

Douglas Keller Jr.

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Education

- Fall 2019 – **Doctorate of Philosophy: Ingénierie, Mécanique et Énergétique**, *École Polytechnique, Institut Polytechnique de Paris*, Palaiseau, Île-de-France, France.
Expected Fall 2022
- Fall 2017 – **Master of Science: Mechanical Engineering**, *College of Engineering and Mines, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Fall 2018
GPA: 4.0/4.0
- Fall 2014 – **Bachelor of Science: Mechanical Engineering**, *College of Engineering and Mines, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Fall 2018
GPA: 3.8/4.0

Research Experience

- Fall 2019 – **PhD Thesis**, *École Polytechnique, Institut Polytechnique de Paris*, Palaiseau, France.
Present
Determining the spatial and temporal effects of the Mistral on the Dense Water Formation in the Gulf of Lion (Western Mediterranean Sea).
(In progress) *Highlighted achievements:*
- Created a database of Mistral events with duration and intensity from atmospheric regional models driven by global weather reanalysis.
 - Ran multiple ocean simulations (NEMO) with different wind forcings to determine the ocean sensitivity to wind forcing.
- Summer 2019 **Seasonal Variability of Superior Mirages**, *University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Determined the seasonal variability of superior mirages in the subarctic and arctic latitudes with GPS radio occultation (GPSRO).
Highlighted achievements:
- Developed an algorithm to detect the presence of a potential mirage in GPSRO refractivity profiles
 - Spatially and temporally determined the variability of potential mirage events in the high latitudes
 - Presented work at the Light and Color in Nature conference in Maine, USA
- Fall 2017 – **Master of Science Thesis**, *University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Fall 2018 (In collaboration with and funded by NASA's Armstrong Flight Research Center)
Determined the effect of electromagnetic interference from electric motors on load sensing strain gauges.
Highlighted achievements:
- Placed NASA's Fiber Optic Sensing System (FOSS) and conventional strain gauge systems in high electromagnetic interference environments found in aviation
 - Developed a load cell designed around the FOSS to measure thrust from an electric motor coupled with a 3-blade propeller to develop future electric propulsion systems
 - Analyzed and compared data retrieved using the FOSS and conventional strain gauges
 - Determined the effect of electromagnetic interference on the thrust loading measurements
 - Determined the effect of mechanical interference/vibration with both systems in the same test application

- Fall 2017 – **Alaska Space Grant Undergraduate Research Fellowship**, *Geophysical Institute, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Summer 2018 Studied the atmospheric boundary layer (ABL) with NASA's network of micro-pulse lidars (MPLNET).
Highlighted achievements:
- Used the MPLNET and radiosonde data to determine the intraday variability of the high latitude atmospheric boundary layer
 - Developed algorithms to determine atmospheric boundary layer structural parameters from the MPLNET profiles
 - Compared and contrasted collocated lidar and radiosonde retrievals of ABL parameters
 - Produced statistical estimates of ABL parameters and computed diurnal and seasonal variations
 - Analyzed the high latitude ABL with the MPLNET, radiosonde data, and global positioning system radio occultation (GPSRO)
- Fall 2016 **Raman Spectroscopy Lidar**, *Geophysical Institute, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
(Funded by the National Science Foundation)
Assisted with the setup of a Raman spectroscopy lidar and developed mechanical fixtures for application.
Highlighted achievements:
- Gained experience in optomechanical design for Lidar development
 - Developed simulation of Lidar signals to condition instrument design for 532 nm, N₂, and H₂O Raman vibrational bands
 - Implemented multichannel Lidar receiver

Vocational Experience

- Summer 2019 – **Research Technician**, *Alaska Center for Energy and Power, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
– Fall 2019 Performing data analytics and large data organization for Alaska Center for Energy and Power's (ACEP) fuel meter project.
Highlighted achievements:
- Developed large data analysis methods for the ACEP fuel meter project
 - Created data visualization methods for different temporal representations
- Spring 2019 – **Research Technician**, *Alaska Center for Energy and Power, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Summer 2019 Rewriting the Alaska Center for Energy and Power's (ACEP) Energy Technology Facility's (ETF) safety manual.
Highlighted achievements:
- Determining the job hazards and required training to safely perform experiments in the ETF
 - Adjusting the emergency action plan of ETF to more effectively transfer ETF's emergency systems
- Spring 2017 – **Teaching Assistant**, *College of Engineering and Mines, University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Fall 2018 Graded homework and exams, and assisted students with studies in engineering.
Highlighted achievements:
- Graded homework and exams for the courses on Mechanics of Materials, Instrumentation and Measurement, and Heat Transfer
 - Recorded lectures for Astrodynamics and Mechanical Vibration
- Summer 2017 **Mechanical Engineering Intern**, *NASA Armstrong Flight Research Center*, Edwards, California, USA.
Tested thermodynamics and heat transfer of the initial Fiber Optic Sensing System (FOSS) enclosure concept for the Quiet Supersonic Technology (QueSST) X-Plane (now the X-59).
Highlighted achievements:
- Researched heat transfer technologies for FOSS enclosure flight testing application such as heat pipes and thermoelectric coolers
 - Analyzed heat transfer methods for FOSS enclosure application including foam insulation
 - Designed prototype enclosure for FOSS components, utilizing analyzed methods features foam insulation and heat pipes for improved high temperature environment survivability

