Dr. Russell Stoneback
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Educational History

Ph.D., May 2009, University of Texas at Dallas, Physics
"Applications of the Electromagnetic Helmholtz Resonator", Dr. Rod Heelis

M.S., May 2006, University of Texas at Dallas, Physics

B.S., May 2003, University of Texas at Austin, Physics

Employment History

Founder/CEO, Sept. 2021, Cosmic Studio

- Responsible for all aspects of a research center.

Assistant Professor, 2016 - 2021, University of Texas at Dallas

- Envision the future of space science and direct scientists, engineers, and students along a path that ensures success of the Center for Space Sciences at UTD.
- Direct a team of engineers through all phases of spaceflight plasma instrumentation and mission development for NASA Explorer, DoD, and CubeSat missions.
- Develop and direct a team of engineers through the creation of new neutral atmosphere satellite-based instrumentation, supporting physics based instrument models, and processing software.
- Lead and support the development of proposals to federal agencies to support students, engineers, and scientists on a range of topics including science, software, and hardware development.
- Extend and improve instrument performance through the creation of physics and software based corrections that account for non-ideal instrument responses.
- Develop tools and methods to enable the next-generation of space weather prediction.
- Lead and support the creation of novel scientific results suitable for publication in refereed journals.
- Support the wider space science community through the development of open source software.
- Support the wider space science community through conference participation, including both giving presentations and hosting conference sessions.
- Develop and teach physics courses at graduate and undergraduate levels.
- Mentor graduate students to ensure they meet scientific and university standards for a Ph.D.
- Support university and department committees.

Research Scientist, 2011 - 2016, University of Texas at Dallas

- Lead and support the development of science and mission proposals to federal agencies to provide individual and small team research support.
- Direct a team of engineers through the translation of heritage spaceflight instrumentation to the CubeSat platform.
- Develop software to convert raw engineering parameters provided by an instrument into scientifically useful geophysical parameters.
- Develop physics-based numerical software to model instrument performance to demonstrate compliance with Explorer and DoD mission instrument performance requirements.
- Develop new operating modes and methods to calibrate instrumentation using on-orbit measurements.
- Develop software to support space science data analysis.
- Lead and support the creation of novel scientific results suitable for publication in refereed journals.

Research Associate, 2009 - 2011, University of Texas at Dallas

- Lead and support the creation of novel scientific results suitable for publication in refereed journals.
- Develop processing and analysis software to support measurements from the C/NOFS satellite.
- Participate in C/NOFS instrumentation discussions, upkeep, and anomaly mitigation strategy development.

Research Assistant, Summer 2007, Indian Institute of Astrophysics; Bangalore, India

- Analyze measurements of solar magnetic field oscillations and their distribution on the Sun to better understand network and inter-network regions.

Teaching Assistant, 2004 - 2009, University of Texas at Dallas

- Support professors in the execution of a variety of undergraduate and graduate level university courses.

Research Assistant, 2003 - 2004, Ander Laboratory; Austin, Tx

- Develop physics based model of gravity sensor and generate predictions of instrument performance.

Professional recognitions and honors

Cover Article - Journal of Geophysical Research: Space Physics, June 2018, on the Python Satellite Data Analysis Toolkit (pysat), open source science software.

JGR Top#20 Downloads - Two articles (pysat and Snakes on a Spaceship, a science Python community overview) in the top 20 most downloaded articles for JGR-Space Physics in the 12 months following publication.

Excellence in Education Fellowship; University of Texas at Dallas, 2007 and 2008; $15,000/yr.

Achievements in original investigation

U. S. Patents

1. **Stoneback, R. A., et. al** (2021) - Spinning Aperture Neutral Drift Sensor (SANDS), U.S. Patent #11,187,827.

   A novel neutral atmosphere instrument capable of measuring neutral winds, temperatures, composition, and density. The last successful neutral instrument launched in 1982 on the Dynamics Explorer-2 mission. SANDS significantly improves upon the heritage instrument by reducing power, mass, and volume, the number of moving parts, and eliminates the need for a mass spectrometer, all while improving robustness, accuracy, and operating rate. SANDS supports operation in non-equilibrium, principally enabled by a new method for isolating geophysical parameters from raw instrument measurements.

2. **Stoneback, R. A.** (2010), Electromagnetic Musical Instruments, U.S. Patent #7,777,119.

   A musical instrument that replaces the resonance of sound waves in acoustic musical instruments with the resonance of electromagnetic waves in a conductive instrument body. The electromagnetic musical instrument produces music we can’t hear using colors we can’t see.

