# MATHIEU DUMBERRY

DEPARTMENT OF PHYSICS, UNIVERSITY OF ALBERTA
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## EDUCATION

| | | |
|---|---|---|
| 1999 – 2004 | Harvard University<br>*Ph. D. in Geophysics*, May 2004<br>Thesis: *Torsional oscillations in the Earth's core: theory, observation and geodynamic consequences*<br>Principal advisor: Jeremy Bloxham | Cambridge, MA, USA |
| 1995 – 1998 | University of British Columbia<br>*M. Sc. in Earth and Ocean Sciences*, April 1998<br>Thesis: *Electromagnetic coupling between the fluid core and its solid neighbours*<br>Principal advisor: Bruce A. Buffett | Vancouver, BC, Canada |
| 1991 – 1994 | Université de Sherbrooke<br>*B. Sc. in Physics*, December 1994<br>Internship advisor: Richard Marchand | Sherbrooke, QC, Canada |

## PROFESSIONAL AND RESEARCH EXPERIENCE

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|---|---|---|
| 2020 – present | Physics, University of Alberta<br>*Professor* | Edmonton, AB, Canada |
| 2014 – 2020 | Physics, University of Alberta<br>*Associate Professor* | Edmonton, AB, Canada |
| Jan - July 2019 | EAS, McGill University<br>*Invited Professor* | Montréal, Québec, Canada |
| Feb - July 2015 | ISTerre, Université Grenoble-Alpes<br>*Professeur invité* | Grenoble, France |
| Oct 2014 - Jan 2015 | Institut de Physique du Globe<br>*Professeur invité* | Paris, France |
| 2008 – 2014 | Physics, University of Alberta<br>*Assistant Professor* | Edmonton, AB, Canada |
| 2004 – 2007 | SEE-IGT, University of Leeds<br>*NERC Postdoctoral Research Fellow* | Leeds, UK |

## List of Publications

*Peer-reviewed: (underlined = students or postdocs)*

- Kiani Shahvandi, M., Adhikari, S., **Dumberry, M.**, Modiri, S., Heinkelmann, R., Schuh, H., Mishra S. and Soja, B., 2024, Contributions of core, mantle and climatological processes to Earth's polar potion, *Nature Geoscience*, 17, 705-710.
- Kiani Shahvandi, M., Adhikari, S., **Dumberry, M.**, Mishra S. and Soja, B., 2024, The increasingly dominant role of climate change on length of day variations, *Proceeding of the National Academy of Sciences*, 121, e2406930121.
- Lecomte, H., Rosat, S., Mandea, M. and **Dumberry, M.**, 2023, Gravitational constraints on the Earth's inner core differential rotation, *Geophys. Res. Lett., 50*, e2023GL104790.
- Bansal, D., Christie, H. and **Dumberry, M.**, 2023, Libration- and precession-driven dissipation in the fluid cores of the TRAPPIST-1 planets, *Planet. Sci. J., 4*, 171.
- Sikdar, B. and **Dumberry, M.**, 2023, The differential precession of Earth's fluid and solid cores, *Phys. Earth Planet. Int., 339*, 107022.
- MacPherson, I. and **Dumberry, M.**, 2022, Deviation of Mercurys spin axis from an exact Cassini state induced by dissipation, *J. Geophys. Res.: Planets, 127*: e2022JE007184.
- **Dumberry,M.**, 2022, The gravity signal of Mercury's inner core, *Earth Space Sci., 9*, e2022EA002344.
- Triana, S. A., **Dumberry, M.**, Cébron, D., Vidal, J., Trinh, A., Gerick, F. and Rekier, J., 2022, Core eigenmodes and their impact on the Earth's rotation, *Surv. Geophys., 43*, 107-148.
- **Dumberry, M.** and Mandea, M., 2022, Gravity variations and ground deformations resulting from core dynamics, *Surv. Geophys., 43*, 5-49.
- Zhang, J. and **Dumberry, M.**, 2021, Viscous dissipation in the fluid core of the Moon, *J. Geophys. Res.: Planets, 126*, e2021JE006966.
- **Dumberry, M.**, 2021, The influence of a fluid core and a solid inner core on the Cassini sate of Mercury, *J. Geophys. Res.: Planets, 126*, e2020JE006621.
- Steinbrügge, G., **Dumberry, M.**, Rivoldini, A., Schubert, G. Cao, H., Schroeder, D. M. and Soderlund, K. M., 2021, Challenges on Mercury's interior structure posed by the new measurements of its obliquity and tides, *Geophys. Res. Lett., 48*, e2020GL089895.
- Rosat, S., Gillet, N., Boy, J.-P., Couhert, A. and **Dumberry, M.**, 2021, Interannual variations of degree 2 from geodetic observations and surface processes, *Geophys. J. Int., 225*, 200-221.
- Gillet, N., **Dumberry, M**. and Rosat, S., 2021, The limited contribution from outer core dynamics to global deformations at the Earth's surface, *Geophys. J. Int., 224*, 216-229.
- Organowski, O. and **Dumberry, M.**, 2020, Viscoelastic relaxation within the Moon and the phase lead of its Cassini state, *J. Geophys. Res. Planets, 125*, e2020JE006386.
- Stys, C. and **Dumberry, M.**, 2020, A past lunar dynamo thermally driven by the precession of its inner core, *J. Geophys. Res. Planets, 125*, e2020JE006396.
- **Dumberry, M.** and More, C., 2020, Weak magnetic field changes over the Pacific due to high conductance in lowermost mantle, *Nature Geoscience, 13*, 516-520.
- Stys, C. and **Dumberry, M.**, 2018, The Cassini state of the Moon's inner core, *J. Geophys. Res. Planets, 123*, 2868-2892.
- **Dumberry, M.**, 2018, Earth Rotation, Excitation, Core, In: Grafarend E. (eds) *Encyclopedia of Geodesy*, Encyclopedia of Earth Sciences Series, Springer, Cham.
- More, C. and **Dumberry, M.**, 2018, Convectively driven zonal flow accelerations in the Earth's fluid core, *Geophys. J. Int., 213*, 434-446.

