev, T. Fuller-Rowell, H. Wang, F. Wu, Impact of MTM on the nighttime equatorial vertical drifts, Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop, Seattle, USA, 2014.

40. T. W. Fang, R. Akmaev, T. Fuller-Rowell, H. Wang, F. Wu, Impact of MTM on the nighttime equatorial vertical drifts, American Geophysical Union Fall Meeting, San Francisco, California, USA, 2014.

41. T. W. Fang, R. Akmaev, R. Stoneback, T. Fuller-Rowell, H. Wang, F. Wu, Impact of MTM dynamics on the nighttime equatorial vertical drifts, American Geophysical Union Fall Meeting, IUGG/IAGA, Prague, Czech Republic, 2015.

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