3. **Stoneback, R.A.** (2010), Electromagnetic Musical Instrument Systems and Related Methods, U.S. Patent #7,777,118.

   Converts the inaudible music produced by electromagnetic musical instruments into audible music.

4. **Stoneback, R. A.** (2010), Electromagnetic Musical Instrument Frequency Conversion Systems and Related Methods, U.S. Patent #7,777,120.

   Converts the inaudible music produced by electromagnetic musical instruments into audible music.

Science Software Releases

1. **Stoneback, R.A.**, J. Klenzing, G. Iyer (2022), Orthogonal Multipole Magnetic Basis Vectors rstoneback/OMMBV: v1.0.1, Zenodo. https://doi.org/10.5281/zenodo.5819124

A new magnetic vector basis that remains orthogonal even for multipole magnetic fields. OMMBV makes the accurate decomposition of plasma velocities into zonal (magnetic east/west) and meridional (magnetic up/down) possible as well as enables the accurate mapping of electric fields and plasma motion along field lines. This field line mapping functionality enables the removal of a full dimension from physics based electrodynamics models. Optimized for plasma/neutral coupling investigations, like NASA's ICON or upcoming Global Dynamics Constellation.

2. **Stoneback, R.A.**, J. Klenzing, A. G. Burrell, A. Pembroke, C. Spence, M. Depew, J. Smith, R. Fuller, V. Von Bose, N. Hargrave, G. Iyer, S. Leite (2021). pysat/pysat: v3.0.1. Zenodo. https://doi.org/10.5281/zenodo.5142690.

The Python Satellite Data Analysis Toolkit (pysat) builds upon xarray and pandas to create a versatile science data workflow enabling robust instrument independent scientific data analysis through a consistent easy to use interface. Pysat and supporting packages provide access to over 80 different data sets across space science, from space weather indices, to satellite data sets, as well as full atmospheric models.

Pysat has been used as a foundational package for instrument processing on the NASA ICON and NOAA/NSPO COSMIC-2 Constellation missions. Pysat is also being used by the Naval Research Laboratory to integrate a variety of model and data sources as part of a next generation space weather prediction system funded through the Defense Advanced Research Projects Agency (DARPA) Space Environment Exploitation (SEE) program.

3. Klenzing, J., **R. A. Stoneback**, A. Pembroke, A. G. Burrell, J. M. Smith, and C. Spence (2021). pysat/pysatCDAAC: Version 0.0.2 (v0.0.2). Zenodo. https://doi.org/10.5281/zenodo.5081202

Provides data plug in support for COSMIC constellation mission data, distributed via the COSMIC Data Analysis and Archive Center (CDAAC). Supports downloading, loading, cleaning, and processing a variety of profile data from COSMIC.

4. Klenzing, J., **Stoneback, R.A.**, A. G. Burrell, M. Depew, and C, Spence. (2021). pysat/pysatMissions: v0.2.2. Zenodo. https://doi.org/10.5281/zenodo.4987828

Builds upon pysat to support 'flying' spacecraft through a variety of atmospheric models to support observation and model comparisons, science planning, as well as testing of instrument processing software.

5. Klenzing, J., **R. A. Stoneback**, C. Spence, and A. G. Burrell. (2021). pysat/pysatSeasons: v0.1.3. Zenodo. https://doi.org/10.5281/zenodo.4950172

Builds upon pysat to provide generalized support for seasonal analysis including bin averaging (by day, file, or orbit) and occurrence probabilities for nD data.

6. M Burrell, A. G., J. Klenzing, **R. A. Stoneback**, and A. Pembroke. (2021). pysat/pysatMadrigal: v0.0.4. Zenodo. https://doi.org/10.5281/zenodo.4927662
   Provides pysat plug-in support for data from the National Science Foundation.

7. M Klenzing, J, **R. A. Stoneback**, A. G. Burrell, J. M. Smith, A. Pembroke, and C. Spence. (2021). pysat/pysatNASA: v0.0.2. Zenodo. https://doi.org/10.5281/zenodo.4906576
   Provides pysat plug-in support for data distributed from NASA via CDAWeb.

8. **Stoneback, R.A.**, M. Depew, J. Klenzing, G. Iyer, and A. Pembroke. (2020). pysat/pysatCDF: pysat Compatibility (0.3.1). Zenodo. https://doi.org/10.5281/zenodo.3765230

A supporting library for quickly reading Common Data Format files used by NASA to store space science measurements. Uses a combination of Python, Fortran, and C libraries.