- **Dumberry, M.** and Wieczorek, M. A., 2016, The forced precession of the Moon's inner core, *J. Geophys. Res. Planets, 121*, 1264-1292.
- Mitrovica, J. X., Hay, C.C., Morrow, E., Kopp, R. E., **Dumberry, M.** and Stanley, S., 2015, Reconciling past changes in Earth's rotation with 20th century global sea-level rise: resolving Munk's enigma, Science Advances, 1, e1500679.
- **Dumberry, M.** and Rivoldini, A., 2015, Mercury's inner core size and core-crystallization regime, *Icarus, 248*, 254–268.
- Davies, C. J., Stegman, D. R. and **Dumberry, M.**, 2014, The strength of gravitational core-mantle coupling, *Geophys. Res. Lett., 41*, 3786–3792, doi:10.1002/2014GL059836.
- Koot, L. and **Dumberry, M.**, 2013, The role of the magnetic field morphology on the electromagnetic coupling for nutations, *Geophys. J. Int., 195*, 200-210.
- Yseboodt, M., Rivoldini, A., Van Hoolst, T. and **Dumberry, M.**, 2013, Influence of an inner core on the long period forced librations of Mercury, *Icarus, 226*, 41-51.
- **Dumberry, M.**, Rivoldini, A., Van Hoolst, T. and Yseboodt, M., 2013, The role of Mercury's core density structure on its longitudinal librations, *Icarus, 225*, 62-74.
- Koning, A. H., and **Dumberry, M.**, 2013, Internal forcing of Mercury's long period free librations, *Icarus*, 223, 40–47.
- **Dumberry, M.** and Koot, L. 2012, A global model of electromagnetic coupling for Earth nutations, *Geophys. J. Int., 191*, 530-544.
- **Dumberry, M.**, 2011, The free librations of Mercury and the size of its inner core, *Geoph. Res. Lett., 38*, L16202, doi:10.1029/2011GL048277.
- Veasey, M., and **Dumberry, M.**, 2011, The influence of Mercury's inner core on its physical libration, *Icarus, 214*, 265-274.
- Koot, L., and **Dumberry, M.**, 2011, Viscosity of the Earth's inner core: constraints from nutation observations, *Earth Planet. Sci. Lett., 308*, 343-349.
- **Dumberry, M.**, 2011, A new twist on inner-core spin, *Nature Geoscience, 4*, 216-217.
- Aubert, A., and **Dumberry, M.**, 2011, Steady and fluctuating inner core rotation in numerical geodynamo models, *Geophys. J. Int., 184*, 162-170.
- Finlay, C.C., **Dumberry, M.**, Chulliat, A. and Pais, A., 2010, Short timescale core dynamics: theory and observations, *Space Sci. Rev., 155*, 177-218.
- **Dumberry, M.**, 2010, Gravitationally driven inner core differential rotation, *Earth Planet. Sci. Lett., 297*, 387-394.
- Koot, L., **Dumberry, M.**, Rivoldini, A., de Viron, O and Dehant, V., 2010, Constraints on the coupling at the core-mantle and inner core boundaries inferred from nutation observations, *Geophys. J. Int., 182*, 1279-1294.
- **Dumberry, M.** and Mound, J., 2010, Inner core - mantle gravitational locking and the super-rotation of the inner core, *Geophys. J. Int., 181*, 806-817.
- **Dumberry, M.**, 2010, Gravity variations induced by core flows, *Geophys. J. Int., 180*, 635-650.
- **Dumberry, M.**, 2009, Influence of elastic deformations on the inner core wobble, *Geophys. J. Int., 178*, 57–64.
- **Dumberry, M.**, 2009, Taylor's constraint and torsional oscillations, in *Les Houches, session LXXXVIII: Dynamos* . Eds P. Cardin and L. F. Cugliandolo, Elsevier, p383-401.

