A, E., Ridley, A. J., Zhang, D., & Xiao, Z. (2012). Analyzing the hemispheric asymmetry in the thermospheric density response to geomagneticstorms. Journal of Geophysical Research, 117, A08317. https://doi.org/10.1029/2011JA017259

Anthes, R. A., Ector, D., Hunt, D. C., Kuo, Y.-H., Rocken, C., Schreiner, W. S., et al. (2008). The COSMIC/FORMOSAT-3 mission: Early results. Bulletin of the American Meteorological Society, 89, 313–334. https://doi.org/10.1175/BAMS-89-3-313

Burch, J. L., Reiff, P. H., Menietti, J. D., Heelis, R. A., Hanson, W. B., Shawhan, S. D., et al. (1985). IMF By -dependent plasma flow and Birkeland currents in the dayside magnetosphere: 1. Dynamics Explorer observations. Journal of Geophysical Research, 90(A2), 1577–1593. https://doi.org/10.1029/JA090iA02p01577

Cherniak, I., & Zakharenkova, I. (2016). High-latitude ionospheric irregularities: Differences between ground- and space-based GPS measurements during the 2015 St. Patrick’s Day storm. Earth Planet and Space, 68, 136. https://doi.org/10.1186/s40623-016-0506-1

Christiansen, F., Papitashvili, V. O., & Neubert, T. (2002). Seasonal variations of high-latitude field-aligned currents inferred from .rsted and Magsat observations. Journal of Geophysical Research, 107(A2), SMP 5-1–SMP 5-13. https://doi.org/10.1029/2001JA900104

Cnossen, I., & F.rster, M. (2016). North-south asymmetries in the polar thermosphere-ionosphere system: Solar cycle and seasonal influences. Journal of Geophysical Research: Space Physics, 121, 612–627. https://doi.org/10.1002/2015JA021750

Cnossen, I., Richmond, A. D., & Wiltberger, M. (2012). The dependence of the coupled magnetosphere-ionosphere-thermosphere system on the Earth's magnetic dipole moment. Journal of Geophysical Research, 117, A05302. https://doi.org/10.1029/2012JA017555

Cnossen, I., Richmond, A. D., Wiltberger, M., Wang, W., & Schmitt, P. (2011). The response of the coupled magnetosphere-ionosphere-thermosphere system to a 25% reduction in the dipole moment of the Earth's magnetic field. Journal of Geophysical Research, 116, A12304. https://doi.org/10.1029/2011JA017063

Codrescu, M. V., Negrea, C., Fedrizzi, M., Fuller-Rowell, T., Dobin, A., Jakowsky, N., et al. (2012). A real-time run of the coupled thermosphere ionosphere plasmasphere electrodynamics (CTIPe) model. Space Weather, 10, S02001. https://doi.org/10.1029/2011SW000736

Cousins, E. D. P., & Shepherd, S. G. (2010). A dynamical model of high-latitude convection derived from SuperDARN plasma drift measurements. Journal of Geophysical Research, 115, A12329. https://doi.org/10.1029/2010JA016017

de la Beaujardiere, O., Alcayde, D., Fontanari, J., & Leger, C. (1991). Seasonal dependence of high-latitude electric fields. Journal of Geophysical Research, 96(A4), 5723–5735. https://doi.org/10.1029/90JA01987

Deng, Y., Fuller-Rowell, T. J., Akmaev, R. A., & Ridley, A. J. (2011). Impact of the altitudinal Joule heating distribution on the thermosphere. Journal of Geophysical Research, 116, A05313. https://doi.org/10.1029/2010JA016019

Deng, Y., Richmond, A. D., Ridley, A. J., & Liu, H.-L. (2008). Assessment of the non-hydrostatic effect on the upper atmosphere using a general circulation model (GCM). Geophysical Research Letters, 35, L01104. https://doi.org/10.1029/2007GL032182