9. **Stoneback, R.A.** (2016), NOAA/NSPO COSMIC-2 Constellation Ion Velocity Meter (IVM) Software

Developed a next generation processing system in Python for the constellation (6) of IVM instruments onboard COSMIC-2 built on pysat. Incorporated lessons from C/NOFS, such as photoemission corrections and correction of cross track ion velocities using geophysical boundary conditions. Developed a new processing algorithm for determining ion velocity increasing the accuracy and robustness of this instrument. Public COSMIC-2 IVM files are processed and created using pysat.

10. **Stoneback, R.A.** (2018), NASA ICON Explorer Ion Velocity Meter Software

Extended the updated IVM processing system for operation on the ICON platform and computers at the University of California at Berkeley. Developed a method for calibrating the operation of the Retarding Potential Analyzer on-orbit. This is particularly significant as calibrations previously could only be accomplished in the lab, before launch. Developed a correction for the variation in potential applied to incident plasma due to the use of a woven grid. Public ICON IVM files are processed and created using pysat.

Open Source Software Community Participation

1. NumFOCUS - non-profit dedicated towards open source science software. Pysat is a NumFOCUS affiliated package. NumFOCUS also includes science packages used throughout the community such as Numpy, SciPy, Matplotlib, pandas, xarray, etc.

2. Python in Heliophysics Community (PyHC) - Community group dedicated towards the production and use of open source science software within heliophysics. Dr. Stoneback has been a leader within PyHC since inception. Pysat is a ‘core’ package within PyHC.

Artwork

My approach for art is intertwined with my scientific research. Physics is a creative science. While the foundation of science is a series of objective experiments, physicists construct a narrative that links disparate experiments together into a cohesive story. The most celebrated physics stories are those that generate new experiments and predict correct results. Nevertheless, there is generally more than one story to solve any given problem. My creativity has been most directly expressed in my mathematics, instrumentation, and software, though these solutions are only accessible to relatively few people. My art is the expression of the same physics using media that are more readily accessible.

1. Orthogonal Multipole Magnetic Basis Vectors (OMMBV) - 2022 - OMMBV is open source software that implements a new technique invented by Dr. Russell Stoneback to create an orthogonal vector basis for plasma electrodynamics. This functionality is required by a variety of satellite and other measurement platforms in space science. As part of software development, a suite of unit tests and plots were developed to establish the performance of the variety of functions needed to create the vector basis. These images, when generated at high resolution and with perceptually uniform color palettes, are artwork. Like many pieces of art, the images reflect the artists perception of reality. The simultaneous expression of art from science software motivated the collection title, ‘Science as Art’.

2. Visualizing Music with Light - 2021 - Dynamic lighting installation in the new science building at The University of Texas at Dallas that visualizes music performed and recorded by Dr. Russell Stoneback. The building was originally going to feature both a physics and music wing thus the intent behind the piece was a merging of the two departments. Dr. Stoneback was selected as the artist given his long term physics research into the creation of new musical instruments using electromagnetic waves (light) and his art background.

Satellite Mission Experience

<u>IVM Instrument Primary Investigator (PI) on NASA’s SORTIE CubeSat</u>

Converted a heritage plasma instrument comprised of two sub-instruments into a single instrument in a smaller package that maintains heritage performance characteristics while also enabling new operating modes. Further, the instrument was adapted for a smaller satellite platform with fewer onboard resources (allowed volume, mass, power, data) than traditional satellites. The main interface of the instrument with atmospheric plasma was optimized using a design principle discovered by Dr. Stoneback. The PI is responsible for all aspects of the instrument, including providing the instruments, ensuring calibration, demonstrating the instruments satisfy requirements, and analyzing the data during the mission. The PI is solely responsible for the quality and direction of the proposed research and the proper use of funds. He is also responsible for all technical, management, and budget issues and is the final authority for this task. The PI leads the Co-I’s and engineering team.

Instrument Co-Investigator (Co-I) for the Ion Velocity Meter (IVM) on NASA's Ionospheric Connections (ICON) Explorer.

