

Elodie GLOESENER

PhD in Planetary Sciences

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Education

- 2019** **PhD in Planetary Sciences**, *Université catholique de Louvain, Belgium*,
Dissertation: Methane clathrate hydrate stability in the Martian subsurface and outgassing scenarios.
- 2012** **MSc. in Space Sciences**, *Université de Liège, Belgium*.
- 2010** **BSc. in Physical Sciences**, *Université de Liège, Belgium*.

Research experience

- June 2021 – present** **Postdoctoral Research Fellow**, *JPL/Caltech, USA*,
Laboratory and modelling studies on the stability of clathrate hydrates on Titan.
- Oct. 2019 – May 2021** **Postdoctoral Researcher**, *Université catholique de Louvain, Belgium*,
Modelling of subsurface – atmosphere exchanges on Mars.
- Oct. 2016 – Sep. 2019** **Research assistant**, *Royal Observatory of Belgium / Université catholique de Louvain, Belgium*,
Investigation of the surface and subsurface water environment, atmospheric trace gases and their sources using the data acquired by the ESA ExoMars TGO.
- Oct. 2013 – Sep. 2016** **FRIA Research Fellow**, *Royal Observatory of Belgium*,
Methane clathrate hydrate stability in the Martian subsurface and outgassing scenarios.
- Nov. 2013 – Jan. 2014** **Intern**, *JPL/Caltech, USA*,
Experimental measurements of the effect of ammonia on the stability of clathrate hydrates and implications for outgassing on Titan.
- Oct. 2012 – Sep. 2013** **Research assistant**, *Royal Observatory of Belgium / Royal Belgian Institute for Space Aeronomy, Belgium*,
Stability of methane clathrate hydrates and thermal modelling of the Martian subsurface.

Awards & Honors

- B.A.E.F.** (Belgian American Educational Foundation) postdoctoral research fellowship, 2020-2021.
- FRIA** fellowship from the Belgian National Fund for Scientific Research (F.R.S. – FNRS), 2013-2016.
- Odissea** prize from the Euro Space Society, 2012.
- Wallonie Espace** award, 2012.

Advising

Internships: Co-advisor of 6 students since 2015.

- Heat and water vapor transfer in the Martian subsurface.
- Analysis of CRISM cube-data: Martian surface albedo information and identification of ice on Mars by NOMAD.
- Thermal modelling of Didymos' moon.
- Low-temperature specific heat capacity measurements of water-ammonia mixtures.

Master theses: Co-advisor of 4 students since 2018.

- Study of liquid brines on present-day Mars.
- Heat effect of meteorite impacts on the degassing of methane trapped in Mars' icy soil.

Service

- LPSC session moderator, 2023.
- AGU OSPA judge, 2021.
- Early Career Officer of the Europlanet Society Benelux Hub, 2020-2022.
- Member of EGU PS division Early Career Scientist Team, 2013-2017.
- Member of EGU PS division Outreach Team, 2013-2017.

Memberships / collaborations

- Member of the EOS project ET-HOME (Evolution and Tracers of Habitability On Mars and the Earth), 2018-2022.
- Member of the BRAIN-be project SCOOP (Towards a Synergistic study Of the atmOsphere of terrestrial Planets), 2015-2019.
- Member of the EU H2020 project UPWARDS (Understanding Planet Mars With Advanced Remote-sensing Datasets and Synergistic Studies), 2015-2018.
- Member of the Interuniversity Attraction Pole Planet TOPERS (Planets: Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS), 2012-2017.

Skills

Laboratory:

- Raman spectroscopy.
- X-Ray diffraction.
- Optical microscopy.
- Cryogenic equipment.
- Calorimetry.

Programming:

- Experienced with FORTRAN, Matlab.
- Good knowledge of C++ and Java.
- Basics of Mathematica and Python.