Deng, Y., & Ridley, A. J. (2006). Dependence of neutral winds on convection E-field, solar EUV, and auroral particle precipitation at high latitudes. Journal of Geophysical Research, 111, A09306. https://doi.org/10.1029/2005JA011368

Deng, Y., & Ridley, A. J. (2014). Simulation of non-hydrostatic gravity wave propagation in the upper atmosphere. Annals of Geophysics, 32, 443–447. <https://doi.org/10.5194/angeo-32-443-2014>

Deng, Y., Sheng, C., Su, Y.-J., Hairston, M. R., Knipp, D., Huang, C. Y., et al. (2015). Correlation between Poynting flux and soft electron

precipitation in the dayside polar cap boundary regions. Journal of Geophysical Research: Space Physics, 120, 9102–9109. https://doi.

org/10.1002/2015JA021075

Dhadly, M., Emmert, J., Drob, D., Conde, M., Doornbos, E., Shepherd, G., et al. (2017a). Seasonal dependence of northern high-latitude

upper thermospheric winds: A quiet time climatological study based on ground-based and space-based measurements. Journal of Geophysical

Research: Space Physics, 122, 2619–2644. https://doi.org/10.1002/2016JA023688

Dhadly, M. S., Emmert, J. T., Drob, D. P., Conde, M. G., Doornbos, E., Shepherd, G. G., et al. (2017b). Seasonal dependence of geomagnetic

active-time northern high-latitude upper thermospheric winds. Journal of Geophysical Research: Space Physics, 123, 739–754. https://

doi.org/10.1002/2017JA024715

Emmert, J. T. (2015). Altitude and solar activity dependence of 1967–2005 thermospheric density trends derived from orbital drag. Journal

of Geophysical Research: Space Physics, 120, 2940–2950. https://doi.org/10.1002/2015JA021047

Emmert, J. T., Fejer, B. G., & Sipler, D. P. (2003). Climatology and latitudinal gradients of quiet time thermospheric neutral winds

over Millstone Hill from Fabry-Perot interferometer measurements. Journal of Geophysical Research, 108(AX), 1196. https://doi.

org/10.1029/2002JA009765

F.rster, M., & Cnossen, I. (2013). Upper atmosphere differences between northern and southern high latitudes: The role of magnetic field

asymmetry. Journal of Geophysical Research: Space Physics, 118, 5951–5966. https://doi.org/10.1002/jgra.50554

F.rster, M., & Haaland, S. (2015). Interhemispheric differences in ionospheric convection: Cluster EDI observations revisited. Journal of

Geophysical Research: Space Physics, 120, 5805–5823. https://doi.org/10.1002/2014JA020774

F.rster, M., Haaland, S. E., & Doornbos, E. (2011). Thermospheric vorticity at high geomagnetic latitudes from CHAMP data and its IMF

dependence. Annals of Geophysics, 29(1), 181–186.

Foster, J. C., St-Maurice, J.-P., & Abreu, V. J. (1983). Joule heating at high latitudes. Journal of Geophysical Research, 88(A6), 4885–4897.

https://doi.org/10.1029/JA088iA06p04885

Fuller-Rowell, T. J. (1998). The “thermospheric spoon”: A mechanism for the semiannual density variation. Journal of Geophysical Research,

103(A3), 3951–3956. https://doi.org/10.1029/97JA03335

Hagan, M. E., & Forbes, J. M. (2003). Migrating and nonmigrating semidiurnal tides in the upper atmosphere excited by tropospheric latent

heat release. Journal of Geophysical Research, 108(A2), 1062. https://doi.org/10.1029/2002JA009466

Hedin, A. E. (1987). MSIS-86 thermospheric model. Journal of Geophysical Research, 92, 4649–4662. https://doi.org/10.1029/

ja092ia05p04649

Hedin, A. E. (1991). Extension of the MSIS thermosphere model into the middle and lower atmosphere. Journal of Geophysical Research,