- **Dumberry, M.**, 2008, Gravitational torque on the inner core and decadal polar motion, *Geophys. J. Int., 172*, 903–920.
- **Dumberry, M.** , 2008, Decadal variations in gravity caused by a tilt of the inner core, *Geophys. J. Int., 172*, 921–933.
- **Dumberry, M.** and Mound, J., 2008, Constraints on core-mantle electromagnetic coupling from torsional oscillations normal modes, *J. Geophys. Res., 113*, B03102, doi:10.1029/2007JB005135.
- **Dumberry, M.**, 2007, Geodynamic constraints on the steady and time-dependent inner core axial rotation, *Geophys. J. Int., 170*, 886-895.
- **Dumberry, M.**, 2007, Torsional oscillations, in *Encyclopedia of Geomagnetism and Paleomagnetism*, Gubbins, D and Herrero-Bervera, E. Eds., Springer, Dordrecht, The Netherlands, pp.746-748.
- **Dumberry, M.** and Finlay, C. C., 2007, Eastward and westward drift of the Earth's magnetic field for the last three millennia, *Earth Planet. Sci. Lett., 254*, 146-157.
- **Dumberry, M.** and Bloxham, J., 2006, Azimuthal flows in the Earth's core and changes in the length of day at millennial timescales, *Geophys. J. Int., 165*, 32-46.
- **Dumberry, M.**, 2005, Comment on "Could the $M_\omega = 9.3$ Sumatra earthquake trigger a geomagnetic jerk?", *EOS, 86*, 343.
- **Dumberry, M.** and Bloxham, J., 2004, Variations in the Earth's gravity field caused by torsional oscillations in the core. *Geophys. J. Int., 159*, 417-434.
- **Dumberry, M.** and Bloxham, J., 2003, Torque balance, Taylor's constraint and torsional oscillations in a numerical model of the geodynamo. *Phys. Earth Planet. Inter., 140*, 29-51.
- Bloxham, J., Zatman, S. and **Dumberry, M.**, 2002, The origin of geomagnetic jerks. *Nature, 420*, 65-68.
- **Dumberry, M.** and Bloxham, J., 2002, Inner core tilt and polar motion. *Geophys. J. Int., 151*, 377-392.
- Marchand, R., Charbonneau-Lefort, M., **Dumberry, M.** and Pronovost, B., 2001, ARANEA, a program for generating unstructured triangular meshes with JAVA Graphics User Interface. *Comput. Phys. Comm., 139*, 172-195.
- **Dumberry, M.** and Buffett, B. A., 1999, On the validity of the geostrophic approximation for calculating the changes in the angular momentum of the core. *Phys. Earth Planet. Inter., 112*, 81-99.
- Marchand, R. and **Dumberry, M.**, 1996, CARRE: a quasi-orthogonal mesh generator for 2D edge plasma modelling. *Comput. Phys. Comm., 96*, 232-246.
- Marchand, R., **Dumberry, M.**, Demers, Y., Côté, C., Le Clair, G., Larsen, J.-M., Bonnin, X. and Braams, B. J., 1995, Up-down symmetry in double null divertor experiments and magnetic field topology. *Nucl. Fusion, 35*, 297-304.

