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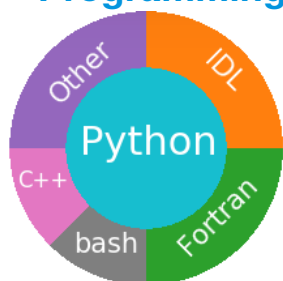
Email

magnus.haw@nasa.gov

Website

magnushaw.info

Programming



github: [magnus-haw](https://github.com/magnus-haw)

Certifications

UBC Machine Shop
Laser Safety

MagnusHaw

Plasma Physicist

Early career scientist with expertise in thermal, magnetic, and optical diagnostics, pulsed power electronics, experimental validation of computational models, and machine learning.

Employment

11/22 -

Aerospace Engineer

[NASA ARC, TSM](#)

Transferred to civil service position, continued development of arc jet diagnostics, data infrastructure, and analysis tools. Supporting MSR-EEV project as arcjet PI and via development/application of new method for automated 3D quantification of woven TPS properties

10/19-11/22 **Plasma Physicist**

[NASA ARC, Analytical Mechanics Associates](#)

Diagnostic development for arc jet uncertainty quantification (TC anomaly mitigation, high speed multi-channel spectroscopy, optically isolated diagnostics), development/validation of Arc Heater Simulator (ARHeS) code, invention of liquid metal MHD-micropumps, development of computer vision software for time-resolved TPS recession measurements, and machine learning data infrastructure development for arc jet facilities.

8/18 - 10/19 **Research Associate**

[NASA ARC, Science and Technology Corporation](#)

Developed custom high-speed (MHz) magnetic diagnostics for arcjet column which validated predictions of magnetic instabilities. Also developed data acquisition system and provided diagnostic support/development for the miniature Arcjet Research Chamber (mARC) facility.

Education

2012 - 2018 **PhD in Applied Physics, Caltech**

Main subject: Experimental Plasma Physics

2012 - 2015 **Masters in Applied Physics, Caltech**

Main subjects: Plasma Physics, Mathematics

2008 - 2012 **Bachelor of Science in Honors Physics, University of British Columbia**

Main subjects: Physics, Mathematics

Honors/Awards

June 2021 **NASA Early Career Public Achievement Medal**

Awarded for development of computer vision segmentation software.

Dec 2020 **AMA Innovation Award 2020**

Awarded for development of computer vision segmentation software.

2020 - 2021 **NASA Ames, Center Innovation Fund 2021 Award**

1 yr award to develop machine learning data infrastructure for arc jets.

2013 - 2018 **NSF Graduate Research Fellowship**

Competitive 5 year US fellowship for doctoral study at US institutions

2012 - 2015 **NSERC Postgraduate Scholarship- Doctorate**

Competitive 3 year Canadian fellowship for doctoral study

Journal Publications

C. Johnston*, M. Haw

Impact of Thermoelectric-Driven Flowfield Voltages on Thermocouples for Ablating Reentry Vehicles

JTHT Vol. 36, 3 (2021); doi:10.2514/1.T6424

B. Seo*, P. Wongwaitayakornkul, M. Haw, R. Marshall, H. Li, P.M. Bellan

Determination of a macro- to micro-scale progression leading to a magnetized plasma disruption

Phys. Plasmas Vol. 27, 2 (2020); doi:10.1063/1.5140348

P. Wongwaitayakornkul*, M. Haw*, H. Li, P.M. Bellan

Magnetically Induced Current Piston for Generating Extreme-Ultraviolet Fronts in the Solar Corona

Astrophys. J. 874, 2 (2019); doi:10.3847/1538-4357/ab09f2

M. Haw*, B. Seo, P.M. Bellan

Laboratory Measurement of Large-Amplitude Whistler Pulses Generated by Fast Magnetic Reconnection

Geophys. Res. Lett. Vol. 46, 13 (2019); doi:10.1029/2019GL082621

M. Haw*, P. Wongwaitayakornkul*, H. Li, P.M. Bellan

Reverse Current Model for Coronal Mass Ejection Cavity Formation

Astrophys. J. Lett. 862, 2 (2018); doi:10.3847/2041-8213/aad33c

P. Wongwaitayakornkul, M. Haw*, H. Li, S. Li, P.M. Bellan

Apex Dips of Experimental Flux Ropes: Helix or Cusp?