Peer-reviewed publications

1. Hong Chua, B., **Gloesener, E.**, Choukroun, M., Vu, T. H., Melwani Daswani, M., Journaux, B., Styczinski, M. J., and Vance, S. D., 2023. Low-temperature specific heat capacity of water-ammonia mixtures down to the eutectic (submitted for publication).
2. Courville, S. W., Castillo-Rogez, J. C., Melwani Daswani, M., **Gloesener, E.**, Choukroun, M., and O'Rourke, J. G., 2023. Timing and abundance of clathrate formation controls ocean evolution in outer solar system bodies (submitted for publication).
3. **Gloesener, E.**, Choukroun, M., Vu, T. H., Maynard-Casely, H. E., Desmedt, A., Davies, A. G., and Sotin, C., 2023. Phase behavior of the ternary H₂O-THF-NH₃ system under cryogenic conditions: Implications for the destabilization of clathrate hydrates on Titan, *ACS Earth Space Chem.*, in press. DOI:10.1021/acsearthspacechem.3c00055.
4. Potter, M. et al. (incl. **Gloesener, E.**), 2023. Manufacturing and characterization of icy simulants for Europa, *2023 IEEE Aerospace Conference Proceedings*, Big Sky, MT, USA.
5. Temel, O., Karatekin, Ö., Mischna, M. A., Senel, C. B., Martínez, G., **Gloesener, E.**, and Van Hoolst, T., 2021. Strong seasonal and regional variations in the evaporation rate of liquid water on Mars, *J. Geophys. Res. Planets* 126, e2021JE006867.
6. **Gloesener, E.**, Karatekin, Ö., and Dehant, V., 2021. Stability and composition of CH₄-rich clathrate hydrates in the present martian subsurface, *Icarus* 353, 114099.
7. Pla-García, J., Rafkin, S. C. R., Karatekin, Ö., and **Gloesener, E.**, 2019. Comparing MSL Curiosity rover TLS-SAM methane measurements with Mars Regional Atmospheric Modeling System (MRAMS) atmospheric transport experiments, *J. Geophys. Res. Planets*, 124, 2141–2167.
8. Temel, O., Karatekin, Ö., **Gloesener, E.**, Mischna, M. A., and van Beeck, J., 2019. Atmospheric transport of subsurface, sporadic, time-varying methane releases on Mars, *Icarus* 325, 39-54.
9. Dehant, V., et al. (incl. **Gloesener, E.**), 2016. PLANET TOPERS: Planets, Tracing the Transfer, Origin, Preservation, and Evolution of their ReservoirS, *Origins of Life and Evolution of Biospheres* 46(4), 369-384.
10. Vu, T., **Gloesener, E.**, Choukroun, M., Ibourichene, A., and Hodyss, R., 2014. Experimental study on the effect of ammonia on the phase behavior of tetrahydrofuran clathrates, *J. Phys. Chem. B.* 118, 13371-13377.

Non-peer-reviewed publications / white papers

1. Stamenković, V., et al. (incl. **Gloesener, E.**), 2020. Deep Trek: Science of Subsurface Habitability & Life on Mars. White Paper for the Planetary Science and Astrobiology Decadal Survey 2023-2032, The National Academies of Sciences, Engineering, and Medicine.
2. Edwards, C. D., et al. (incl. **Gloesener, E.**), 2020. Deep Trek: Mission Concepts for Exploring Subsurface Habitability & Life on Mars. White Paper for the Planetary Science and Astrobiology Decadal Survey 2023-2032, The National Academies of Sciences, Engineering, and Medicine.
3. **Gloesener, E.**, Karatekin, Ö., and Dehant, V., 2013. Le méthane et les clathrates sur Mars, *Ciel et Terre* 129, 2-11.

Invited Talks

1. **Gloesener, E.**, Choukroun, M., Vu, T. H., Maynard-Casely, H. E., Davies, A. G., Desmedt, A., Sotin, C., 2022. Experimental and modelling studies on the phase behavior of clathrate hydrates in the presence of ammonia: Implications for methane outgassing on Titan, *Journées GDR Hydrates 2022*, IFPEN, Rueil-Malmaison, France.
2. **Gloesener, E.**, and Gillmann, C., 2017. Habitability of past and present Mars, *Joint symposium of the BNCGG and the UNITER doctoral school "Earth and Life Interactions"*, Louvain-la-Neuve, Belgium.
3. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2015. Modeling gas transport in the Martian subsurface, *EGU General Assembly*, Vienna, Austria.