- Summer 2015 **Engineering Intern**, *Alaska Department of Transportation*, Fairbanks, Alaska, USA.
Determined the compliance of pedestrian facilities in the Fairbanks Borough with the American Disability Act (ADA).
Highlighted achievements:
- Measured state maintained pedestrian facilities such as sidewalks and ramps
 - Determined pedestrian facility requirements for ADA compliance including required slope accommodation for disabled pedestrians
 - Compiled measurement data from multiple interns for coordinator review

Project Experience

- Summer 2016 **Golf Swing Replicator Prototype**, *Project Aisle*, Spokane, Washington, USA.
Designed and built a golf swing replicating rig.
Highlighted achievements:
- Designed the golf swing replicator prototype in SolidWorks 2014 with adjustable stand, ball holder, and swinging mechanism
 - Fabricated the golf swing replicator prototype, utilizing the mill, lathe, and MIG welder
 - Tested and analyzed golf swing replicator prototype
- Fall 2014 – **Ice Arch Build**, *University of Alaska Fairbanks*, Fairbanks, Alaska, USA.
Spring 2015 Part of the construction team that built the winning design for UAF's 2014 Ice Arch competition.
Highlighted achievements:
- Constructed and setup the wooden ice molds
 - Erected the dual ice arch design

Publications

D. Keller, D. R. Eagan, G. J. Fochesatto, R. Peterson (2019) "Advantages of Fiber Bragg Gratings for Measuring Electric Motor Loadings in Aerospace Application." *Review of Scientific Instruments*

Submitted

D. Keller, G. J. Fochesatto. "Seasonal Variation of Subarctic and Arctic Superior Mirages with GPSRO." *Applied Optics*

In Progress

D. Keller, G. J. Fochesatto. "A New Wavelet to Determine the Planetary Boundary Layer Height from Micro Pulse Lidar Backscatter."

Conference Talks

D. Keller, G. J. Fochesatto. "Identifying the Conditions for the Occurrence of High Latitude Superior Mirages." *Light and Color in Nature*, Bar Harbor, Maine, USA. July 15, 2019

Conference Proceedings

G. J. Fochesatto, O. Galvez, P. Ristori, D. Keller, and E. L. Fochesatto. "Lidar to Determine the Fractions of Ice, Liquid and Water Vapor in Polar Tropospheric Cloud." *Proceedings of the 28th International Laser Radar Conference*, Bucharest, Romania. 25-30 June 2017.

Conference Poster Presentations

D. Keller, G. J. Fochesatto. "RAOBs and Micro Pulse Lidar Determination of the Atmospheric Boundary Layer." *Alaska Space Grant Program Annual Symposium*, Anchorage, Alaska, USA. April 20, 2018.

D. Keller, D. Eagan. "FOSS Load Cell." *Undergraduate Research and Scholarly Activity Research Day*, Fairbanks, Alaska, USA. April 10, 2018.

D. Keller, G. J. Fochesatto, Ellsworth Welton, Jasper Lewis, James Campbell, and Sebastian Stewart. "Methodology for PBL Retrieval Based on NASA MPLNET Datasets." *99th Annual American Meteorological Society Meeting*, Phoenix, Arizona, USA, Jan. 6-10, 2019.

Programming

Languages Python, C/C++, MATLAB, Julia, Fortran

Platforms and APIs Linux, Windows, CUDA, Arduino, Raspberry Pi

Sports

Winter 2017 – **Krav Maga Instructor**, *Alaska Krav Maga & Fitness*, Fairbanks, Alaska, USA.
Winter 2018 Taught Krav Maga, Muay Thai, and fitness classes to students at varying levels of skill. Also trained in Brazilian Jiu Jitsu.
Hockey Played hockey competitively until 2014, peaking at the Junior A Tier III level in the AWWHL (now part of the NA3HL). Played intramurals and beer league from then on.
Skiing Skiing downhill and backcountry (with skins and the whole setup for charging steeper lines).

Hobbies

Other Interests Aerospace and aviation, game development, optics and physics, artificial intelligence, quantum communication, music, language learning.

References

Philippe Drobinski PhD, Director of Laboratoire de Météorologie Dynamique
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