

Marc G. Berthoud

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US Permanent Resident

EDUCATION

Ph.D., Astronomy

January 2008

Cornell University, Ithaca, NY

Thesis Title: CO Emission from the Inner Disk around Intermediate-Mass Stars

Minor field: Geology

GPA: 3.6/4.0

Diploma, Physics

October 1997

Swiss Federal Institute of Technology, Zürich, Switzerland

Thesis Title: ALP-SAT: Scientific Mission Planning for a Micro Satellite

EXPERIENCE

Research Engineer

January 2008 – Present

Engineering Center, University of Chicago – Yerkes Observatory, Williams Bay, WI

Visiting Scholar, Northwestern University, Evanston, IL (starting August 2012)

HAWC+ (High-resolution Airborne Wideband Camera for SOFIA) Instrument Scientist and Software Lead

- Responsible for HAWC+ pipeline development, deployment and commissioning. Developed the Data Reduction Pipeline (DataPipe) framework in Python to implement the HAWC data reduction pipeline. This framework allows automatic data reduction and incorporation of IDL, C and Java code.
- Worked with other developers and scientists to implement the pipeline using DataPipe. Analyzed results from lab and inflight observations to develop new algorithms and diagnostic products. Gathered and responded to user feedback to implement updates and develop new tools. Wrote manuals, verification and validation, and interface control documents.
- Developed and set up the online HAWC Data Viewer online tool to review and analyze FITS data, provide inflight quality control and allow for efficient post-flight data distribution. This software uses Python WSGI scripts on an Apache webserver and JavaScript client-side code.
- Maintained and upgraded the HAWC instrument control software written in Java and Lab View.
- Responsible for planning and executing HAWC instrument tests at Yerkes and JPL and pre-flight characterization tests at NASA Armstrong, focusing on instrument optics and science performance optimization. Responsible for setup and inflight monitoring of data acquisition and reduction systems during commissioning and science flights.
- Built, tested and ran warm electronics and software for HAWC optical system, housekeeping and refrigeration systems. Responsible for development and documentation of room-temperature optical components, wiring and cabling for these systems. Analyzed optical design for system upgrade.
- Set up and maintained data reduction and archiving server at Northwestern. Responsible for successful data transfers and pipeline runs for lab, commissioning and science flight data. Set up and maintained online team collaboration tools.
- Procured, set up and maintained flight computers and instrument network. Ensured remote team access for hardware in access-restricted NASA locations.
- Responsible for licensing of commercial software components.

Research Engineer

March 2017 – Present

Visiting Scholar, Northwestern University, Evanston, IL

ToI TEC Half-Wave Plate (HWP) Electronics and Software Lead

- Designed, built, tested and deployed electronics and software for HWP control, sensor data acquisition and distribution. The system uses a COTS motor driver and encoder with a high-speed data acquisition card controlled by a C program in a Linux PC.
- Developed and managed ToI TEC HWP project schedule.
- Coordinated with ToI TEC instrument team and LMT telescope personnel to develop interfaces and plan system installation.

Educator

September 2011 – Present

Yerkes Observatory, Williams Bay, WI

Mentor and student lab manager

- Developed curriculum, planned and led technology-focused summer camps at Yerkes Observatory, as well as workshops for educators and students in the fields of astronomy, programming and electronics.
- Mentored and supervised college and high school students working on electronics and software projects for Yerkes education, outreach and student science initiatives, including summer camps and Stone Edge Observatory (SEO) data reduction. Managed online documentation for project continuity.
- Adapted the Data Reduction Pipeline framework (DataPype) to reduce SEO data. Deployed the HAWC Data Viewer to distribute SEO data. Set up and ran the SEO automatic data reduction and distribution server. Supported SEO use for University of Chicago astronomy education. Contributed to SEO operating report.

Research Assistant

Summer 1999 – November 2007

Department of Astronomy and Space Sciences, Cornell University, Ithaca, NY

- FORCAST team member (Faint Object infraRed CAmera for the SOFIA airborne Telescope)
- Studied the inner disks around Herbig Ae/Be stars using CO overtone emission.
- Conducted research on asteroid surfaces.
- Developed the control and data acquisition software for a test range for radio antennae.

Teaching Assistant

Fall 1998 – Spring 2003

Department of Astronomy and Space Sciences, Cornell University, Ithaca, NY

Applied Physics Intern

Summer 1996, Spring 1998

Asea Brown Boveri Research Lab, Baden, Switzerland

Applied Physics Intern

Summer 1992, Spring 1993

Swiss Federal Materials Science & Technology Research Institution, Dübendorf, Switzerland

SKILLS AND CERTIFICATIONS

- Expertise in algorithm development for data analysis, real-time data acquisition and process control
- Extensive programming experience with Python (Jupyter, Astropy, Flask), C, C++, LabVIEW, IDL, Java, JavaScript, PHP, Perl, Pascal, SQL, Lisp and IRAF
- Skilled at setting up and managing Linux cloud servers, network accessible drives, Cisco switches, and collaborative spaces using TWiki, Confluence, Slack and GitHub
- Experience with cryogenic and compressed air systems, using equipment from Sensoray, National Instruments, Keithley, Lakeshore and Agilent
- Proficient at designing and building signal distribution electronics and wiring, developing systems with stepper and servo motors, and high-speed data acquisition and systems monitoring
- Familiar with Zemax, Microsoft Project and Mechanical Desktop
- Permanent NASA badge (PIV-2) for Ames Research Center
- Pilot license for small unmanned aircraft. General Class amateur radio license
- Fluent in French, German, and English