96, 1159–1172. https://doi.org/10.1029/90ja02125

Jin, Y., & Xiong, C. (2020). Interhemispheric asymmetry of large-scale electron density gradients in the polar cap ionosphere: UT and seasonal

variations. Journal of Geophysical Research: Space Physics, 125, e2019JA027601. https://doi.org/10.1029/2019JA027601

Johnson, F. S., & Gottlieb, B. (1970). Eddy mixing and circulation at ionospheric levels. Planetary and Space Science, 18, 1707–1718. https://

doi.org/10.1016/0032-0633(70)90004-8

Killeen, T. L., & Roble, R. G. (1984). An analysis of the high-latitude thermospheric wind pattern calculated by a thermospheric general circulation

model: 1. Momentum forcing. Journal of Geophysical Research, 89(A9), 7509–7522. https://doi.org/10.1029/JA089iA09p07509

Killeen, T. L., Won, Y.-I., Niciejewski, R. J., & Burns, A. G. (1995). Upper thermosphere winds and temperatures in the geomagnetic polar

cap: Solar cycle, geomagnetic activity, and interplanetary magnetic field dependencies. Journal of Geophysical Research, 100(A11),

21327–21342. https://doi.org/10.1029/95JA01208

Knipp, D., Kilcommons, L., Hairston, M., & Coley, W. R. (2021). Hemispheric asymmetries in poynting flux derived from DMSP spacecraft.

Geophysical Research Letters, 48, e2021GL094781. https://doi.org/10.1029/2021GL094781

Kwak, Y.-S., Richmond, A. D., Deng, Y., Forbes, J. M., & Kim, K.-H. (2009). Dependence of the high-latitude thermospheric densities on the

interplanetary magnetic field. Journal of Geophysical Research, 114, A05304. https://doi.org/10.1029/2008JA013882

Laundal, K. M., Cnossen, I., Milan, S. E., Haaland, S. E., Coxon, J., Pedatella, N. M., et al. (2017). North–south asymmetries in Earth's

magnetic field. Space Science Reviews, 206, 225–257. https://doi.org/10.1007/s11214-016-0273-0

Laundal, K. M., & .stgaard, N. (2009). Asymmetric auroral intensities in the Earth’s Northern and Southern hemispheres. Nature, 460,

491–493. https://doi.org/10.1038/nature08154

Laundal, K. M., & Richmond, A. D. (2017). Magnetic coordinate systems. Space Science Reviews, 206, 27–59. https://doi.org/10.1007/

s11214-016-0275-y

Lei, J., Dou, X., Burns, A., Wang, W., Luan, X., Zeng, Z., & Xu, J. (2013). Annual asymmetry in thermospheric density: Observations and

simulations. Journal of Geophysical Research: Space Physics, 118, 2503–2510. https://doi.org/10.1002/jgra.50253

Lin, C. Y., Deng, Y., Sheng, C., & Drob, D. P. (2017). A study of the nonlinear response of the upper atmosphere to episodic and stochastic

acoustic-gravity wave forcing. Journal of Geophysical Research: Space Physics, 122, 1178–1198. https://doi.org/10.1002/2016JA022930

Liou, K., & Mitchell, E. (2020). Hemispheric asymmetry of the dayside aurora due to imbalanced solar insolation. Scientific Reports, 10.

https://doi.org/10.1038/s41598-020-70018-w

Liou, K., Newell, P. T., & Meng, C.-I. (2001). Seasonal effects on auroral particle acceleration and precipitation. Journal of Geophysical

Research, 106(A4), 5531–5542. https://doi.org/10.1029/1999JA000391

Liu, H., Lühr, H., Henize, V., & K.hler, W. (2005). Global distribution of the thermospheric total mass density derived from CHAMP. Journal

of Geophysical Research, 110, A04301. https://doi.org/10.1029/2004JA010741

Lu, G., Richmond, A. D., Emery, B. A., Reiff, P. H., de la Beaujardi.re, O., Rich, F. J., et al. (1994). Interhemispheric asymmetry of the

high-latitude ionospheric convection pattern. Journal of Geophysical Research, 99(A4), 6491–6510. https://doi.org/10.1029/93JA03441