## TEACHING EXPERIENCE

| | | |
|---|---|---|
| Fall 2022<br>2023, 2024 | University of Alberta<br>"Astronomy of the Solar System", ASTRO120<br>*Lecturer* | Edmonton, AB, Canada |
| Fall 2023 | University of Alberta<br>"Geophysical imaging of Earth's Interior", GEOPH 325<br>*Lecturer* | Edmonton, AB, Canada |
| Winter 2008,<br>2009, 2010, 2011<br>2023, 2024 | University of Alberta<br>"Global Geodynamics", GEOPH 440/521<br>*Lecturer* | Edmonton, AB, Canada |
| Fall 2019<br>2020, 2021 | University of Alberta<br>"Particles and waves", PHYS124<br>*Lecturer* | Edmonton, AB, Canada |
| Winter 2012<br>2013, 2014, 2016,<br>2017, 2018 | University of Alberta<br>"Introductory Computational Physics", PHYS 234<br>*Lecturer* | Edmonton, AB, Canada |
| Fall 2015<br>2016, 2017, 2018,<br>2019 | University of Alberta<br>"Physics of the Earth", GEOPH 210<br>*Lecturer* | Edmonton, AB, Canada |
| Spring 2017 | University of Alberta (School in Cortona)<br>"Natural Disasters", INTD 200<br>*Lecturer* | Cortona, Italy |
| Winter 2011,<br>2012, 2013 | University of Alberta<br>"Introduction to Geophysics", GEOPH 110<br>*Lecturer* | Edmonton, AB, Canada |
| Fall 2008,<br>2009, 2010, 2013<br>2020, 2021 | University of Alberta<br>"Gravity, Magnetic and Electrical Techniques", GEOPH 325<br>*Lecturer* | Edmonton, AB, Canada |
| Winter 2003 | Harvard University<br>"History of the Earth", EPS 8 (Profs. Paul F. Hoffman and Daniel P. Schrag)<br>*Teaching Fellow* | Cambridge, MA, USA |
| Fall 2000<br>and Winter 2001 | Harvard University<br>"Applied Mathematics 21a,b", AM 21a,b (Prof. Jeremy Bloxham)<br>*Teaching Fellow* | Cambridge, MA, USA |
| Winter 2000 | Harvard University<br>"Introduction to Planetary Physics", EPS 106 (Prof. Jeremy Bloxham)<br>*Teaching Fellow* | Cambridge, MA, USA |

## STUDENTS & POSTDOCS

*Current Graduate Students*

- **Roman Bukatiuk**, M.Sc, January 2022 –, *Core flow driven by glaciation cycles*.
- **Huifeng Zhang**, Ph.D, September 2022 –, *Core-mantle torque and length of day changes*.
- **Ian MacPherson**, M.Sc, September 2023 –, *Dissipation and flow in fluid planetary cores driven by libration*.

*Former Postdoctoral Research Assistant*

- **Colin More**, January 2018 - October 2018, *Quasi-geostrophic models of core dynamics*.
- **Laurence Koot**, July 2009 - December 2010, *Earth's nutations and core-mantle coupling*.

