

## Elizabeth A. MacDonald

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### Research Experience Narrative

Dr. MacDonald is a proven team leader who has been studying aurora, magnetosphere-ionosphere coupling, and associated spacecraft instrumentation for 19 years. Her experience ranges over the complete cycle of instrument production and scientific analysis, including design and modeling, integration and testing, satellite operations, and in situ scientific data analysis. These skills and a keen research interest in the near-Earth plasma environment allow her to make key contributions to technology development, magnetospheric science, and space weather national priorities. She has founded and led the interdisciplinary, innovative, global, real-time Aurorasaurus project, the world's first citizen science project relating to the auroras.

### Research Interests

Plasma mass spectrometry and instrument technology development; wave-particle interactions and the effect of plasma on radiation belt dynamics; mapping and coupling between the ionosphere and the inner magnetosphere; aurora; the impact of heavy ions on geomagnetic storm processes; space weather

### Professional Experience

**Research Space Physicist**, Heliophysics Science Division, GSFC 2014–present

**Program Scientist**, Heliophysics Division/SMD, NASA Headquarters 2016-present

Dr. MacDonald is detailed to NASA HQ with a focus on instrument technology, magnetospheric and ionospheric science, and space weather. In 2014-15 she served as the Deputy Product Lead for the Dual Ion Spectrometers segment of the Fast Plasma Investigation for the recently launched Magnetospheric MultiScale (MMS) mission. She serves as a Co-I on the NASA Van Allen Probes team and as the Goddard lead on the Aurorasaurus project. She is a member of the Federal Community of Practice on Crowdsourcing and Citizen Science and the NASA Community of Practice on Citizen Science. She also led a small internal R&D project scoping low TRL thermal plasma instrumentation for new missions.

- Committee on Solar and Space Physics, National Academies of Science (2014-16)
- Recent NASA training: Leading Teams for Influence, Science Communication
- Co-I of GSFC recently selected Heliophysics CAN Education proposal (~\$4M/yr)

**Team Lead**, Space Science and Applications (ISR-1), Los Alamos National Lab. 2005-2014

At Los Alamos Dr. MacDonald served as a team leader for her group, and the principal investigator for 3 DOE-funded plasma mass spectrometer instruments and one project team. As High Altitude Space Monitoring (HASM) program Chief Scientist for the Space Environment she led and coordinated data exploitation efforts, new host specifications, and scope assessment for meeting mission requirements to measure the space environment at geosynchronous orbit. Since 2005 served as a key team member and led instrument design and validation for the Helium, Oxygen, Proton, and Electron Spectrometer on the NASA Van Allen Probes mission and was recognized as an RBSP-ECT Co-Investigator in 2011.

**Affiliate Research Scientist**, New Mexico Consortium, Los Alamos, NM 2012–present  
Founder of the first website, Aurorasaurus.org, to combine social media and citizen science to forecast the visibility of the aurora for the solar maximum. Interviewed by the Diane Rehm show, Wired MapLabs, and many other media sources. Led creation of a global, agile, extensible, open source, real-time, alerting GIS platform for citizen science and crowd-sourcing via the web, iOS and Android apps.

#### Education

**BS, Physics**, University of Washington, Seattle, WA, USA

**PhD, MS Physics**, University of New Hampshire, Durham, NH, USA

#### Honors

**NASA Group Achievement Award** – Fast Plasma Investigation Team, MMS

**Aurorasaurus Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) award** - \$1M funding from Geospace, Human Centered Computing, and Informal Science Education programs

**NASA Group Achievement Award** – Van Allen Probes Project Team

**LANL Large Team Distinguished Performance Award** (2 times)

**Los Alamos Awards Program** recognition (3 times)

**NASA Graduate Student Researchers Program (GSRP)** fellowship

**New Hampshire NASA Space Grant Consortium** graduate fellowship

**Washington NASA Space Grant Consortium** scholarship

#### Professional Societies

**American Geophysical Union**, since 1998; **Citizen Science Association**, since 2014

**Selected Work** (for full list see: <http://scholar.google.com/citations?user=kwXywwzkAAAAJ&hl=en>)

MacDonald, E. A., and Dixon, P. et al., **Multipoint observations of the open-closed field line boundary as observed by the Van Allen Probes and geostationary satellites during the November 14th 2012 geomagnetic storm**, J. Geophys. Res., 2015.

MacDonald, E. A., N. A. Case, et al., **Aurorasaurus: A citizen science platform for viewing and reporting the aurora**, Space Weather, doi: 10.1002/2015SW001214, 2015.

Case, N. A., E. A. MacDonald, et al., **Mapping Auroral Activity with Twitter**, GRL, 42, 2015.

Spence, H. E., G. D. Reeves (+36 co-authors), **Science Goals and Overview of the Energetic Particle, Composition, and Thermal Plasma (ECT) Suite on NASA's Radiation Belt Storm Probes (RBSP) Mission**, Space Science Reviews, 2013.

Funsten, H. O., R. M. Skoug, A. A. Guthrie, E. A. MacDonald (+14 coauthors), **Helium, Oxygen, Proton, and Electron (HOPE) Mass Spectrometer for the Radiation Belt Storm Probes Mission**, Space Sci. Rev., 2013.

MacDonald, E., et al., **New Magnetospheric Ion Composition Measurement Techniques, FUTURE PERSPECTIVES OF SPACE PLASMA AND PARTICLE INSTRUMENTATION AND INTERNATIONAL COLLABORATIONS**: Proc. of the Int. Conference, AIP, 1144, 2009.

MacDonald, E. A., M. H. Denton, M. F. Thomsen, and S. P. Gary, **Superposed epoch analysis of a whistler instability criterion at geosynchronous orbit during geomagnetic storms**, J. Atmos. and Solar-Terr. Phys., 70, 2008.

MacDonald, E., K. A. Lynch, M. Widholm, R. Arnoldy, P. M. Kintner, E. M. Klatt, M. Samara, J. LaBelle, and G. Lapenta, **In Situ Measurement of Thermal Electrons on the SIERRA Nightside Auroral Sounding Rocket**, J. Geophys. Res., 111, 2006.