ICON is a NASA Explorer mission that will measure the interaction between the thermosphere (neutral particles) and ionosphere (plasma). The thermosphere is a primary driver of ionospheric dynamics though the measurement record is sparse. The IVM is the only ionospheric instrument on ICON and measures thermal plasma properties at the satellite location such as density, composition, temperature, and motion. Dr. Stoneback developed the IVM software as well as methods and software to enable comparisons between the neutral (remote location) and plasma (satellite location) measurements. IVM measurements, after transformation into a numerically determined geomagnetic frame, will be scaled along the geomagnetic field onto a reference altitude coincident with the neutral measurements. These comparisons are fundamental to achieving mission success. Co-I duties include those of the PI though the PI retains final responsibility.

Mission PI on DAWN CubeSAT (Phase 1 Previously Funded 2018 - Resubmitted 2019)

DAWN seeks to gain a better understanding of thermosphere ionosphere connections at sunrise. DAWN includes a novel neutral atmosphere instrument capable of measuring winds at the satellite location called SANDS. Dr. Stoneback conceived and led the development of this new instrument suitable for CubeSats. The last successful in-situ neutral wind instrument flew in 1982 on Dynamics Explorer 2, a much larger satellite with a larger budget. SANDS improves upon the last instrument with much smaller volume, mass, and power, as well as improved accuracy. The design is simpler, more robust, requires fewer motors, and does not employ a magnetic field that can inhibit plasma measurements by the IVM. The PI is responsible for all aspects of the mission.

IVM Instrument Co-I on COSMIC-2 constellation

COSMIC-2 is a constellation of six satellites, each with an IVM as well as an instrument designed to use GPS signals for weather prediction (NOAA). The IVM will measure properties of the ionosphere to support operational space weather models run by the Air Force. Under disturbed conditions, the ionosphere interferes with communications between the ground and space-based resources. In addition to normal Co-I duties, Dr. Stoneback developed the software that translates the raw measurements into geophysical parameters that accurately reflect the ionosphere. Dr. Stoneback has also developed a novel machine learning processing system to integrate both GPS and IVM measurements into a cohesive real-time specification of the ionosphere.

IVM Instrument Co-I on NASA/INPE SPORT

Collaborative mission with Brazil to better understand dynamic phenomena in the ionosphere. This mission utilizes the instrument design and software developed by Dr. Stoneback as part of the SORTIE mission. SPORT is planning to use pysat as a mission wide framework to assist in developing, testing, validating, and running instrument processing software.

Articles in refereed journals

1. **Stoneback R. A.**, Burrell A. G., Klenzing J., Smith J. (2023), The pysat ecosystem. *Frontiers in Astronomy and Space Sciences*, https://doi.org/10.3389/fspas.2023.1119775.

2. Immel, T.J., B. Harding, R. A. Heelis, A. Maute, J. Forbes, S. England, S. Mende, C. Englert, **R. A. Stoneback**, et al. (2021), Regulation of ionospheric plasma velocities by thermospheric winds. *Nature Geoscience 14, 893–898,* https://doi.org/10.1038/s41561-021-00848-4.

3. Forbes, J., R. A. Heelis, X. Zhang, C. Englert, B. Harding, M. He, J. Chau, **R. A. Stoneback**, et al (2021), Q2DW-Tide and -Ionosphere Interactions as Observed From ICON and Ground-Based Radars, *Journal of Geophysical Research: Space Physics, 126, 11,* https://doi.org/10.1029/2021JA029961.

4. Forbes, J., X. Zhang, R. A. Heelis, **R. A. Stoneback**, et al (2021), Atmosphere-Ionosphere (A-I) Coupling as Viewed by ICON: Day-to-Day Variability Due to Planetary Wave (PW)-Tide Interactions, *Journal of Geophysical Research: Space Physics, 126, 6,* https://doi.org/10.1029/2020JA028927.

5. Hsu, C.-T., T. Matsuo, A. Maute, **R. Stoneback**, C.-P. Lien (2021), Data-Driven Ensemble Modeling of Equatorial Ionospheric Electrodynamics: A Case Study During a Minor Storm Period Under Solar Minimum Conditions, *Journal of Geophysical Research: Space Physics, 126, 7,* https://doi.org/10.1029/2020JA028539.

6. Giday N. M,. Katamzi-Joseph, Z. T., and **R. A. Stoneback** (2020), Effect of moderate geomagnetic storms on equatorial plasma bubbles over eastern Africa in the year 2012: Evolution and electrodynamics, *Advances in Space Research*, 65, 7, https://doi.org/10.1016/j.asr.2020.01.013.

