Kevin Olsen | Curriculum Vitae

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Education

University of Toronto **Toronto, Canada**
Doctor of Philosophy, Department of Physics *2016*
Thesis: Temperature and pressure retrievals and mitigation of the impact of dust for a high-resolution Fourier transform spectrometer mission to Mars.

University of Alberta **Edmonton, Canada**
Master of Science, Department of Physics *2010*
Thesis: Improvements to the resolution and efficiency of the DEAP-3600 dark matter detector and their effects on background studies.

Bachelor of Science, Specialization, Department of Physics *2008*

Research Experience

University of Oxford **Oxford, UK**
Fellow in Atmospheric, Oceanic and Planetary Physics (AOPP) *2023–2025*

- UK Space Agency (UKSA) Mars Science Fellow. The overall aim of this project is to determine the interdependence of halogen, hydrocarbon and water chemical cycles on Mars, and their role in detecting past or present life.

The Open University **Milton Keynes, UK**
Research Fellow *2022–2023*

- Six-month post as a research fellow with Professor Manish Patel during which I continued my work with the ExoMars TGO between my two UKSA fellowships.

University of Oxford **Oxford, UK**
Fellow in Atmospheric, Oceanic and Planetary Physics (AOPP) *2019–2022*

- Holding an Aurora Science Fellowship from the UK Space Agency, I became a Co-Investigator of the Atmospheric Chemistry Suite (ACS) on the ExoMars Trace Gas Orbiter (TGO).
- I studied the vertical structure of CO, H_2O, HDO, and O_3 in the atmosphere of Mars, and hunted for previously undetected trace gases, such as CH_4 and HCl, making the first detection of HCl.

Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS) **Guyancourt, France**
Laboratoire de Météorologie Dynamique (LMD) **Paris, France**
Postdoctoral research with Professors François Forget and Franck Montmessin *2016–2019*

- With ACS, I contributed to analyses of the thermal structure of the Martian atmosphere and the quantities of H_2O and HDO in it. I made the first-ever measurements of the vertical structure of CO.
- I created a global climatology of water ice clouds on Mars using the entire 14-year data set from the Mars Express Observatoire pour la Minéralogie, l'Eau, les Glaces et l'Activité (OMEGA) imaging spectrometer.

University of Toronto **Toronto, Canada**
PhD research with Professor Kimberly Strong *2011–2016*

- I prepared analysis software in support of a high-resolution spectrometer for the ExoMars TGO using Earth-observation data from the Atmospheric Chemistry Experiment (ACE-FTS) and the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC). I also validated methane data from the Greenhouse Gases Observing Satellite (GOSAT).

University of Alberta **Edmonton, Canada**
MSc research with Professor Aksel Hallin *2008–2010*

- My MSc research was on background studies and electronic requirements for the Dark Matter Experiment using Argon Pulse-shape discrimination (DEAP). I identified background sources in a prototype detector, contributed to calibration software development, and developed a characterisation framework for photon detectors.

Awards

UK Space Agency Mars Exploration Science Standard Call 2023, £246,306 *2024–2026*
- Conferred by the UK Space Agency (UKSA) for hiring postdoctoral research assistant.

***JGR-Planets* – 2022 Outstanding Reviewer** *2023*

UK Space Agency Mars Science Fellowship, £472,814 *2023–2026*
- Conferred by the UKSA.

***Icarus* – Best Reviewer Award** *2023*

***Icarus* – Best Reviewer Award** *2022*

UK Space Agency Aurora Science Fellowship, £395,136 *2019–2022*
- Conferred by the UKSA.

NSERC PDF Fellowship, $89,980 *2018–2020*
- Conferred by the Natural Sciences and Engineering Research Council (NSERC) of Canada.

Ontario Graduate Scholarship, $15,000 *2014*
- Conferred by the Province of Ontario.

Centre for Global Change Studies Graduate Student Research Award, $4,500 *2014*
- Conferred by the Centre for Global Change Studies at the University of Toronto.

University of Toronto Graduate Fellowship, $10,000 *2013–2014*
- Conferred by the School of Graduate Studies at the University of Toronto.

Centre for Global Change Studies Graduate Student Research Award, $4,500 *2012*

University of Toronto Graduate Fellowship, $10,000 *2012–2013*

Student Travel Grant, $550 *2011*
- Conferred by the School of Graduate Studies at the University of Toronto.

University of Toronto Graduate Fellowship, $9,400 *2011–2012*

University of Toronto Graduate Fellowship, $10,000 *2011*

Helen Biltek Leadership Scholarship, $600 *2007*
- Conferred by the Department of Physics at the University of Alberta.

Jason Lang Memorial Scholarship, $1000 *2007*
- Conferred by the Office of the Registrar at the University of Alberta.

Other Education

University of Toronto **Toronto, Canada**

NSERC CREATE Summer School in Arctic Atmospheric Science, Nottawasaga Inn *2013*
- Week-long school on various topics related to the Arctic and atmospheric science in the Arctic.

NSERC CREATE Research Project Management Workshop, Institute for Aerospace Studies *2013*
- Introduction to project management, accreditation programs, intellectual property and commercialization.

Student Machine Shop Modular Course, Department of Physics *2011*
- Modular course on machine shop operating procedures, including for mills and lathes.

University of Western Ontario **London, Canada**
Planetary Science Short Course, Centre for Planetary Science and Exploration *2011*
- An intensive seven-day course focused on the processes of terrestrial planet formation and exploration.

Teaching Experience

University of Oxford **Oxford, UK**
Demonstrator, Physics Teaching Laboratories *2023–2024*
- Laboratory demonstrator for first-year course on Data Analysis.

Formal Mentor of PostDocs *2022–2025*
- Discuss research problems and career development with postdoctoral researchers.

MPhys Evaluator *2021–2022*
- Evaluated the research potential of MPhys students after completing their MPhys project.

McGill University **Montreal, Canada**
Guest Lecturer for TEPS Graduate Course *2022*
- Teaching a module on "Observations of Solar System atmospheres" for the NSERC CREATE graduate training course on Technologies for Exo-Planetary Science (TEPS). Includes lecturing, providing assignments, and leading a journal discussion.