LEADERSHIP EXPERIENCE

- Organized and supported outreach activities at Yerkes Observatory as a volunteer (2008-2011)
 - Developed and managed scientific and technological projects for high school interns
 - Led professional development workshops for local teachers
 - Gave public talks about the HAWC instrument and general astronomy
- Member of the "Ask an Astronomer" team, a Cornell student-run website to answer astronomy questions from the general public (curious.astro.cornell.edu) (2000-2011)
- Astronomy Departmental Representative, Cornell Graduate and Professional Student Association
- Treasurer, Swiss Club at Cornell
- Boy scout troop leader, Zürich, Switzerland

PUBLICATIONS

- **Berthoud, M. G.**, Keller, L. D., Herter, T. L., Richter, M. J., Near IR CO overtone emission in 51 Ophiuchi, *ApJ* 660, 461-468 (2007)
- **Berthoud, M. G.**, An equal-area map projection for irregular objects, *Icarus* 175, 382-389 (2005)

CONFERENCE PROCEEDINGS

- **Berthoud, M. G.**, Online Data Reduction and Quicklook Tool for HAWC, *Astronomical Data Analysis Software and Systems XXII*, Astronomical Society of the Pacific Conference Series, Volume 475, p.193 (2013)
- **Berthoud, M.**, Harper, D. A., Hirsch, B., Loewenstein, B., Pernic, R., Sandberg, E., Sandford, D., Sherman, R., Vaillancourt, J. E., Wirth, C., HAWC: The facility far-IR camera for SOFIA, *SOFIA Workshop: Scientific Opportunities for new Instrumentation* (2010)
- Dowell, C. D., Cook, B. T., Harper, D. A., Lin, L., Looney, L. W., Novak, G., Stephens, I., **Berthoud, M.**, Chuss, D. T., Crutcher, R. M., Dotson, J. L., Hildebrand, R. H., Houde, M., Jones, T. J., Krejny, M., Lazarian, A., Moseley, S. H., Tassis, K., Vaillancourt, J. E., Werner, M. W., HAWCPOl: a first-generation far-infrared polarimeter for SOFIA, *Proceedings of the SPIE*, Volume 7735, pp. 77356H-77356H-9 (2010)
- Adams, J. D., Herter, T. L., Gull, G. E., Schoenwald, J., Keller, L. D., **Berthoud, M.**, Stacy, G. J., Nikola, T., Henderson, C. P., FORCAST: the first light instrument for SOFIA, *Proceedings of the SPIE*, Volume 7014, pp. 70142F-70142F-8 (2008)
- **Berthoud, M. G.**, Keller, L. D., Herter, T. L., Richter, M. J., Analysis of CO overtone emission from inner disks of Herbig Ae/Be stars, *American Astronomical Society Meeting 207*, #39.08 (2005)
- **Berthoud, M. G.**, Keller, L. D., Herter, T. L., Richter, M. J., Detection of Circumstellar Disks of Herbig Ae/Be Stars Using CO Overtone Emission, *Protostars and Planets V*, *Proceedings of the Conference*, Contribution No. 1286., p.8495 (2005)
- Adams, J. D., Herter, T. L., Keller, L. D., Gull, G. E., Pirger, B., Schoenwald, J., **Berthoud, M.**, Testing of mid-infrared detector arrays for FORCAST, *Optical and Infrared Detectors for Astronomy*, *Proceedings of the SPIE*, Volume 5499, pp. 442-451 (2004)
- Keller, L. D., Herter, T., Stacey, G., Gull, G., Schoenwald, J., Pirger, B., Adams, J., **Berthoud, M.**, Nikola, T., First test results from FORCAST: the facility mid-IR camera for SOFIA, *Ground-based Instrumentation for Astronomy*, *Proceedings of the SPIE*, Volume 5492, pp. 1086-1093 (2004)
- **Berthoud, M.**, Thomas, P., Veverka, J., Eros: Crater Densities in 3 Major Impact Features, *Bulletin of the American Astronomical Society*, Vol. 33, p.1149 (2001)
- **Berthoud, M. G.**, Bell, J. F., III, Clark, B. E., Gaffey, M. J., Testing Spectral Methods for Asteroid Surface Compositional Determination Using Spectroscopic and Compositional Data of Ordinary Chondrite Meteorites, *32nd Annual Lunar and Planetary Science Conference*, abstract no.2080 (2001)

SUCCESSFUL PROPOSALS

- **Berthoud, M.**, Herter, T., Keller, L., Whelan, D., A search for CO overtone emission to identify molecular gas in disks around intermediate-mass stars, *Palomar Observatory Observing Proposal for Semester 2005A* (2004)