7. Burrell, A.G., J. Klenzing, A. Halford, **R. A. Stoneback**, A.C. Kellerman, A.M. Annex, J. Ma, D. Stansby, K.M. Laundal, S. K. Morley, (2018), Snakes on a Spaceship -- An Overview of Python in Heliophysics. *Journal of Geophysical Research: Space Physics, 123, 10,384-10,402.* https://doi.org/10.1029/2018JA025877

8. **Stoneback, R. A.**, Burrell, A. G., Klenzing, J., & Depew, M. D. (2018), PYSAT: Python Satellite Data Analysis Toolkit. *Journal of Geophysical Research: Space Physics (Cover Article)*, 123, 5271–5283. https://doi.org/10.1029/2018JA025297

9. Burrell, A. G., Perry, G. W., Yeoman, T. K., Milan, S. E., & **Stoneback, R.** (2018), Solar influences on the return direction of high-frequency radar backscatter. *Radio Science*, 53, 577–597. https://doi.org/10.1002/2017RS006512

10. Chaitanya, P., A. K. Patra, Y. Otsuka, T. Yokoyama, M. Yamamoto, **R. A. Stoneback**, and R. A. Heelis (2017), Daytime zonal drifts in the ionospheric 150 km and E regions estimated using EAR observations, *J. Geophys. Res. Space Physics*, 122, 9045–9055, doi: 10.1002/2017JA024589.

11. Heelis, R.A., **R. A. Stoneback,** M.D. Perdue et al. (2017), Ion Velocity Measurements for the Ionospheric Connections Explorer, *Space Sci Rev* 212: 615. https://doi.org/10.1007/s11214-017-0383-3

12. Chaitanya, P., A. K. Patra, Y. Otsuka, T. Yokoyama, M. Yamamoto, **R. A. Stoneback**, and R. A. Heelis (2017), Daytime zonal drifts in the ionospheric 150 km and E regions estimated using EAR observations, *J. Geophys. Res. Space Physics*, 122, 9045–9055, doi: 10.1002/2017JA024589.

13. Akalaa, A. O., A. H. Ejalonibu, P. H. Doherty, S. M. Radicella, K. Groves, C. S. Carrano, C. T. Bridgwood, **R. A. Stoneback** (2016), Characterization of GNSS Amplitude Scintillations over Addis Ababa, Ethiopia: 2009–2013, *Advances in Space Research*, dor:10.1016/j.asr.2017.01.044

14. Hairston, M., W. R. Coley, and **R. A. Stoneback** (2016), Responses in the polar and equatorial ionosphere to the March 2015 St. Patrick Day storm, *J. Geophys. Res. Space Physics*, 121, 11,213–11,234, doi:10.1002/2016JA023165.

15. Fang, T.-W., R. A. Akmaev, **R. A. Stoneback**, T. Fuller-Rowell, H. Wang, F. Wu, (2016) Impact of midnight thermosphere dynamics on the equatorial ionospheric vertical drifts: Impact of MTM on nighttime ion drift, *J. Geophys. Res. Space Physics*, 119(5), 3777–3788, doi:10.1002/2013JA019732.

16. Rodrigues, F. S., J. M. Smith, M. Milla, and **R. A. Stoneback** (2015), Daytime ionospheric equatorial vertical drifts during the 2008-2009 extreme solar minimum, *J. Geophys. Res. Space Physics*, 119, doi:10.1002/2014JA020478.

17. Coley, W. R., **R. A. Stoneback**, and R. A. Heelis (2014), Topside equatorial zonal ion velocities measured by C/NOFS during rising solar activity, *Annales Geophysicae*, *32*, 69–75, doi:10.5194/angeo-32-69-2014.

18. Hairston, M. R., N. Maruyama, W. R. Coley, and **R. A. Stoneback** (2014), Storm time meridional flows: a comparison of CINDI observations and model results, *Annales Geophysicae*, 32, 659-668, doi:10.5194/angeo-32-659-2014.

19. Klenzing, J., O. de La Beaujardière, L. C. Gentile, J. Retterer, F. S. Rodrigues, and **R. A. Stoneback** (2014), Preface C/NOFS results and equatorial ionospheric dynamics, *Annales Geophysicae*, 32(1), 1303–1303, doi:10.5194/angeo-32-1303-2014.

20. Patra, A. K., P. P. Chaitanya, Y. Otsuka, T. Yokoyama, M. Yamamoto, **R. A. Stoneback**, and R. A. Heelis (2014), Vertical ExB drifts from radar and C/NOFS observations in the Indian and Indonesian sectors: Consistency of observations and model, *J. Geophys. Res. Space Physics*, 119(5), 3777–3788, doi:10.1002/2013JA019732.