University of Toronto **Toronto, Canada**
Advanced Physics Laboratories (224/324) *2013–2015*
- Full time teaching assistantship (TA-ship) with Dr. Ruxandra Serbanescu for advanced labs for physics students, meeting twice a week and performing experiments over several sessions.
- Supervised a group of experiments, taught laboratory procedures, uncertainty analysis, how to operate equipment, and evaluated student work.

Supervisor for Summer Research Project *2013*
- Organized and supervised a project for a summer intern with Professor Kimberly Strong.
- Developed and proposed a project, managed the student's progress throughout, and gave help whenever necessary.

Advanced Physics Laboratories (294/394) *2012–2013*
- Full time TA-ship with Professor Barth Netterfield for project-based labs for engineering science students.
- Supervised labs, helping students understand experiments, and graded lab books.

Advanced Electronics Laboratories (405) *2011–2012*
- Full time TA-ship with Professor Nigel Edwards supervising advanced physics students working with electronic circuits.
- Helped students build and test circuits, held regular office hours and marked lab books and written reports.

Introductory Physics Laboratories (132) *2011*
- Full time TA-ship as a lab demonstrator for first year physics labs for non-physics majors.

Tutorial Room Instructor *2011*
- Part time TA-ship assisting students in the tutorial room with various problems and concepts.

University of Alberta **Edmonton, Canada**
Supervisor for Summer Research Project *2009*
- Supervised an undergraduate student's summer research project with Professor Aksel Hallin.
- Managed the student's progress, helped the student with his project, and integrated his results with our collaboration's work.

Advanced Physics Laboratories (397) *2008–2010*
- Full time TA-ship with Professor Aksel Hallin supervising the advanced third year lab courses for honours undergraduate physics and engineering-physics students.
- Assisted students in designing and building experiments, helped students understand and use lab equipment, and evaluated monthly formal reports.

Second-year Physics Laboratories (29x) *2008–2009*

- Full time TA-ship with Professor Mark Freeman supervising second-year lab courses for general students, honours and specialization physics students, and engineering-physics students (multiple distinct sections).
- Supervised weekly labs, demonstrated experiments, and marked short lab reports and two formal reports.

Service

UK Space Agency **London, UK**
Member, Exploration Science Call Review Panel *2024*
- Evaluated fellowship and PDRA proposals submitting to the 2024 UKSA Exploration Science call.

UK Space Agency **London, UK**
Member, Mars Studentship Call Review Panel *2023*
- Evaluated PhD studentship proposals submitting to the 2023 UKSA Mars Science call.

Science and Technology Facilities Council (STFC) **Swindon, UK**
Member, Astronomy Grants Panel (AGP) *2022*
- Evaluated funding proposals for postdoctoral research assistants submitting to the Planetary Studies Panel of the AGP.

University of Oxford **Oxford, UK**
AOPP Social Event Coordinator *2023*
- Organized monthly social events for students and staff in the department.

Team Member for low-cost areostationary Mars weather constellation *2022*
- Defining mission requirements for an ESA Fast-class mission concept or opportunity.

Contributor to STFC 2021 Roadmap for Solar System Research *2021*
- Co-authored the white paper: *The Aurora Programme: Mars Exploration and Mars Sample Return.*

University of Toronto **Toronto, Canada**
Team Member, Canadian Space Agency (CSA) Topical Team for Planetary Atmospheres *2016*
- I participated on an advisory team prioritizing scientific objectives and investigations for the CSA.

Adviser, University of Toronto Aerospace Team *2014*
- Provided payload advice for their entry in the Canadian Satellite Design Challenge.

Science Adviser, Robotics for Space Exploration *2014–2015*
- Provided spectrometry support for two entries in the University Rover Challenge.

President, Physics Graduate Student Association (PGSA) *2013–2014*
- Engaged graduate students in departmental affairs, organized all meeting and events undertaken by the PGSA.

University of Alberta **Edmonton, Canada**
Particle Physics Representative, Graduate Physics Students' Association (GPSA) *2008–2010*
- Engaged graduate students in departmental affairs, communicated between my focus area and the GPSA.

Undergraduate Representative to Department Council, Department of Physics *2007–2008*
- Attended monthly council meetings, ensured that the concerns of the undergraduate student body in Physics are given consideration, polled student body for feedback on issues, and voted on all matters.

President, University of Alberta Undergraduate Physics Society (UPS) *2006–2007*
- Managed all meetings, events and projects undertaken by the UPS, and promoted involvement from younger students.

Commodore, University of Alberta Sailing League *2006–2007*
- Organized all meetings and communications among executive, and communicated with the University of Alberta.

Vice President Financial, University of Alberta Undergraduate Physics Society *2005–2006*
- Managed UPS financial holdings, helped organize events.

Associate Commodore, University of Alberta Sailing League *2005–2006*

Publications

Peer-Reviewed Publications

Ni, Y. H., Wu, Z. .C., Korablev, O. I., **Olsen, K. S.**, Ling, Z. C., Zhao, Y.-Y. S., Mao, W. S., Fu, X. H., Li, B., & Zhang, J. Experimental Evidence for Chlorine-bearing Gas Generation during Martian Dust Activities and Implications for the Chlorine Cycle. Submitted to *Journal of Geophysical Research* (2024).

Rajendran, K., Streeter, P., Lewis, S. R., Duffy, M., Holmes, J. A., **Olsen, K. S.**, Korablev, O. I., Patel, M. R. Global transport of chlorine species in the Martian atmosphere and the resulting surface distribution of perchlorates. Submitted to *Journal of Geophysical Research* (2024).

Streeter, P., Rajendran, K., Lewis, S. R., **Olsen, K. S.**, Trokhimovskiy, A., Korablev, O. I., Patel, M. R. Global distribution and seasonality of martian atmospheric HCl explained through heterogeneous chemistry. Submitted to *Geophysical Research Letters* (2024).

Alday, J., Trokhimovskiy, A., Belyaev, D., Fedorova, A. A., Holmes, J., Patel, M. R., Mason, J., Lefèvre, F., **Olsen, K. S.**, Montmessin, F. Korablev, O. I., Baggio, L., Patrakeev, A. Upper limits of HO_2 in the atmosphere of Mars from the ExoMars Trace Gas Orbiter Submitted to *Monthly Notices of the Royal Astronomical Society* (2024).