Conference abstracts (1st author only)

1. **Gloesener, E.**, Vu, T. H., Choukroun, M., Davies, A. G., Desmedt, A., Sotin, C., 2023. Liquid ethane substitution of methane in clathrate hydrates under Titan-like conditions (poster), *54th Lunar and Planetary Science Conference*, The Woodlands, TX, United States.
2. **Gloesener, E.**, Choukroun, M., Vu, T. H., Maynard-Casely, H. E., Desmedt, A., Davies, A. G., Sotin, C., 2022. Experimental study on the phase behavior of the H₂O-THF-NH₃ system at cryogenic temperatures: Implications for the destabilization of methane clathrate hydrates on Titan (poster), *AGU Fall Meeting*, Chicago, IL, United States.
3. **Gloesener, E.**, Choukroun, M., Maynard-Casely, H. E., Vu, T. H., Davies, A. G., Sotin, C., 2022. The phase behavior of the ternary H₂O-THF-NH₃ system at low temperatures: Implications for clathrate hydrates and methane outgassing on Titan (oral), *53rd Lunar and Planetary Science Conference*, The Woodlands, TX, United States.
4. **Gloesener, E.**, Choukroun, M., Vu, T. H., Davies, A. G., Sotin, C., 2021. Stability of clathrate hydrates in the presence of ammonia: Experimental and modelling perspectives (poster), *AGU Fall Meeting*, New Orleans, LA, United States.
5. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2021. Migration and storage of methane in the Martian crust (oral), *EGU General Assembly*, online.
6. **Gloesener, E.**, Temel, O., Karatekin, Ö., Joiret, S., Dehant, V., 2020. Destabilization of methane clathrate hydrate by meteorite impacts on present-day Mars (poster), *Europlanet Science Congress*, online.
7. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2020. Diffusive and advective transport of methane in the Martian subsurface (oral), *34th Nordic Geological Winter Meeting*, Oslo, Norway.
8. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2019. Advective and diffusive transport of methane from shallow subsurface sources on Mars (poster), *EPSC-DPS Joint Meeting*, Geneva, Switzerland.
9. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2019. Stability of clathrate hydrates at low latitude on Mars (poster), *9th International Conference on Mars*, Pasadena, CA, United States.
10. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2019. Change in methane surface flux due to seasonal variations on Mars (poster), *EGU General Assembly*, Vienna, Austria.
11. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2018. Methane transport in the subsurface of Mars (poster), *European Planetary Science Congress*, Berlin, Germany.
12. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2018. Influence of subsurface properties on water ice and methane clathrate stability on Mars (oral), *"From Mars Express to ExoMars" Workshop*, ESAC, Madrid, Spain.
13. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2017. The role of subsurface properties on transport of water and trace gases: 1D simulations at selected Mars landing sites (poster), *AGU Fall Meeting*, New Orleans, LA, United States.

14. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2017. CH₄-rich clathrate hydrate stability zone in the present Martian subsurface (poster), *6th Mars Atmosphere Modelling and Observations Workshop*, Granada, Spain.
15. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2016. Interpretation of MSL REMS data using 1D coupled heat and water vapor transport model of Mars subsurface (poster), *EGU General Assembly*, Vienna, Austria.
16. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2015. Water vapor and methane transport in the Martian subsurface (poster), *AGU Fall Meeting*, San Francisco, CA, United States.
17. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2015. Modeling water vapor transport in the Martian subsurface (poster), *6th Moscow Solar System Symposium*, Moscow, Russia.
18. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2015. Stability of clathrate hydrates and gas transport in the Martian subsurface (poster), *EGU General Assembly*, Vienna, Austria.
19. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2014. Stability of clathrate hydrates in Martian crust (poster), *EGU General Assembly*, Vienna, Austria.
20. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2013. Martian methane and stability of clathrates in the crust of Mars (poster), *European Planetary Science Congress*, London, United Kingdom.
21. **Gloesener, E.**, Karatekin, Ö., Dehant, V., 2013. Martian methane and link with clathrates in the crust of Mars (poster), *EGU General Assembly*, Vienna, Austria.