Luan, X., Wang, P., Dou, X., & Liu, Y. C.-M. (2015). Interhemispheric asymmetry of the equatorial ionization anomaly in solstices observed

by COSMIC during 2007–2012. Journal of Geophysical Research: Space Physics, 120, 3059–3073. https://doi.org/10.1002/2014JA020820

Lysak, R. L., Song, Y., Waters, C. L., Sciffer, M. D., & Obana, Y. (2020). Numerical investigations of interhemispheric asymmetry due to

ionospheric conductance. Journal of Geophysical Research: Space Physics, 125, e2020JA027866. https://doi.org/10.1029/2020JA027866

Mayr, H. G., Harris, I., & Spencer, N. W. (1978). Some properties of upper atmosphere dynamics. Reviews on Geophysics, 16, 539–565.

https://doi.org/10.1029/rg016i004p00539

McHarg, M., Chun, F., Knipp, D., Lu, G., Emery, B., & Ridley, A. (2005). High-latitude Joule heating response to IMF inputs. Journal of

Geophysical Research, 110, A08309. https://doi.org/10.1029/2004JA010949

Moen, J., & Brekke, A. (1993). The solar flux influence of quiet-time conductances in the auroral ionosphere. Geophysical Research Letters,

20, 971–974. <https://doi.org/10.1029/92GL02109>

Nishitani, N., Papitashvili, V. O., Ogawa, T., Sato, N., Yamagishi, H., Yukimatu, A. S., & Rich, F. J. (2003). Interhemispheric asymmetry

of the high-latitude ionospheric convection on 11–12 May 1999. Journal of Geophysical Research, 108, 1184. https://doi.

org/10.1029/2002JA009680

Ohtani, S., Wing, S., Ueno, G., & Higuchi, T. (2009). Dependence of premidnight field-aligned currents and particle precipitation on solar

illumination. Journal of Geophysical Research, 114, A12205. https://doi.org/10.1029/2009JA014115

Paetzold, H. K., & Zschoerner, H. (1961). The structure of the upper atmosphere and its variations after satellite observations. Space Research

(Vol. 2, pp. 958–973). North Holland Publishers.

Papitashvili, V. O., & Rich, F. J. (2002). High-latitude ionospheric convection models derived from Defense Meteorological Satellite Program

ion drift observations and parameterized by the interplanetary magnetic field strength and direction. Journal of Geophysical

Research, 107(A8), SIA 17-1–SIA 17-13. https://doi.org/10.1029/2001JA000264

Perlongo, N. J., & Ridley, A. J. (2016). Universal time effect in the response of the thermosphere to electric field changes. Journal of Geophysical

Research: Space Physics, 121, 3681–3698. https://doi.org/10.1002/2015JA021636

Pettigrew, E. D., Shepherd, S. G., & Ruohoniemi, J. M. (2010). Climatological patterns of high-latitude convection in the Northern and

Southern hemispheres: Dipole tilt dependencies and interhemispheric comparisons. Journal of Geophysical Research, 115, A07305.

https://doi.org/10.1029/2009JA014956

Prikryl, P., Ghoddousi-Fard, R., Spogli, L., Mitchell, C. N., Li, G., Ning, B., et al. (2015). GPS phase scintillation at high latitudes during geomagnetic

storms of 7–17 March 2012 - Part 2: Interhemispheric comparison. Annals of Geophysics, 33, 657–670. https://doi.org/10.5194/

angeo-33-657-2015

Qian, L., Burns, A. G., Solomon, S. C., & Wang, W. (2013). Annual/semiannual variation of the ionosphere. Geophysical Research Letters,

40, 1928–1933. https://doi.org/10.1002/grl.50448

Qian, L., Solomon, S. C., & Kane, T. J. (2009). Seasonal variation of thermospheric density and composition. Journal of Geophysical Research,