Olsen, K. S. *et al.* Relationships between HCl, H2O, aerosols, and temperature in the Martian atmosphere Part II: quantitative correlations. Submitted to *Journal of Geophysical Research* (2024).

Olsen, K. S. *et al.* Relationships between HCl, H2O, aerosols, and temperature in the Martian atmosphere Part I: climatological outlook. Submitted to *Journal of Geophysical Research* (2024).

Määttänen, A., Fedorova, A., Giuranna, M., Hernàndez-Bernal, J., Leseigneur, Y., Montmessin, F., **Olsen, K. S.**, S/'anchez-Lavega, A., Stcherbinine, A., Szantai, A., Tirsch, D., Vincendon, M., Willame, Y., & Wolkenberg, P. Dust and clouds on Mars: the view from Mars Express. Accepted in *Space Science Reviews* (2024). **To be included in the book: 20 Years of Mars Express.**

Taysum, B. M., Palmer, P. I., **Olsen, K. S.** Luginin, M., Ignatiev, N., Trokhimovskiy, A., Shakun, A. Grigoriev, A., Montmessin, F., Korablev, O. I. Observed seasonal changes in Martian hydrogen chloride explained by heterogeneous chemistry *Astronomy & Astrophysics* (2024), doi:10.1051/0004-6361/202449546.

Mason, J. P. *et al.* Climatology and diurnal variation of ozone column abundances for 2.5 Mars years as measured by the NOMAD-UVIS spectrometer. *Journal of Geophysical Research* **129**, e2023JE008270 (2024), doi:10.1029/2023JE008270.

Luginin, M., Trokhimovskiy, A., Taysum, B., Fedorova, A. A., Korablev, O., **Olsen, K. S.**, Montmessin, F., & Lefèvre, F. An evidence of rapid hydrogen chloride uptake on water ice in the atmosphere of Mars. *Icarus* **411**, 115960 (2024), doi:10.1016/j.icarus.2024.115960.

Mason, J. P. *et al.* Ultraviolet and visible reflectance spectra of Phobos and Deimos as measured by the ExoMars-TGO/NOMAD-UVIS spectrometer. *Journal of Geophysical Research* **128**, e2023JE008002 (2023), doi:10.1029/2023JE008002.

Trokhimovskiy, A., Fedorova, A. A., Lefèvre, F., Korablev, O., **Olsen, K. S.**, Alday, J., Belyaev, D., Montmessin, F., Patrakeev, A., & Kokonkov, N. Revised upper limits for abundances of NH_3, HCN and HC_3N in the Martian atmosphere. *Icarus* **407**, 115789 (2023), doi:10.1016/j.icarus.2023.115789.

Alday, J., Trokhimovskiy, A., Patel, M. R., Fedorova, A. A., Lefèvre, F., Montmessin, F., Holmes, J. A., Rajendran, K., Mason, J. P., **Olsen, K. S.** Belyaev, D. A., Korablev, O. I., Baggio, L., Patrakeev, A., Shakun, A. Photochemistry on Mars reduces the abundance of heavy isotopes in atmospheric ^{1}CO and their escape efficiency to space. *Nature Astronomy* **7**, 867–876 (2023), doi:10.1038/s41550-023-01974-2. **Cover of July 2023 issue.**

Wang, A., Jackson, A. W., Sturchio, N. C., Houghton, J., Yan, C. Y. C., **Olsen, K. S.**, & Qu, Q. H. K. Martian carbonates, oxychlorines, and chlorine: quantities to be generated by dust storms. *Geophysical Research Letters* **50**, e2022GL102127 (2023), doi:10.1029/2022GL102127.

Fedorova, A. A., Montmessin, F., Trokhimovskiy, A., Luginin, M., Korablev, O. I., Alday, J., Belyaev, D. A.,

Holmes, J., Lefèvre, F., **Olsen, K. S.**, Patrakeev, A., & Shakun, A. A two-Martian year survey of the water vapor saturation state on Mars based on ACS NIR/TGO occultations. *Journal of Geophysical Research* **128**, e2022JE007348 (2023), doi:10.1029/2022JE007348.

Belyaev, D. A., Fedorova, A. A., Trokhimovskiy, A., Alday, J., Korablev, O. I., Montmessin, F., Starichenko, E. D., **Olsen, K. S.**, & Patrakeev, A. Thermal Structure of the Middle and Upper Atmosphere of Mars from ACS/TGO CO2 Spectroscopy. *Journal of Geophysical Research* **127**, e2022JE007286 (2022), doi:10.1029/2022JE007286.

Holmes, J. A., Lewis, S. R., Patel, M. R., Alday, J., Aoki, S., Liuzzi, G., Villanueva, G. L., Crismani, M. M. J., Fedorova, A. A., **Olsen, K. S.**, Kass, D. M., Vandaele, A. C., & Korablev, O. Global variations in water vapour and saturation state throughout the Mars Year 34 dusty season. *Journal of Geophysical Research* **127**, e2022JE007203 (2022), doi:10.1029/2022JE007203.

Fedorova, A. A., Trokhimovskiy, A., Lefèvre, F., **Olsen, K. S.**, Korablev, O. I., Forget, F., Montmessin, F., Ignatiev, N., Lomakin, A., Belyaev, D. A., Alday, J., Luginin, M., Shakun, A., & Grigoriev, A. Climatology of the CO vertical distribution on Mars based on ACS TGO measurements. *Journal of Geophysical Research* **127**, e2022JE007195 (2022), doi:10.1029/2022JE007195.