21. **Stoneback, R. A.** and R. A. Heelis (2014), Identifying equatorial ionospheric irregularities using in situ ion drifts, *Annales Geophysicae*, 32, 421-429, doi:10.5194/angeo-32-421-2014.

22. Yizengaw, E., M. B. Moldwin, E. Zesta, C. Mbane, B. Damtie, A. Mebrahtu, B. Rabiu, C. Valladares, and **R. A. Stoneback** (2014), The longitudinal variability of equatorial electrojet and vertical drift velocity, *Annales Geophysicae, 32, 231-238, doi:10.5194/angeo-32-231-2014,*

23. Hairston, M. R., W. R. Coley, and **R. A. Stoneback** (2013), Vertical and meridional equatorial ion flows observed by CINDI during the 26 September 2011 storm, *J. Geophys. Res. Space Physics*, *118*(8), 5230–5243, doi:10.1002/jgra.50411.

24. Huang, C. Y., P. A. Roddy, E. K. Sutton, **R. A. Stoneback**, R. F. Pfaff, L. C. Gentile, and S. H. Delay (2013), Ion-neutral coupling during deep solar minimum, *Journal of Atmospheric and Solar-Terrestrial Physics*, *103*, 138–146, doi:10.1016/j.jastp.2012.11.009.

25. Ngwira, C. M., J. Klenzing, J. Olwendo, F. M. D'ujanga, **R. A. Stoneback**, and P. Baki (2013), A study of intense ionospheric scintillation observed during a quiet day in the East African low-latitude region, *Radio Science*, *48*(4), 396–405, doi:10.1002/rds.20045.

26. **Stoneback, R. A.**, N. K. Malakar, D. J. Lary, and R. A. Heelis (2013a), Specifying the equatorial ionosphere using CINDI on C/NOFS, COSMIC, and data interpolating empirical orthogonal functions, *J. Geophys. Res. Space Physics*, *118*, doi:10.1002/jgra.50596.

27. **Stoneback, R. A.** , R. A. Heelis, R. G. Caton, Y. J. Su, and K. M. Groves (2013b), In situ irregularity identification and scintillation estimation using wavelets and CINDI on C/NOFS, *Radio Science*, *48*(4), 388–395, doi:10.1002/rds.20050.

28. Su, Y.-J., J. M. Retterer, R. G. Caton, **R. A. Stoneback**, R. F. Pfaff, and P. A. Roddy (2013), Air Force low-latitude ionospheric model in support of the C/NOFS mission, edited by J. D. Huba, R. W. Schunk, and G. Khazanov, *AGU monograph*, 201, 107–117.

29. Araujo-Pradere, E., T.-W. Fang, D. N. Anderson, M. Fedrizzi, and **R. A. Stoneback** (2012), Modeling the daytime, equatorial ionospheric ion densities associated with the observed, four-cell longitude patterns in E × B drift velocities, *Radio Science*, *47*, RS0L12, doi:10.1029/2011RS004930.

30. Bernhardt, P. A. et al. (2012), Ground and space-based measurement of rocket engine burns in the ionosphere, *IEEE Trans. Plasma Sci.*, *40*(5), 1267–1286, doi:10.1109/TPS.2012.2185814.

31. Burrell, A. G., R. A. Heelis, and **R. A. Stoneback** (2012), Equatorial longitude and local time variations of topside magnetic field-aligned ion drifts at solar minimum, *J. Geophys. Res. Space Physics*, *117*, A04304, doi:10.1029/2011JA017264.

32. Haaser, R. A., G. D. Earle, R. A. Heelis, J. Klenzing, **R. A. Stoneback**, W. R. Coley, and A. G. Burrell (2012), Characteristics of low-latitude ionospheric depletions and enhancements during solar minimum, *J. Geophys. Res. Space Physics*, *117*(A), 10305, 10.1029/2012JA017814.

33. Huang, C., S. H. Delay, P. A. Roddy, E. K. Sutton, and **R. A. Stoneback** (2012), Longitudinal structures in the equatorial ionosphere during deep solar minimum, *Journal of Atmospheric and Solar-Terrestrial Physics*, 90-91, 156-163, doi:10.1016/j.jastp.2012.04.012.