Astrophys. J. 848, 2 (2017); doi:10.3847/1538-4357/aa8990

M. Haw*, P.M. Bellan

MHD collimation mechanism in arched flux ropes characterized using volumetric, time-dependent B-vector measurements

Geophys. Res. Lett. Vol. 44, 19 (2017); doi:10.1002/2017GL074505

M. Haw*, P.M. Bellan

1D fast coded aperture camera

Rev. of Sci. Instr. 86, 043506 (2015); doi:10.1063/1.4917345

M. Semczuk*, X. Li, W. Gunton, M. Haw, et al.

High resolution photoassociation spectroscopy of the ${}^6\text{Li}_2\ 3\Sigma_g^+$ state

Phys. Rev. A. 87 (2013); doi:10.1103/PhysRevA.87.052505

M. Haw, N. Evetts, W. Gunton, J.V. Dongen, J.L. Booth*, and K.W. Madison

Magneto-optical trap loading rate dependence on trap depth and vapor density

JOSA B, Vol. 29, Issue 3, pp. 475-483 (2012); doi:10.1364/JOSAB.29.000475

* indicates corresponding author

Theses

PhD: Experimental and Numerical Studies of Cavities, Flows, and Waves in Arched Flux Ropes

Caltech

- Developed suite of high speed (20 MHz) magnetic, optical, and electronic diagnostics for pulsed plasma experiments
- Measured 3D time dependent magnetic field of pulsed plasma experiment and used data to verify a proposed collimation mechanism in flux ropes.
- Adapted 3D magnetohydrodynamic code from Los Alamos National Lab to simulate flux rope experiments.
- Developed theory to explain 3-part structure of coronal mass ejections.
- Measured high-frequency whistler wave pulses excited by magnetic reconnection.

BSc: New Vibrational Levels of ${}^6\text{Li}_2$

University of British Columbia

- Measured 7 new vibrational levels of the ${}^6\text{Li}_2$ 1st excited potential using TiSaph-laser photoassociation- spectroscopy in cold atom traps.
- Developed LabView data acquisition code and a Python server for wavemeter.

Additional Research Experience

- 5/11 - 9/11 **UBC Quantum Degenerate Gas Laboratory** Vancouver, BC
Worked with Dr. James Booth to experimentally verify the predominant loading model of vapor cell MOTs (Reif model), by measuring loading rate as a function of trap depth and background gas density.
- 5/10 - 8/10 **UBC Numerical Relativity Group** Vancouver, BC
Worked with Dr. Matthew Choptuik and Dr. Jeremy Heyl on porting visualization software to Qt and benchmarking GPU's against cluster performance for CUDA simulations of neutron star crust cracking.
- 5/09 - 8/09 **Carnegie Observatories Summer Research Assistant** Pasadena, CA
Worked with Dr. Barry Madore to create a database of legacy Cepheid variable photometry from text recognition scans of old publications (1910-1970) in preparation for an improved estimate of the Hubble constant.
- 7/08 - 9/08 **JPL Student Summer Internship** Pasadena, CA
Worked with Dr. Julie Castillo-Rogez to constrain conditions for differentiation of small icy bodies using dynamical modeling. BAAS abstract: <http://adsabs.harvard.edu/abs/2008DPS....40.5804C>.

Conference Presentations

- A. Quintart and M. Haw* (Jan 2023) ArcjetCV: a new machine learning application for extracting time-resolved recession measurements from arc jet test videos. AIAA SciTech, National Harbor, MD (paper/talk)
- M. Haw*, M. E. MacDonald, S. V. Colom (Jan 2023) Big-data Efficient and Automated Science Transfer (BEAST): an open-source software architecture for arc jet data management, modeling, and automation. AIAA SciTech, National Harbor, MD (paper/talk)
- S. V. Colom*, M. Haw (Jan 2023) Open-source Wireless Sensor Network (Wi-Se Net) for Flexible Deployment. AIAA SciTech, National Harbor, MD (paper/talk)

K. Chennakesavan, A. Quintart, M. Haw* (Jan 2023) 1D-Convolutional Neural Network Architecture for Generalized Time-Segmentation Tasks. AIAA SciTech, National Harbor, MD (paper/talk)

M. Haw*, J. Santos, J. Mach (Aug 2022) Thermocouple anomalies: mechanisms, interpretation, and mitigation. IPPW, Santa Clara, CA (talk)

M. Haw*, J. Santos, J. Mach (Jun 2021) A survey of thermocouple anomalies: mechanisms, interpretation, and mitigation. NSMMS-CRASTE, VA (talk)

G. Palmer*, M. Haw (Jan 2021) The Impact of Electrostatic Forces on Dust Particles during Martian Entry. AIAA SciTech, Virtual meeting (paper/talk)