Olsen, K. S., Fedorova, A. A., Forget, F., Millour, E., Bierjon, A., Trokhimovskiy, A., Montmessin, F., Lefèvre, F., Korablev, O. I., Baggio, L., Alday, J., Wilson, C. F., Irwin, P. G. J., Belyaev, D. A., Patrakeev, A., & Shakun, A. Seasonal changes in the vertical structure of ozone in the Martian lower atmosphere and its relationship to water vapour. *Journal of Geophysical Research* **127**, e2022JE007213 (2022), doi:10.1029/2022JE007213. **Eos Editor's Highlight.**

Braude, A. S., Montmessin, F., **Olsen, K. S.**, Trokhimovskiy, A., Korablev, O. I. Lefvre, F., Fedorova, A. A., Alday, J., Baggio, L., Irbah, A., Lacombe, G., Forget, F., Millour, E., Wilson, C. F., & Patrakeev, A. No detection of SO_2, H_2S or OCS in the atmosphere of Mars from the first two Martian years of observations from TGO/ACS. *Astronomy & Astrophysics* **658**, A86 (2021), doi:10.1051/0004-6361/202142390.

Alday, J., Wilson, C. F., Irwin, P. G. J., Trokhimovskiy, A., Montmessin, F., Fedorova, A. A., Belyaev, D. A., **Olsen, K. S.**, Korablev, O. I., Lefèvre, F., Braude, A. S., Baggio, L., Patrakeev, A., & Shakun, A. Isotopic composition of CO_2 in the atmosphere of Mars as observed by ACS onboard the ExoMars TGO. *Journal of Geophysical Research* **126**, e2021JE006992 (2021), doi:10.1029/2021JE006992.

Alday, J., Trokhimovskiy, A., Irwin, P. G. J., Wilson, C. F., Montmessin, F., Lefèvre, F., Fedorova, A. A., Belyaev, D. A., **Olsen, K. S.**, Korablev, O. I., Vals, M., Rossi, L., Baggio, L. Bertaux, J.-L., Patrakeev, A., & Shakun, A. Isotopic fractionation of water and its photolytic products in the atmosphere of Mars. *Nature Astronomy* **5**, 943–950 (2021), doi:10.1038/s41550-021-01389-x.

Trokhimovskiy, A., Fedorova, A. A., **Olsen, K. S.**, Alday, J., Lefèvre, F., Korablev, O. I., Montmessin, F., Patrakeev, A., Belyaev, D. A., & Shakun, A. Isotopes of chlorine from HCl in the Martian atmosphere. *Astronomy & Astrophysics* **651**, A32 (2021), doi:10.1051/0004-6361/202140916.

Montmessin, F. *et al.* A stringent upper limit of 20 pptv for methane on Mars and constraints on its dispersion outside Gale crater. *Astronomy & Astrophysics* **650**, A140 (2021), doi:10.1051/0004-6361/202140389.

Aoki, S. *et al.* Annual appearance of hydrogen chloride on Mars and its correlation with water vapor from TGO/NOMAD observations. *Geophysical Research Letters* **48**, e2021GL092506 (2021), doi:10.1029/2021GL092506.

Belyaev, D. A., Fedorova, A. A., Korablev, O. I., Trokhimovskiy, A., Montmessin, F., Alday, J., Lefèvre, F., Patrakeev, A., **Olsen, K. S.**, & Shakun, A. Revealing a high water abundance in the upper mesosphere of Mars with ACS onboard TGO. *Geophysical Research Letters* **48**, e2021GL093411 (2021), doi:10.1029/2021GL093411.

Olsen, K. S., Trokhimovskiy, A., Braude, A. S., Korablev, O. I., Fedorova, A. A., Wilson, C. F., Patel, M. R., Irwin, P. G. J., Montmessin, F., Lefèvre, F., Baggio, L., Alday, J., Belyaev, D. A., Patrakeev, A., & Shakun, A. Upper limits for phosphine (PH_3) in the atmosphere of Mars. *Astronomy & Astrophysics* **649**, L1 (2021),

doi:10.1051/0004-6361/202140868.

Olsen, K. S., Trokhimovskiy, A., Montabone, L., Fedorova, A. A., Luginin, M., Lefèvre, F., Korablev, O. I., Montmessin, F., Forget, F., Millour, E., Baggio, L., Alday, J., Wilson, C. F., Irwin, P. G. J., Belyaev, D. A., Patrakeev, A., & Shakun, A. Seasonal reappearance of HCl in the atmosphere of Mars during the Mars year 35 dusty season. *Astronomy & Astrophysics* **647**, A161 (2021), doi:10.1051/0004-6361/202140329.

Korablev, O., **Olsen, K. S.** *et al.* Transient HCl in the atmosphere of Mars. *Science Advances* **7**, eabe4386 (2021), doi:10.1126/sciadv.abe4386.

Olsen, K. S., Lefèvre, F., Montmessin, F., Fedorova, A. A., Trokhimovskiy, A., Baggio, L., Korablev, O., Alday, J., Wilson, C. F., Forget, F., Belyaev, D. A., Patrakeev, A., Grigoriev, A., & Shakun, A. The vertical structure of CO in the Martian atmosphere from the ExoMars Trace Gas Orbiter. *Nature Geoscience* **14**, 67–71 (2021), doi:10.1038/s41561-020-00678-w. **Cover of February 2021 issue.**

Szantai, A., Audouard, J., Forget, F., **Olsen, K. S.**, Gondet, B., Millour, E., Madeleine, J.-B., Pottier, A., Langevin, Y., & Bibring, J.-P. Martian cloud climatology and life cycle extracted from Mars Express OMEGA spectral images. *Icarus* **353**, 114101 (2021), doi:10.1016/j.icarus.2020.114101.

Olsen, K. S., Forget, F., Madeleine, J.-B., Szantai, A., Audouard, A., Geminale, A., Altieri, F., Bellucci, G., Montabone, L., & Wolff, M. J. Retrieval of the water ice column and physical properties of water-ice clouds in the Martian atmosphere using the OMEGA imaging spectrometer. *Icarus* **353**, 113229 (2021), doi:10.1016/j.icarus.2019.03.006.

Trokhimovskiy, A., Perevalov, V., Korablev, O., Fedorova, A. A., **Olsen, K. S.**, Bertaux, J.-L., Patrakeev, A., Shakun, A., Montmessin, F., & Lefèvre, F. First observation of the magnetic dipole CO_2 main isotopologue absorption band at 3.3 μm in the atmosphere of Mars by ExoMars ACS. *Astronomy & Astrophysics* **639**, A142 (2020), doi:10.1051/0004-6361/202038134.