34. **Stoneback, R. A.**, R. L. Davidson, and R. A. Heelis (2012), Ion drift meter calibration and photoemission correction for the C/NOFS satellite, *J. Geophys. Res. Space Physics*, *117*, A08323, doi:10.1029/2012JA017636.

35. Araujo-Pradere, E., D. N. Anderson, M. Fedrizzi, and **R. A. Stoneback** (2011), Communications/Navigation Outage Forecasting System observational support for the equatorial E× B drift velocities associated with the four-cell tidal structures, *Radio Science*, *46*, RS0D09, doi:10.1029/2010RS004557.

36. Aveiro, H. C., D. L. Hysell, R. G. Caton, K. M. Groves, J. Klenzing, R. F. Pfaff, **R. A. Stoneback**, and R. A. Heelis (2012), Three-dimensional numerical simulations of equatorial spread F: Results and observations in the Pacific sector, *J. Geophys. Res. Space Physics*, *117*(A3), A03325, doi:10.1029/2011JA017077.

37. Burrell, A. G., R. A. Heelis, and **R. A. Stoneback** (2011), Latitude and local time variations of topside magnetic field-aligned ion drifts at solar minimum, *J. Geophys. Res. Space Physics*, *116*, A11312, doi:10.1029/2011JA016715.

38. Klenzing, J. H., D. E. Rowland, R. F. Pfaff, G. Le, H. Freudenreich, R. A. Haaser, A. G. Burrell, **R. A. Stoneback**, W. R. Coley, and R. A. Heelis (2011), Observations of low-latitude plasma density enhancements and their associated plasma drifts, *J. Geophys. Res. Space Physics*, *116*(A9), A09324, doi:10.1029/2011JA016711.

39. **Stoneback, R. A.**, R. A. Heelis, A. G. Burrell, W. R. Coley, B. G. Fejer, and E. Pacheco (2011), Observations of quiet time vertical ion drift in the equatorial ionosphere during the solar minimum period of 2009, *J. Geophys. Res. Space Physics*, *116*, A12327, doi:10.1029/2011JA016712.

40. Heelis, R. A., **R. A. Stoneback**, G. D. Earle, R. A. Haaser, and M. A. Abdu (2010), Medium-scale equatorial plasma irregularities observed by Coupled Ion-Neutral Dynamics Investigation sensors aboard the Communication Navigation Outage Forecast System in a prolonged solar minimum, *J. Geophys. Res. Space Physics*, *115*, A10321, doi:10.1029/2010JA015596.

41. **Stoneback, R. A.** (2010), The Dipole Impedance of an Aperture, *Progress In Electromagnetics Research,* 26, 401-423, doi:10.2528/PIERB10062406.

Invited Presentations as First Author

1. **Stoneback, R. A.,** Science as Art, NASA Heliophysics Science Division Seminar, July 2022

2. **Stoneback, R. A.,** Exploring the Universe using Science as Art, CEDAR Workshop Banquet, June 2022, Austin, TX

3. **Stoneback, R. A.,** Benefitting from Constellation Data using pysat, AGU Dec 2019, San Francisco, CA.

4. **Stoneback, R. A.,** Vertically Integrated Space Science, NASA Goddard Space Flight Center, August 2019, Washington DC

5. **Stoneback, R. A.,** Vertically Integrated Space Science, Air Force Research Lab, July 2019, Albuquerque, NM

6. **Stoneback, R. A.,** Vertically Integrated Space Science, Naval Research Lab, April 2019, Albuquerque, NM

7. **Stoneback, R. A. a**nd A. G. Burrell (2018), Pysat and DINEOFs: A next-generation space weather framework, NASA Seminar, Goddard Space Flight Center, MD.

8. **Stoneback, R. A.** (2018), Development and Integration Plan for HelioPhysics, NASA HelioPhysics Workshop, Boulder, CO.

9. **Stoneback, R. A.** (2017), CubeSats: The Future of Space Science, AIAA Meeting, Richardson, TX.

10. **Stoneback, R. A.** (2017), The Intersection of Space and Music, University of Dallas, TX.

11. **Stoneback, R. A.** and R. A. Heelis (2013), The evolution of irregularity occurrence from low to moderate solar activity, AGU Fall Meeting, San Francisco, CA.

12. **Stoneback, R. A.** (2011), Seasonal meridional drifts and the occurrence of irregularities observed by C/NOFS, CEDAR, Sante Fe, NM.

13. **Stoneback, R. A.** and R. A. Heelis (2010), Seasonal variations in equatorial ion drifts measured by C/NOFS, AGU Fall Meeting, San Francisco, CA.