M. Haw* (Nov 2020) Measurement of Material Recession and Shock Standoff in Plasma Windtunnel using Neural Nets. APS Division of Plasma Physics Annual Meeting, Virtual meeting (poster)

M. Haw*, J. Meurisse, S. Visser, S.F. Izquierdo, J.C. Schulz, N.N. Mansour (Jan 2020) Preliminary Measurements of the Motion of Arcjet Current Channel Using Inductive Magnetic Probes. AIAA SciTech, Orlando, FL (paper/talk)

M. Haw* (Nov 2019) Simulating Flux Ropes as Systems of Current Carrying Wires. APS Division of Plasma Physics Annual Meeting, Ft. Lauderdale, FL (talk)

M. MacDonald*, D. Philippidis, T. Ho, M. Haw, J. Hartman, M. McGlaughlin (Jun 2019) Build-up of the second-generation 30 kW miniature arc jet (mARC II) at NASA Ames Research Center. AIAA Aviation, Dallas, TX (paper/talk)

M. Haw*, P. Wongwaitayakornkul, P.M. Bellan (November 2018) A model for how induced reversed-currents form the 3-part CME structure. APS Division of Plasma Physics Annual Meeting, Portland, OR (talk)

M. Haw*, P.M. Bellan (November 2018) Laboratory measurement of whistler wave pulse from impulsive reconnection. APS Division of Plasma Physics Annual Meeting, Portland, OR (poster)

M. Haw*, P. Wongwaitayakornkul, P.M. Bellan (August 2018) A model for how induced reversed-currents form the 3-part CME structure. Solar Heliospheric and Interplanetary Environment Workshop, Cocoa Beach, FL (poster)

M. Haw*, P. Wongwaitayakornkul, P.M. Bellan (July 2018) A model for how induced reversed-currents form cavities above prominences COSPAR 2018, Pasadena, CA (invited talk)

M. Haw*, P. Wongwaitayakornkul, P.M. Bellan (Oct 2017) Apex Dips of Experimental Flux Ropes: Helix or Cusp? APS Division of Plasma Physics Annual Meeting, Milwaukee, WI (talk)

M. Haw*, P.M. Bellan (July 2017) High speed magnetic probe for measurement of wavevector: First Results. Solar Heliospheric and Interplanetary Environment Workshop, Saint-Sauveur, Quebec (poster)

M. Haw*, P. Wongwaitayakornkul, P.M. Bellan (July 2017) MHD simulation of Caltech solar loop. Solar Heliospheric and Interplanetary Environment Workshop, Saint-Sauveur, Quebec (poster)

M. Haw*, P. Wongwaitayakornkul, H. Li, S. Li, P. M. Bellan (June 2017) MHD simulation of Caltech solar loop. Interrelationships between Plasma Experiments in the Laboratory and in Space (IPELS) Meeting, San Diego CA (poster)

M. Haw, P. M. Bellan*, (March 2017) Using measurements of magnetic fields and electric currents in lab and space plasmas to understand the dynamics of what is happening. AFOSR Space Science Review, Arlington, VA (talk)

M. Haw*, P. M. Bellan, (Dec 2016) High speed magnetic probe for measurement of wavevector. AGU Fall Meeting, San Francisco, CA (poster)

M. Haw*, P.M. Bellan, (Nov 2016) Experimental Verification of MHD Flow Mechanism in Arched Flux Ropes Using 3D B-field Measurements. APS Division of Plasma Physics Annual Meeting, San Jose CA (talk)

M. Haw*, K. B. Chai*, X. Zhai, and P. M. Bellan, (Sept 2016) Extreme ultra-violet bursts, particle heating, and whistler wave emission in fast magnetic reconnection induced by kink-driven Rayleigh-Taylor instability and measurements of forces, flows, and collimation in toroidal current channels. US-Japan Compact Torus Meeting, Irvine CA, (talk)

M. Haw*, P.M. Bellan, H. Li, S. Li, (July 2016) Non-conservative forces, density, and flow from 3D B-field measurements. Solar Heliospheric and Interplanetary Environment Workshop, Santa Fe NM (poster)

M. Haw*, P.M. Bellan, (May 2016) 3D Laboratory Measurement of Dynamic Forces in Arched Flux Tubes. High Energy Density Laboratory Astrophysics Conference, Palo Alto, CA (poster)

M. Haw*, P.M. Bellan, (Nov 2015) Laboratory Measurement of 3D Magnetic Reconnection of Arched Flux Tubes. APS Division of Plasma Physics Annual Meeting, Savannah GA (poster)