Olsen, K. S., Lefèvre, F., Montmessin, F., Trokhimovskiy, A., Baggio, L., Fedorova, A. A., Alday, J., Lomakin, A., Belyaev, D. A., Patrakeev, A., Shakun, A., & Korablev, O. First detection of ozone in the mid-infrared at Mars: implications for methane detection. *Astronomy & Astrophysics* **639**, A141 (2020), doi:10.1051/0004-6361/202038125.

Fedorova A. A. *et al.* Stormy water on Mars: The distribution and saturation of atmospheric water during the dusty season. *Science* **367**, 297–300 (2020), doi:10.1126/science.aay9522.

Alday, J., Wilson, C. F., Irwin, P. G. J., **Olsen, K. S.**, Baggio, L., Montmessin, F., Trokhimovskiy, A., Korablev, O., Fedorova, A. A., Belyaev, D. A., Grigoriev, A., Patrakeev, A., & Shakun, A. Oxygen isotopic ratios in Martian water vapour observed by ACS MIR on board the ExoMars Trace Gas Orbiter. *Astronomy & Astrophysics* **630**, A91 (2019), doi:10.1051/0004-6361/201936234.

Olsen, K. S., Boone, C. D., Toon, G. C., Montmessin, F., Fedorova A. A., Korablev, O. I., & Trokhimovskiy, A. Validation of the HITRAN 2016 and GEISA 2015 line lists using ACE-FTS solar occultation observations. *Journal of Quantitative Spectroscopy & Radiative Transfer* **236**, 106590 (2019), doi:10.1016/j.jqsrt.2019.106590.

Vandaele, A. C. *et al.* Martian dust storm impact on atmospheric H_2O and D/H observed by ExoMars Trace Gas Orbiter. *Nature* **568**, 521–524 (2019), doi:10.1038/s41586-019-1097-3.

Korablev, O. I. *et al.* No detection of methane on Mars from early ExoMars Trace Gas Orbiter observations. *Nature* **568**, 517–520 (2019), doi:10.1038/s41586-019-1096-4.

Pollmann, T. *et al.* In-situ characterization of the Hamamatsu R5912-HQE photomultiplier tubes used in the DEAP-3600 experiment. *Nuclear Instruments and Methods in Physics A* **922**, 373–384 (2019), doi:10.1016/j.nima.2018.12.058.

Amaudruz, P.-A. *et al.* Design and Construction of the DEAP-3600 Dark Matter Detector. *Astroparticle Physics* **108**, 1–23 (2019), doi:10.1016/j.astropartphys.2018.09.006.

Kuźniak, M. *et al.* First results from the DEAP-3600 dark matter search with argon at SNOLAB. *Physical Review*

Letters **121**, 071801 (2018), doi:10.1103/PhysRevLett.121.071801.

Korablev, O. I. *et al.* The Atmospheric Chemistry Suite (ACS) of three spectrometers for the ExoMars 2016 Trace Gas Orbiter. *Space Science Reviews* **214**, 7 (2018), doi:10.1007/s11214-017-0437-6.

Olsen, K. S., Strong, K., Walker, K., Boone, C. D., Raspollini, P., Plieninger, J., Bader, W., Grutter, M., Hannigan, J. H., Hase, F., Jones, N., de Mazière, M., Notholt, J., Schneider, M., Smale, D., Sussmann, R. & Saitoh, N. Comparison of the GOSAT TANSO-FTS TIR CH_4 volume mixing ratio vertical profiles with those measured by ACE-FTS, ESA MIPAS, and IMK-IAA MIPAS, and 16 NDACC sites. *Atmospheric Measurement Techniques* **10**, 3697–3718 (2017), doi:10.5194/amt-10-3697-2017.

Kuźniak, M. *et al.* Measurement of the scintillation time spectra and pulse-shape discrimination of low-energy β and nuclear recoils in liquid argon with DEAP-1. *Astroparticle Physics* **85**, 1–23 (2016), doi:10.1016/j.astropartphys.2016.09.002.

Olsen, K. S., Toon, G. C. & Strong, K. Simulation of source intensity variations from atmospheric dust for solar occultation Fourier transform infrared spectroscopy. *Journal of Molecular Spectroscopy* **323**, 78–85 (2016), doi:10.1016/j.jms.2015.11.008.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. New temperature and pressure retrieval algorithm for high-resolution infrared solar occultation spectrometry: analysis and validation against ACE-FTS and COSMIC. *Atmospheric Measurement Techniques* **9**, 1063–1082 (2016), doi:10.5194/amt-9-1063-2016.

Qadi, A. *et al.* Mars methane analogue mission: Mission simulation and rover operations at Jeffrey Mine and Norbestos Mine Quebec, Canada. *Advances in Space Research* **55**, 2414–2426 (2015), doi:10.1016/j.asr.2014.12.008.

Akashi-Ronquest, M. *et al.* Improving photoelectron counting and particle identification in scintillation detectors with Bayesian techniques. *Astroparticle Physics* **65**, 40–54 (2015), doi:10.1016/j.astropartphys.2014.12.006.

Pollmann, T. *et al.* Radon backgrounds in the DEAP-1 liquid-argon-based Dark Matter detector. *Astroparticle Physics* **62**, 178–194 (2015), doi:10.1016/j.astropartphys.2014.09.006.

Olsen, K. S., Cloutis, E. & Strong, K. Small-scale methane dispersion modelling for possible plume sources on the surface of Mars. *Geophysical Research Letters* **39**, L19201 (2012), doi:10.1029/2012GL052922.

Olsen, K. S., Hallin, A. L. & the DEAP/CLEAN Collaboration. SPE analysis of high efficiency PMTs for the DEAP-3600 dark matter detector. *Journal of Physics: Conference Series* **312**, 072015 (2011), doi:10.1088/1742-6596/312/7/072015.