*Former Graduate Students*

- **Olivier Organowski**, M.Sc., September 2016 - December 2018, *Viscoelastic Relaxation within the Moon and the Phase Lead of its Cassini State.*
- **Christopher Stys**, M.Sc, September 2016 - December 2018, *Inner Cassini States of the Moon, and their implications for a mechanically driven dynamo*.
- **Colin More**, Ph.D., January 2011 - October 2017, *Magnetically-forced axisymmetric zonal accelerations in Earth's outer core*.
- **Zhenhua Li**, Ph.D. (co-supervision), September 2013 - September 2017, *Rotational Seismology and Its Applications in Microseismic Event Localization*.
- **Daniel Laycock**, Ph.D., September 2009 - December 2014, *A generalized two dimensional quasigeostrophic model of thermal convection*.
- **Martin Veasey**, M.Sc., July 2008 - October 2010, *The free librations of Mercury and the size of its inner core*.

*Former Undergraduate Students*

- **Sally Palmers**, September 2023 - April 2024, *Libration-induced dissipation in the TRAPPIST-1 planets*.
- **Ian MacPherson**, May 2020 - August 2023, *Dissipation in the Cassini state of Mercury*.
- **Dhananjhay Bansal**, May 2021 - April 2023, *Forced precession of Trappist-1 planets*.
- **Hannah Christie**, May - December 2022, *Forced libration of Trappist-1 planets*.
- **Bhaswardeep Sikdar**, May - December 2022, *The differential precession of Earth's fluid and solid cores*.
- **Ashaduzzaman Joy**, May - December 2022, *Gravity variations in geodynamo simulations*.
- **Jiarui Zhang**, May - August 2020, *Dissipation in the Cassini state of the Moon*.
- **Gonzalo Rubio**, January - April 2017, *Numerical simulation of a quasi-geostrophic model of thermal convection*.
- **Christopher Stys**, January - April 2016, *Gravity variations induced by the precession of the Moon's inner core*.
- **Simone Strohmair**, January - May 2013, *Librations on Mercury*.
- **Matthew Quigley**, May - August 2012, *Archaeomagnetic westward drift*.
- **Alice H. Koning**, September - December 2011, *Mercury's long period free librations*.
- **Mitchell Liddell**, May - August 2009, *Eclipse data and length of day changes*.

## AWARDS AND ACADEMIC HONORS

- Excellence in Refereeing, Journal of Geophysical Research - Planets, 2016.
- Canadian Geophysical Union Young Scientist Award, May 2013
- Awarded the "Zatman lecture" at the $11^{th}$ symposium of SEDI (Study of the Earth's Deep Interior) in Kunming, China, July 2008.
- Discovery grant of the National Sciences and Engineering Research Council of Canada (NSERC), 2008 – 2012, 2012 – 2017, 2017 – 2024
- Postdoctoral Fellowship of the Natural Environment Research Council of United Kingdom (NERC), 2004 – 2007.
- Outstanding student paper award, Geodesy Section, Fall Meeting of the American Geophysical Union, 2002.
- Certificate of Excellence in Teaching, Derek Bok Center, Harvard University, Fall of 2000 and Spring of 2001.

## MEDIA AND OUTREACH

*Broadcast Interview*

- *Leap year*, Radio Active with Jessica Ng and Min Dhariwal, CBC radio, Edmonton, February 29 2024.
- *Leap year*, Morning with Sue and Andy, QR Chorus radio, Calgary, January 23 2024.
- *The Earth's inner core and its fluctuating rotation* , A little more conversation with Ben O'Hara Byrne, Corus/Global News Radio Network, January 25 2023.
- *Une rare lune bleue cette année pour l'Halloween*, La Croisée, Radio Canada Alberta, October 28 2020.
- *The changing magnetic field of Earth*, Sirius XM National Post Radio, February 7 2019.
- *La navigation dans l'Arctique perturbée*, La Croisée, Radio Canada Alberta, January 21 2019.
- *Il y a plus de mouvement quon pensait entre les couches terrestres*, La Croisée, Radio Canada Alberta, March 7 2018.
- *Can moon mining change tides on earth?*, Quirks and Quarks, CBC radio, February 18 2017.
- *The slowing of the Earth and sea level rise*, The Link, Radio Canada International, December 16 2015.
- *La fonte des glaciers influence la rotation de la Terre*, La Croisée, Radio Canada Alberta, December 16 2015.
- *Meteorite impact in Alberta*, midi 30, Radio Canada Alberta, May 8 2014.