M. Haw*, P.M. Bellan, (July 2015) Laboratory Measurement of 3D Magnetic Reconnection of Arched Flux Tubes. Solar Heliospheric and Interplanetary Environment Workshop, Stowe VT (poster)

M. Haw*, P.M. Bellan, (Nov 2014) Preliminary Results for Coded Aperture Plasma Diagnostic. APS Division of Plasma Physics Annual Meeting, New Orleans, LA (poster)

M. Haw*, P.M. Bellan, (July 2014) Preliminary Results for Coded Aperture Plasma Diagnostic. Solar Heliospheric and Interplanetary Environment Workshop, Telluride, CO (poster)

M. Haw*, P.M. Bellan, (Nov 2013) Preliminary Results for Coded Aperture Plasma Diagnostic. APS Division of Plasma Physics Annual Meeting, Denver, CO (poster)

M. Haw*, P.M. Bellan, (July 2013) Preliminary Results for Coded Aperture Plasma Diagnostic. Solar Heliospheric and Interplanetary Environment Workshop, Buford, GA (poster)

M. Haw*, N. Evetts, W. Gunton, J.V. Dongen, J. L. Booth, and K.W. Madison. (Oct 2011) Verification of Magneto-optic Trap Loading Model. Canadian Undergraduate Physics Conference (talk and poster)

M. Haw*, J. Castillo-Rogez (Aug 2008) Time of Formation and Chemical Alteration of Small Icy Objects in the Outer Solar System. JPL Student Day presentation. (talk)

R. Sivron*, M. Haw, B. Liu, E. Jin (April 2008) Revised estimate of black hole size using speed of sound in high temperature plasmas. Mid-American Regional Astrophysics Conference, Kansas City, MO (talk)

Other Abstracts/Publications

M. MacDonald*, J. Balboni, C. Cornelison, J. Hartman, M. Haw, E. Fretter, B. Cruden, M. Wilder, H. Hwang, **NASA Ames Thermophysics Ground Test Facilities Supporting Future Planetary Atmospheric Entry, white paper to National Academies Decadal Survey BAAS**, (Sept 2020)

M. Haw, **Single Color Photoassociation Spectroscopy of 6Li_2 and 85Rb_2** . UBC cIRcle repository: <http://hdl.handle.net/2429/43353>. (Undergraduate thesis)

M. Haw, **A8-3 Model Rocket Impulse Measurement.**

UBC cIRcle repository: <http://hdl.handle.net/2429/7905>. (Undergraduate project)

J. Castillo-Rogez*, M. Haw, S. Vance, D. Matson, T. Johnson, **Time of Formation and Chemical Alteration of Small Icy Objects in the Outer Solar System** *BAAS*, Vol. 40, p.503 (2008); <http://adsabs.harvard.edu/abs/2008DPS....40.5804C>

Personal Projects

Off-Grid Refrigerator Built a 200W off-grid solar power system for refrigerator

Laser Engraver Built a laser engraver from e-waste CD drives and RPi microcontroller

WxPython Astronomy app Displays Messier objects visible at specific location, time.

LED Lighting for Star Trek Musical Designed power and control systems for 50k LED's

Django web developer/admin Developed and manage several websites

Teaching Experience

- 10/15 - 6/16 **Teaching Assistant, APH 156: Plasma Physics** [Caltech](#)
Aph 156 is an advanced graduate course in plasma physics. Held weekly office hours, graded assignments, and gave make-up lectures.
- 10/14-10/16 **Swing Dance Instructor** [Caltech Ballroom Dance Club](#)
Taught quarterly 6-week class series and weekly beginner classes.
- 6/12 - 8/12 **Teaching Assistant, Summer Science Program (SSP)** [Santa Barbara](#)
SSP is an advanced summer program for high school seniors; students learn the astrodynamics, programming, and observational astronomy to complete a near-asteroid orbit determination. As a TA, my responsibilities included grading homework and lab books, teaching programming, supervising telescope observations, and acting as a residence adviser.
- 8/12 - 9/12 **Nat'l Park Ranger, Bryce Canyon National Park** [Utah](#)
Worked as part of the astronomy outreach program at Bryce. Led public telescope viewing of stars, planets, & galaxies at night; solar telescope during the day.
- 9/06 - 6/08 **Assistant Instructor for Lego Robotics Class** [Crestview Preparatory School](#)
Co-taught Lego robotics short course (gear trains, basic programming) at elementary school (grades 4-6).