114, A01312. https://doi.org/10.1029/2008JA013643

Reiff, P. H., & Burch, J. L. (1985). IMF By-dependent plasma flow and Birkeland currents in the dayside magnetosphere: 2. A global model

for northward and southward IMF. Journal of Geophysical Research, 90(A2), 1595–1609. https://doi.org/10.1029/JA090iA02p01595

Reistad, J. P., .stgaard, N., Laundal, K. M., Haaland, S., Tenfjord, P., Snekvik, K., et al. (2015). Intensity asymmetries in the dusk sector

of the poleward auroral oval due to IMF Bx. Journal of Geophysical Research: Space Physics, 119, 9497–9507. https://doi.

org/10.1002/2014JA020216

Richmond, A. D. (1995). The ionospheric wind dynamo: Effects of its coupling with different atmospheric regions. In R. M. Johnson & T.

L. Killeen (Eds.), The upper mesosphere and lower thermosphere: A review of experiment and theory (pp. 49–65). https://doi.org/10.1029/

GM087p0049

Richmond, A. D., & Kamide, Y. (1988). Mapping electrodynamic features of the high-latitude ionosphere from localized observations:

Technique. Journal of Geophysical Research, 93(A6), 5741–5759. https://doi.org/10.1029/JA093iA06p05741

Ridley, A. J. (2007). Effects of seasonal changes in the ionospheric conductances on magnetospheric field-aligned currents. Geophysical

Research Letters, 34. L05101. https://doi.org/10.1029/2006GL028444

Ridley, A. J., Deng, Y., & T.th, G. (2006). The global ionosphere thermosphere model. Journal of Atmospheric and Solar-Terrestrial Physics,

68(8), 839–864. https://doi.org/10.1016/j.jastp.2006.01.008

Ridley, A. J., & Kihn, E. A. (2004). Polar cap index comparisons with AMIE cross polar cap potential, electric field, and polar cap area.

Geophysical Research Letters, 31, L07801. https://doi.org/10.1029/2003GL019113

Roble, R. G., & Dickinson, R. E. (1973). Is there enough solar extreme ultraviolet radiation to maintain the global mean thermospheric

temperature? Journal of Geophysical Research, 78(1), 249–257. https://doi.org/10.1029/JA078i001p00249

Russell, C. T., Chappell, C. R., Montgomery, M. D., Neugebauer, M., & Scarf, F. L. (1971). Ogo 5 observations of the polar cusp on November

1, 1968. Journal of Geophysical Research, 76(28), 6743–6764. https://doi.org/10.1029/JA076i028p06743

Sandholt, P. E., & Farrugia, C. J. (2007). Role of poleward moving auroral forms in the dawn-dusk auroral precipitation asymmetries induced

by IMF By. Journal of Geophysical Research, 112, A04203. https://doi.org/10.1029/2006JA011952

Sheng, C., Deng, Y., Chen, Y.-J., Heelis, R. A., & Huang, Y. (2019). Effects of alignment between particle precipitation and ion convection

patterns on Joule heating. Journal of Geophysical Research: Space Physics, 124, 4905–4915. https://doi.org/10.1029/2018JA026446

Sivla, W. T., Mtumela, Z., & Ogunjobi, O. (2020). Asymmetric behaviour and geomagnetic dependencies of zonal winds in the middle latitude

upper thermosphere. Advances in Space Research, 66(2020), 2141–2150. https://doi.org/10.1016/j.asr.2020.07.020

Spicher, A., Clausen, L. B. N., Miloch, W. J., Lofstad, V., Jin, Y., & Moen, J. I. (2017). Interhemispheric study of polar cap patch occurrence

based on Swarm in situ data. Journal of Geophysical Research: Space Physics, 122, 3837–3851. https://doi.org/10.1002/2016JA023750

Sutton, E. K., Forbes, J. M., & Knipp, D. J. (2009). Rapid response of the thermosphere to variations in Joule heating. Journal of Geophysical

Research, 114(A4). https://doi.org/10.1029/2008JA013667

Tanaka, T. (2001). Interplanetary magnetic field By and auroral conductance effects on high-latitude ionospheric convection patterns.