*Test Interviews*

- *A magnetic mystery: UAlberta physicists explain decades-old puzzle of Earth's magnetic field*, Andrew Lyle, Faculty of Science website, University of Alberta, June 29 2020.
- *Getting a glimpse inside the moon*, Katie Willis, Faculty of Science website, University of Alberta, December 18 2018.
- *Melting glaciers, rising sea level slow down Earth's rotation*, Emily Chung, CBC online, December 11 2015.
- *The days are getting longer, Jennifer Pascoe* , Faculty of Science website, University of Alberta, December 11 2015.

## RECENT PRESENTATIONS AT CONFERENCES

*Recent conference presentations (oral) as first author*

- Millennial axisymmetric Magneto-Coriolis modes in Earth's fluid core, *IUGG*, Berlin, Germany, July 2023.
- The gravity signal of Mercury's inner core, *MExAG*, online, April 2022.
- The influence of a fluid core and a solid inner core on the Cassini sate of Mercury, *MExAG*, online, April 2021.
- The influence of a fluid core and a solid inner core on the Cassini sate of Mercury, *Fall AGU*, San Francisco, USA, Dec. 2020.
- The enigmatic magnetic field of the Earth: why its temporal variation is weaker over the Pacific?, *CUPC meeting*, online, London, Canada, Nov. 2020
- Gravity variations and surface deformations connected to Earth's core dynamics, *ISSI workshop*, Bern, Switzerland, Sept. 2021
- The low geomagnetic secular variation and weak core flows in the Pacific, *Fall AGU*, San Francisco, USA, Dec. 2019.
- Mechanically generated ancient lunar dynamo: constraints from reconstructions of its past Cassini state, *The core of the Moon*, Marseille, France, May 2019.
- On zonal flows and axial dipole field changes, *Fourth Swarm Science Meeting & Geodetic Mission Workshop*, Banff, Canada, March 2017.
- The forced precession of the Moon's inner core, *Advances in Lunar Magnetism from Paleomagnetism to Dynamos*, Cargése, France, May 2016.
- Earth's core contribution to variations in length of day, *Fall AGU*, San Francisco, USA, Dec. 2015.
- A generalized quasi-geostrophic model of thermal convection, *Fall AGU*, San Francisco, USA, Dec. 2015.
- A generalized quasi-geostrophic model of thermal convection, *IUGG*, Prague, Czech Republic, July 2015.
- A generalized quasi-geostrophic model of thermal convection, *CGU*, Montreal, Canada, May 2015.
- A generalized quasi-geostrophic model of thermal convection, *EGU*, Vienna, Austria, April 2015.
- Mercury's inner core size and core-crystallization regime, *EGU*, Vienna, Austria, April 2015.

*Recent conference presentations (poster) as first author*

- The dynamical connection between axisymmetric azimuthal and meridional flows at the top of Earth's core, *SEDI*, Great Barrington MA, USA, June 2024.
- Millennial axisymmetric Magneto-Coriolis modes in Earth's fluid core, *SEDI*, Zurich, Switzerland, July 2022.
- The low geomagnetic secular variation and weak core flows in the Pacific, *IUGG*, Montreal, Canada, July 2019.
- The low geomagnetic secular variation in the Pacific and the inhomogeneous conducting lower mantle, *Fall AGU*, Washington DC, USA, Dec. 2018.
- The low geomagnetic secular variation in the Pacific and the inhomogeneous conducting lower mantle, *SEDI*, Edmonton, Canada, July 2018.