Conference Organization

1. **Stoneback, R. A.**, A. G. Burrell, J. Klenzing (2016 - 2022), Snakes on a Spaceship. Created and chaired a new session at the CEDAR Workshop to provide a platform for open source science software. Dr. Stoneback has contributed presentations to each session over 7 years.

2. **Stoneback, R. A.**, (2022), Science as Art. Created and chaired a new session at the CEDAR Workshop to provide a platform for artistic expressions using science.

3. Barnum, J., S. Polson, **R. A. Stoneback,** A. Roberts, et al (June 2022), Python in Heliophysics Community (PyHC) Summer School. Inaugural summer school to introduce the broader community to the software within PyHC. Hosted at the European Space Astronomy Center in Madrid, Spain.

4. Beaujardière, O., P. Doherty, L. Gentile, Chaosong Huang, Cheryl Huang, J. Klenzing, T. Pedersen, J. Retterer, P. Roddy, F. Rodrigues, **R. A. Stoneback** and Y.-J. Su (March 2013), Workshop on C/NOFS Results and Equatorial Dynamics, Albuquerque, NM. Conference and Session Organizer.

5. Coster, A. J., E. Yizengaw, R. L. Bishop and **R. A. Stoneback** (2012), Fall American Geophysical Union (AGU) meeting, SA013. The Equatorial Ionosphere: Drivers and Coupling Processes, San Francisco, CA. Session Organizer.

Journal special issues edited or co-edited

1. Pinnock, M., J. Klenzing, J. Retterer, L. C. Gentile, **R. A. Stoneback**, O. De La Beaujardière, and F. S. Rodrigues (2014), C/NOFS results and equatorial ionospheric dynamics, *Annales Geophysicae - Special Issue*.

External funding for original investigations

1. Collaborative Research: Inferring High Latitude Convection Patterns Using SuperDARN, DMSP and ACE
Stoneback, R. A., M. Hairston, W. Coley, J. Baker
6/2013 - 6/2016, $314,609

2. Scintillation Observations and Response of The Ionosphere to Electrodynamics (SORTIE)
Crowley, G., **R. A. Stoneback**, C. Huang
NASA
1/2014 - 6/2018, $300,000

3. Collaborative Research: CEDAR--Assimilative Analysis of Low- and Mid-latitude Ionospheric Electrodynamics
Matsuo, T., **R. A. Stoneback**, A. Maute
National Science Foundation
6/2017 - 6/2019, $89,243

4. Post-midnight equatorial F region plasma irregularities
Stoneback, R. A., F. Rodrigues, J. Krall, J. Hubs
NASA
6/2018 - 5/2021, $390,000

5. DAWN: Understanding Ion-Neutral Coupling and Electrodynamics of the Earth's Ionosphere at Dawn
Stoneback, R. A., F. Rodrigues, R. A. Heelis
NASA
2/2019 - 1/2023, $3,817,853
Phase A Awarded - $40,000

6. Neutral Wind Measurements from a CubeSat
Stoneback, R. A.
NRL SBIR in collaboration with ASTRA
1/2019 - 6/2019, Phase A Awarded - $40,000

7. pysat and DINEOFs: A Generalized Space Weather System
Stoneback, R. A.
NRL BAA
2019 - 2022, ~$500,000

8. Scintillation Prediction Observations Research Task (SPORT)
Heelis, R. A. , **R. A. Stoneback**
NASA, ~$500,000

9. Ionospheric Connections Explorer (ICON)
Heelis, R. A., **R. A. Stoneback**
NASA, ~$5,000,000

10. COSMIC-2/Formosat-7
Heelis, R. A., **R. A. Stoneback**
NOAA/Air Force, ~$5,000,000

11. COUSIN Rocket
NASA, ~$500,000

Classroom teaching

1. 2021, Spring, Phys 1301, Physics 1, Mechanics, Algebra based

2. 2019, Fall, PHYS 5322, Electromagnetism II, Graduate Level

3. 2019, Spring, Phys 1301, Physics 1, Mechanics, Algebra based

4. 2018, Fall, PHYS 2326, Physics 2, Electricity and Magnetism, Calculus based

5. 2018, Spring, PHYS1301, Physics 1, Mechanics, Algebra based
6. 2017, Fall, PHYS 2326, Physics 2, Electricity and Magnetism, Calculus based
7. 2017, Spring, PHYS 1301, Physics 1, Mechanics, Algebra based