Book Chapters

Määttänen, A., Fedorova, A. A., Giuranna, M., Hernandez-Bernal, J., Leseigneur, Y., Montmessin, F., **Olsen, K. S.**, Sanchez-Lavega, A., Stcherbinine, A., Szantai, A., Tirsch, D., Vincendon, M., Willame, Y. & Wolkenberg, P. Dust and clouds on Mars: the view from Mars Express. For *20 years of Mars Express science*. International Space Science Institute (2024).

Other Publications

Olsen, K. S., emphet al. Relationships between HCl, H_2O, aerosols, and temperature in the Martian atmosphere. *European Planetary Science Congress Abstracts* **17**, EPSC2024-912 (2024).

Olsen, K. S., Evans, R., Eshbaugh, H., Warren, T. J., Shirley, K. A., Nowicki, K., & Bowles, N. E. Returning to Mars with BEBOP (Broadband Exploration with Bolometric Optics). *European Planetary Science Congress Abstracts* **17**, EPSC2024-1093 (2024). Bridges, J. *et al.* The Aurora Programme: Mars Exploration and Mars Sample Return. White Paper for the STFC *2021 Roadmap for Solar System Research* (2021).

Olsen, K. S. *et al.* HCl in the atmosphere of Mars: first detection of a halide gas. *European Planetary Science Congress Abstracts* **14**, EPSC2020-711 (2020).

Olsen, K. S. *et al.* Vertical distributions of CO, H_2O, HDO, and temperature in the atmosphere of Mars after a year of observations with the ExoMars Trace Gas Orbiter (TGO) Atmospheric Chemistry Suite mid-infrared (ACS

MIR) solar occultation spectrometer. *European Planetary Science Congress Abstracts* **13**, EPSC-DPS2019-1463-3 (2019).

Olsen, K. S., Montmessin, F., Boone, C. D., Toon, G. C., Fedorova, A. A., Trokhimovskiy, A., Korablev, O. I. & the ExoMars TGO Science Working Team. Spectroscopy and trace gas retrievals for the ExoMars Trace Gas Orbiter (TGO) Atmospheric Chemistry Suite mid-infrared (ACS MIR) solar occultation spectrometer using the JPL Gas Fitting software (GFIT). *European Planetary Science Congress Abstracts* **12**, EPSC2018-916 (2018).

Forget, F., Olsen, K. S., Willame, Y., Szantai, A., Millour, E., Vals, M., Montmessin, F. European Commission Research and Innovation Action UPWARDS. Delivery 4.2: Climatology of Mars cloud optical depth and particle size using Mex OMEGA imaging spectrometer data (2018).

Olsen, K. S., Forget, F., Madeleine, J.-B., Szantai, A., Audouard, A., Geminale, A., Altieri, F., Oliva, F., Bellucci, G., Montabone, L. & Wolff, M. J. Spatial distribution of retrieved water ice cloud properties at Mars using OMEGA. *Mars Science Workshop: From Mars Express to ExoMars Abstracts* (2017).

UPWARDS Team. Third Interim Progress Report. Progress report to the UPWARDS funding agencies (2017).

Olsen, K. S., Montmessin, F., Fedorova, A. A., Trokhimovskiy, A., Korablev, O. I., and the ExoMars TGO Science Working Team. Trace gas retrievals for the ExoMars Trace Gas Orbiter Atmospheric Chemistry Suite mid-infrared solar occultation spectrometer. *European Planetary Science Congress Abstracts* **11**, EPSC2017-938 (2017).

CSA Topical Team: Planetary Atmospheres. Potential Canadian science and medical contributions to the exploration of the Moon, Mars, and beyond. *CSA Topical Teams Report: Planetary* (2017).

UPWARDS Team. Second Annual General Report. Progress report to the UPWARDS funding agencies (2017).

Olsen, K. S., Forget, F., Madeleine, J.-B., Szantai, A., Audouard, A., Geminale, A., Altieri, F., Bellucci, G., Montabone, L. & Wolff, M. J. The distributions of retrieved properties from water ice clouds in the Martian atmosphere using the OMEGA imaging spectrometer. *Mars Atmosphere: Modelling and Observation, 6^{th} International Workshop* (2017).

Olsen, K. S., Toon, G. C., Boone, C. D., Sheese, P. E., Walker, K. A. & Strong, K. Intercomparison of water vapour and temperature retrievals between the CSA's ACE-FTS and the UCAR/NSPO's COSMIC/Formosat-3 satellites, and presentation of a new algorithm for retrieving temperature. *Proceedings of the 66^{th} International Astronautical Congress* (2015).

Walker, K. A. *et al.* Mars Atmospheric Trace Molecule Occultation Spectrometer (MATMOS) algorithm feasibility study report. *CSA Closeout Science Support* (2013).

Popa, D., Olsen, K. S., Wilhelm, R., Anderson-Trocme, L., Strong, K., & Whyte, L. Mars Methane Mission gas sampling report for FD-1 and FD-2. Technical report for CSA and MPB Communications (2012).

Olsen, K. S. Mars Methane Mission 2011 field campaign University of Toronto operations report. Technical report for CSA and MPB Communications (2011).

Olsen, K. S. SPE analysis of high efficiency Hamamatsu R877-100 PMT. Technical report for the DEAP collaboration (2010).

Olsen, K. S. Analysis of alpha backgrounds in the DEAP-1 detector. *Proceedings of the 24^{th} Lake Louise Winter Institute: Fundamental Interactions* (2009), arXiv:0906.0348.

Zhang, M. & Olsen, K. S. Relative energy corrections for the DEAP-1 detector. Technical report for the DEAP collaboration (2007).

Olsen, K. S. Isolation of background alpha events and pure Rn-222 decays from LAr. Technical report for the DEAP collaboration (2008).

Olsen, K. S. Analysis of multilayer Fe/Au systems exhibiting interactions between ferromagnetic layers using the Kerr effect and a photoelastic modulator. Undergraduate thesis (2007).

Presentations

Invited Talks

Key findings of the ExoMars Trace Gas Orbiter after three full Mars-years of observations. Interdisciplinary Seminar Series. University of Edinburgh, Edinburgh, UK, June 2024.

Key findings of the ExoMars Trace Gas Orbiter after three full Mars-years of observations. Interdisciplinary Seminar Series. University of Aberdeen, Aberdeen, UK, June 2024.