## Invited Seminars

- BepiColombo Geodesy and Geophysics Working Group, Rome (online), Italy, March 2022
- University of Alberta, Edmonton, Canada, September 2019
- McGill University, Montréal, Canada, March 2019
- University of Münster (2), Münster, Germany, June 2015
- ETH Zurich, Switzerland, May 2015
- Université Grenoble-Alpes, Grenoble, France, March 2015
- Institut de Physique du Globe, Paris, France, January 2015
- University of Leeds, Leeds, UK, October 2014
- Université du Québec à Montréal, Montréal, Canada, October 2014
- McGill University, Montréal, Canada, October 2014
- Université de Montréal, Montréal, Canada, September 2014
- University of Alberta, Edmonton, Canada, September 2013
- University of Toronto, Toronto, Ontario, Canada, March 2013
- California Institute of Technology, Los Angeles, USA, October 2010
- University of Liverpool, Liverpool, UK, November 2007
- Princeton University, Princeton, USA, March 2007
- University of Edinburgh, Edinburgh, UK, February 2007
- University of Alberta, Edmonton, Canada, January 2007
- Institut de Physique du Globe de Strasbourg, France, November 2006
- Université du Québec, Montréal, Canada, October 2006
- University of California, Los Angeles, USA, March 2006
- University of Newcastle, Newcastle, UK, November 2005
- University of Toronto, Toronto, Canada, March 2005
- University of Leeds, Leeds, UK, February 2005
- University College London, London, UK, January 2005
- Princeton University, Princeton, USA, April 2004
- Université du Québec, Montréal, Canada, November 2003
- Brown University, Providence, USA, March 2002.

## Invited oral presentations at international conferences

- CUPC meeting, online, London, Canada, November 2021
- AGU fall meeting (2), San Francisco, USA, December 2015
- CGU/AGU spring meeting, Montreal, Canada, May 2015
- EGU general assembly, Vienna, Austria, April 2015
- 8th Euromech conference, Bad Reichenhall, Germany, September 2010.
- AGU fall meeting, San Francisco, USA, December 2008.
- Zatman Lecture, 11th Symposium of SEDI, Kunming, China, July 2008.
- Physics Summer School, Les Houches, France, August 2007.
- IUGG General Assembly, Perugia, Italy, July 2007.
- EGU general assembly, Vienna, Austria, April 2005.
- AGU fall meeting, San Francisco, USA, December 2003.

## SERVICE

*International*

- Chair, SEDI, July 2023 – present
- Vice-Chair, SEDI, July 2019 – July 2023
- SEDI scientific committee, since 2015
- Leading organizer, SEDI meeting, Edmonton, Canada, July 2018
- Guest Editor, Physics of the Earth and Planetary Interiors, SEDI special issue, 2024 –
- Guest Editor, Physics of the Earth and Planetary Interiors, SEDI special issue, 2022-2023
- Guest Editor, Geophysical Journal International, SEDI special issue, 2018-2019
- Associate Editor, Geophysical Research Letters, 2018 – 2022
- NSF panelist, geophysics program, October 2013
- DFG panelist, dynamic Earth program, February 2015
- FRQNT panelist, CO-03 Mathématiques, physique et informatique, January 2022
- Chair of division 1, working group 1, International Association of Geomagnetism and Aeronomy (IAGA) (2014-2016)
- Regular organizer and convener of sessions at international meetings.
- Reviewed more than 100 scientific papers, including many for top journals such as *Nature*, *Science*, *Nature Geoscience* and *PNAS*.
- Regular reviewer of grant applications for *NSERC (Canada)*, *NSF (USA)*, *NASA (USA)*, *NERC (UK)* and *ANR (France)*.

*University & Departmental*

- Director, Institute for Geophysical Research, (2022 - present)
- Physics Undergraduate program renewal committee (2022 - present)
- Geophysics Undergraduate program renewal committee (2020 - present)
- Faculty of Science representative on Campus St-Jean Council (2017-2018, 2021 - present)
- Geophysics Focus Area coordinator (2019 - 2022)
- Graduate Student Admission committee (2017-2018)
- Hiring committee, Astrophysics position (2015)
- Graduate Scholarship committee (many years since 2010)
- Best Student Paper Award committee (many years since 2010)
- Faculty of Science representative on Faculty of Engineering Council (2012-2013)
- Served on numerous PhD candidacy exams, MSc and PhD thesis defences