Journal of Geophysical Research, 106(A11), 24505–24516. https://doi.org/10.1029/2001JA900061

Th.bault, E., Finlay, C. C., Beggan, C. D., Alken, P., Aubert, J., Barrois, O., et al. (2015). International geomagnetic reference field: The 12th

generation. Earth, Planets and Space, 67, 79. https://doi.org/10.1186/s40623-015-0228-9

Tulasi Ram, S., Su, S.-Y., & Liu, C. H. (2009). FORMOSAT-3/COSMIC observations of seasonal and longitudinal variations of equatorial

ionization anomaly and its interhemispheric asymmetry during the solar minimum period. Journal of Geophysical Research, 114,

A06311. https://doi.org/10.1029/2008JA013880

Weimer, D. R. (2005). Improved ionospheric electrodynamic models and application to calculating Joule heating rates. Journal of Geophysical

Research, 110, A05306. https://doi.org/10.1029/2004JA010884

Workayehu, A. B., Vanham.ki, H., & Aikio, A. T. (2020). Seasonal effect on hemispheric asymmetry in ionospheric horizontal and fieldaligned

currents. Journal of Geophysical Research: Space Physics, 125, e2020JA028051. https://doi.org/10.1029/2020JA028051

Yamazaki, Y., Kosch, M. J., & Sutton, E. K. (2015). North-south asymmetry of the high-latitude thermospheric density: IMF BY effect.

Geophysical Research Letters, 42, 225–232. https://doi.org/10.1002/2014GL062748

Zhang, B., Lotko, W., Brambles, O., Wiltberger, M., Wang, W., Schmitt, P., & Lyon, J. (2012). Enhancement of thermospheric mass density

by soft electron precipitation. Geophysical Research Letters, 39, L20102. https://doi.org/10.1029/2012GL053519

Zhang, X., Liu, L., & Liu, S. (2017). Dependence of thermospheric zonal winds on solar flux, geomagnetic activity, and hemisphere as

measured by CHAMP. Journal of Geophysical Research: Space Physics, 122, 8893–8914. https://doi.org/10.1002/2016JA023715

Zhang, Y., England, S., & Paxton, L. J. (2010). Thermospheric composition variations due to nonmigrating tides and their effect on ionosphere.

Geophysical Research Letters, 37, L17103. <https://doi.org/10.1029/2010GL044313>

Zhao, Y., Deng, Y., Wang, J.-S., Zhang, S.-R., & Lin, C. Y. (2020). Tropical cyclone-induced gravity wave perturbations in the upper atmosphere:

GITM-R simulations. Journal of Geophysical Research: Space Physics, 125, e2019JA027675. https://doi.org/10.1029/2019JA027675

Zhu, Q., Deng, Y., Maute, A., Kilcommons, L. M., Knipp, D. J., & Hairston, M. (2021). ASHLEY: A new empirical model for the high-latitude

electron precipitation and electric field. Space Weather, 19, e2020SW002671. https://doi.org/10.1029/2020SW002671

Zhu, Q., Deng, Y., Maute, A., Sheng, C., & Lin, C. Y. (2017). Impact of the vertical dynamics on the thermosphere at low and middle

latitudes: GITM simulations. Journal of Geophysical Research: Space Physics, 122, 6882–6891. https://doi.org/10.1002/2017JA023939

Zhu, Q., Deng, Y., Richmond, A., & Maute, A. (2018). Small-scale and mesoscale variabilities in the electric field and particle precipitation and

their impacts on Joule heating. Journal of Geophysical Research: Space Physics, 123, 9862–9872. https://doi.org/10.1029/2018JA025771