Key findings of the ExoMars Trace Gas Orbiter after almost three full Mars-years of observations. Yale University, New Haven, Connecticut, USA, March 2024.

Key findings of the ExoMars Trace Gas Orbiter after almost three full Mars-years of observations. The 2023/2024 Noble Seminar Series. University of Toronto, Toronto, Canada, October 2023.

Contemporary chemistry in the Martian atmosphere observed with the ExoMars Trace Gas Orbiter. Imperial College London, London, UK, March 2023.

Keynote presentation at the 3^{rd} British Planetary Science Conference. Open University, Milton Keynes, UK, June 2022.

Observations of Solar System atmospheres. NSERC CREATE Technologies for Exo-Planetary Science (TEPS). McGill University, Montreal, Canada, March 2022.

Trace gas retrievals with the ExoMars Trace Gas Orbiter Atmospheric Chemistry Suite. Physical Research Laboratory, Ahmedabad, India, May 2021.

The ACS investigation of the Martian atmosphere after 1.5 years in operation. Department of Physics, University of Oxford, Oxford, UK, February 2020.

Conference Presentations and Posters

Olsen, K. S., emphet al. Relationships between HCl, H_2O, aerosols, and temperature in the Martian atmosphere (**oral, Solicited**) *European Planetary Science Congress*, Berlin, Germany, September 2024.

Olsen, K. S., Evans, R., Eshbaugh, H., Warren, T. J., Shirley, K. A., Nowicki, K., & Bowles, N. E. Returning to Mars with BEBOP (Broadband Exploration with Bolometric Optics; **oral**). *European Planetary Science Congress*, Berlin, Germany, September 2024.

Olsen, K. S., Montmessin, F., Korablev, O., Trokhimovskiy, A., Fedorova, A. A., Baggio, L., Alday, J., Belyaev, D., A., Shakun, & Patrakeev, A. The polar and near-polar atmosphere of Mars as seen with the ExoMars Trace Gas Orbiter's Atmospheric Chemistry Suite (**poster**). *Eighth International Conference on Mars Polar Science and Exploration*, Whitehorse, Yukon, July 2024.

Olsen, K. S., Trokhimovskiy, A., Fedorova, A. A., Kleinbohl, A., Lefèvre, F., Montmessin, F., Korablev, O., Alday, J., Baggio, L., Belyaev, D., Patrakeev, A., Shakun, A. & Patel, M. The chlorine cycle on Mars: What do we know after three Mars years of observation with ACS on TGO (**oral**)? *European Geosciences Union General Assembly*, Vienna, Austria, April 2023.

Olsen, K. S. Contemporary chemistry in the Martian atmosphere observed with the ExoMars Trace Gas Orbiter (**oral, invited**). *British Planetary Science Conference*, Open University, Milton Keynes, UK, June 2022.

Olsen, K. S., Irwin, P. G. J. I., Fedorova, A. A., Trokhimovskiy, Korablev, O., Luginin, M., Belyaev, D., Patrakeev, A., Shakun, A., Lefèvre, F., Montmessin, F., Baggio, L., Alday, J., Forget, F., Millour, E., Bierjon, A., & Montabone, L. The vertical structure of trace gases in the atmosphere of Mars revealed by ACS on ExoMars TGO (**oral**). *7^{th} International workshop on the Mars Atmosphere: Modelling and Observations*, Paris, France, June 2022.

Olsen, K. S., Fedorova, A. A., Trokhimovskiy, A., Lefèvre, F., Montmessin, F., Korablev, O., Baggio, L., Alday, J., Forget, F., Millour, E., Bierjon, A., Wilson, C. F., Irwin, P. G. J., Belyaev, D., Patrakeev, A., & Shakun, A. Simultaneous observations of HCl, ozone, and water vapour with ACS MIR on the ExoMars Trace Gas Orbiter (**oral**). *American Geophysical Union Fall Meeting*, New Orleans, Louisiana, December 2021.

Korablev, O., Montmessin, F., Trokhimovskiy, A., Lefèvre, F., Fedorova, A. A., Baggio, L., Irbah, A., Lacombe, G., Olsen, K. S., Belyaev, D. A., Alday, J., Braude, A., Forget, F., Daerden, F., Pla-Garcia, J., Rafkin, S. C. R., Wilson, C. F., Patrakeev, A., Shakun, A., Bertaux, J.-L. A Stringent Upper Limit of 20 pptv for Methane on Mars and Constraints on Its Dispersion Outside Gale Crater (**oral**). *American Geophysical Union Fall Meeting*, New Orleans, Louisiana, December 2021.

Olsen, K. S., Trokhimovskiy, A., Korablev, O., Lefèvre, F., Montmessin, F., Fedorova, A. A., Alday, J., Belyaev, D., Baggio, L., Patrakeev, A., Grigoriev, A., & Shakun, A. HCl in the atmosphere of Mars: first detection of a halide gas (**oral**). *European Planetary Science Congress*, Granada, Spain, September 2020.

Olsen, K. S. The ACS investigation of the Martian atmosphere after 1.5 years in operation (**oral**). *UK Solar System Planetary Atmospheres Meeting 2020*, London, UK, January 2020.

Olsen, K. S., Alday, J., Baggio, L., Belyaev, D., Fedorova, A., Grigoriev, A., Lefèvre, F., Korablev, O., Montmessin, F., Patrakeev, A., Rossi, L., Shakun, A., & Trokhimovskiy, A. Vertical distributions of CO, H 2 O, HDO, and temperature at Mars after 1 year of observations with the ExoMars TGO ACS MIR solar occultation spectrometer (**oral**). *European Planetary Science Congress – Division of Planetary Science*, Geneva, Switzerland, September 2019.

Olsen, K. S., Alday, J., Baggio, L., Belyaev, D., Fedorova, A., Grigoriev, A., Korablev, O., Montmessin, F., Patrakeev, A., Shakun, A., Trokhimovskiy, A. & the ExoMars TGO Science Working Team. Trace Gas Retrievals for the ExoMars Trace Gas Orbiter (TGO) Atmospheric Chemistry Suite (ACS) mid-infrared channel during the first year of operation (**poster**). *European Geosciences Union General Assembly*, Vienna, Austria, April 2019.

Olsen, K. S., Montmessin, F., Baggio, L., Boone, C. D., Toon, G. C., Fedorova, A. A., Trokhimovskiy, A., Grigoriev, A., Patrakeev, A., Korablev, O. I. & the ExoMars TGO Science Working Team. Spectroscopy and trace gas retrievals for the ExoMars Trace Gas Orbiter (TGO) Atmospheric Chemistry Suite mid-infrared (ACS MIR) solar occultation spectrometer using the JPL Gas Fitting software (GFIT) (**poster**). *European Planetary Science Congress*, Berlin, Germany, September 2018.

Olsen, K. S., Forget, F., Madeleine, J.-B., Szantai, A., Audouard, J., Geminale, A., Altieri, F., Olivia, F. Bellucci, G., Montabone, L. & Wolff, M. J. Spatial distribution of retrieved water ice cloud properties at Mars using OMEGA (**oral**). *Mars Science Workshop: From Mars Express to ExoMars*, Madrid, Spain, February 2018.

Olsen, K. S., Montmessin, F., Fedorova, A. A., Trokhimovskiy, A., Korablev, O. I. & the ExoMars TGO Science Working Team. Trace gas retrievals for the ExoMars TGO ACS MIR solar occultation spectrometer (**poster**). *European Planetary Science Congress*, Riga, Latvia, September 2017.

Olsen, K. S., Korablev, O. I., Ignatiev, N., Fedorova, A. A., Trokhimovskiy, A., Grigoriev, A., Shakun, A., Lefèvre, F., Montmessin, F. & Forget, F. Trace gas retrievals for the ExoMars Trace Gas Orbiter Atmospheric Chemistry Suite mid-infrared channel (**oral**). *51^{st} Canadian Meteorological and Oceanographic Society (CMOS) Congress*, Toronto, Canada, July 2017.

Olsen, K. S., Forget, F., Madeleine, J.-B., Szantai, A., Audouard, J., Geminale, A., Altieri, F., Bellucci, G., Montabone, L. & Wolff, M. J. Water ice cloud property retrievals at Mars with OMEGA: Spatial distribution and column mass (**oral**). *European Geosciences Union General Assembly*, Vienna, Austria, April 2017.

Olsen, K. S., Forget, F., Madeleine, J.-B., Szantai, A., Audouard, J., Geminale, A., Altieri, F., Bellucci, G., Montabone, L. & Wolff, M. J. The distributions of retrieved properties from water ice clouds in the Martian atmosphere using the OMEGA imaging spectrometer (**oral**). *6^{th} International workshop on the Mars Atmosphere: Modelling and Observations*, Granada, Spain, January 2017.

Olsen, K. S., Strong, K, Walker, K. A., Boone, C. D., Raspollini, P., Plieninger, J. & Saitoh, N. Validation of the GOSAT TANSO-FTS TIR CH_4 vertical profile data product using CH_4 vertical profiles from MIPAS (ESA and IMK) and ACE-FTS (**oral**). *12^{th} International Workshop on Greenhouse Gas Measurements from Space*, Kyoto, Japan, July 2016.

Olsen, K. S., Toon, G. C., Boone, C. D., Sheese, P. E., Walker, K. A. & Strong, K. Intercomparison of water vapour and temperature retrievals between the CSA's ACE-FTS and the UCAR/NSPO's COSMIC/Formosat-3

satellites, and presentation of a new algorithm for retrieving temperature (**oral**). *66th International Astronautical Congress*, Jerusalem, Israel, October 2015.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Seasonal comparisons of retrieved temperature and water vapour between ACE-FTS and COSMIC (**interactive poster**). *European Geosciences Union General Assembly*, Vienna, Austria, April 2015.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. High-resolution solar-occultation Fourier transform spectroscopy in a dusty atmosphere (**poster**). *65th International Astronautical Congress*, Toronto, Ontario, October 2014.

Olsen, K. S., Cloutis, E., Brisco, T., Sherwood-Lollar, B. & Strong, K. Mars analogue rover operations in the asbestos mines of Quebec (**poster**). *65th International Astronautical Congress*, Toronto, Ontario, October 2014.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Temperature and pressure retrievals from the Atmospheric Chemistry Experiment (ACE): A new technique and comparison with COSMIC (**oral**). *40th Committee on Space Research (COSPAR) Scientific Assembly*, Moscow, Russia, August 2014.

Olsen, K. S., Toon, G. C., Conway, S., Walker, K., Berube, P., Veilleux, J., Hipkin, V. & Strong, K. Fourier transform spectroscopy to study planetary atmospheres (**poster**). *40th COSPAR Scientific Assembly*, Moscow, Russia, August 2014.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Temperature and pressure retrievals for an ACE-like mission to Mars (**oral**). *48th CMOS Congress*, Rimouski, Quebec, June 2014.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Atmospheric retrievals in preparation for a solar-occultation high-resolution Fourier transform spectrometer at Mars (**poster**). *44th Lunar and Planetary Science Conference*, The Woodlands, Texas, March 2013.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Simulated trace gas retrievals for the MATMOS mission: Temperature retrievals and the effects of high dust content (**oral**). *Workshop on Infrared Remote Sensing Applications*, Quebec City, Quebec, October 2012.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Simulated Mars trace gas retrievals from the TGO MATMOS instrument (**poster**). *39th COSPAR Scientific Assembly*, Mysore, India, July 2012.

Olsen, K. S., Toon, G. C., Boone, C. D. & Strong, K. Development and assessment of analysis methods for MATMOS trace gas retrievals (**poster**). *American Geophysical Union Fall Meeting*, San Francisco, California, December 2011.

Olsen, K. S. & Hallin, A. SPE analysis of high efficiency PMTs for the DEAP-3600 dark matter detector (**poster**). *International Nuclear Physics Conference*, Vancouver, British Columbia, July 2010.

Olsen, K. S. Analysis of alpha backgrounds in the DEAP-1 detector (**oral**). *Lake Louise Winter Institute: Fundamental Interactions*, Lake Louise, Alberta, February 2009.