

# LUCAS LANGE

NASA Postdoctoral Fellow at Jet Propulsion Laboratory, California, USA

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## WORK EXPERIENCE

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### Jet Propulsion Laboratory

#### NPP Fellow.

April 2025 - April 2027

*Supervisor: sylvain.piqueux@jpl.caltech.edu*

- Developing 1D thermal model for the future analyses of Europa Clipper's data.
- Constraining ice properties from ice temperature measurements.
- Quantifying the detectability of an endogenic heat source on Europa.
- Developing new thermal models to map subsurface ice on Mars.

### Laboratoire Météorologie Dynamique

#### Postdoc.

January 2025 - March 2025

*Supervisor: forget@lmd.ipsl.fr*

- Studying the formation of Methane frost on Pluto
- Studying the evolution of the Martian Climate at low obliquity.

### Laboratoire Météorologie Dynamique

#### Ph.D.

September 2021 - December 2024

*Supervisor: forget@lmd.ipsl.fr*

- Designing and Implementing of a parameterization to simulate slope microclimates (1 km of resolution) in the coarse Mars Planetary Climate Model.
- Building of a new asynchronous model called the Planetary Evolution Model to study Martian paleoclimates.
- Modelling the stability of (sub)surface ice on Mars through time.
- Studying the evolution of the Martian Climate at low obliquity.

### Laboratoire Météorologie Dynamique

#### Internship in the Planetary Science Team

April 2021 - September 2021

*Supervisor: forget@lmd.ipsl.fr*

- Recalibration of the InSight pressure dataset.
- Studying the evolution of the Martian atmospheric Mass and CO<sub>2</sub> cycle during the last 50 years with InSight, MSL, Viking dataset and a Mars Global Climate Model.

### Jet Propulsion Laboratory - NASA

#### Internship in the Planetary And Exoplanetary Atmospheres department

March 2020 - August 2020

*Advisor: sylvain.piqueux@jpl.nasa.gov*

- *Europa*: Quantifying the sensitivity of future Europa Clippers measurements to ice microphysics and the roughness of the terrains with improvement in the 1D thermal model KRC.
- *Mars*: Studying the interactions between the regolith and diurnal CO<sub>2</sub> frost in low latitudes terrains based on Mars Odyssey dataset and KRC.

## EDUCATION

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### M.S in Planetary Sciences and Astrophysics - Université Paul Sabatier -

2020 - 2021

Major in Planetology, Surface Processes, Climatology

Rank: 2/31, grade: 17.3/20.

### Engineering Degree - ISAE-SUPAERO

2017 - 2021

Common core: Applied Mathematics, Fluid Mechanics, Physics, Informatique, Data Processes. Major in Planetary Sciences. Minor in the numerical modelling of complex systems.

Rank in the common core: 9/231.

### Intensive Preparation Courses for the entrance exams to top French Engineering Schools - Lycée Carnot - Dijon

2015 - 2017

## SELECTED RESEARCH AWARDS

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- French National High-Performance Computing Equipment (GENCI), 1.5 million hours of supercomputer computing, 2021-2024
- Space Foundation - French Space & Air Army, 5 k\$, 2021
- Toulouse School of Aerospace Engineering, 15 k\$, 2020

## SELECTED PROFESSIONAL SERVICE AND AWARDS

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### Journal Reviewer

Journal of Geophysical Research, Planets; Icarus; Nature Earth and Environment; Planetary and Space Science

### Seminar

- *The Many Faces of Mars during its Recent Past*, JPL, 2025
- *Buried Subsurface Water Ice on Mars: Unlocking the Planet's Climate History*, Observatoire de Paris, 2025
- *Buried Subsurface Water Ice on Mars: Unlocking the Planet's Climate History*, Laboratoire de Planétologie et Géosciences, 2025
- *Buried Subsurface Water Ice on Mars: Unlocking the Planet's Climate History*, LATMOS, 2025
- *Buried Subsurface Water Ice on Mars: Unlocking the Planet's Climate History*, LATMOS, 2025
- *Modeling Mars Present-Day and Past Climates with Global Climate Models: the « Mars Through Time » project*, Weizmann Institute, 2023
- *Modeling Mars Present-Day and Past Climates with Global Climate Models: the « Mars Through Time » project*, IRAP, 2023

### Organization

- Mars Modelling and Observations Workshop, Paris, 2022

### Advising/Mentoring

- Undergraduate students: 1 in 2023 (1 month)
- M.S students: 1 in 2023 (6 months)

### Public Outreach

- Volunteer at the Science Festival, Sorbonne University, 2021
- Co-organisation of the "OSE-InSight Program", ISAE-SUPAERO, 2017-2021
- Astronomy Festivals, Cite de l'Espace, 2017-2019

### Awards

- 3<sup>rd</sup> Place in the European Aerospace Engineering Students contest *PEGASUS*, 2021
- High School Student Merit Price, 2015

## PRESS RELEASES (LEADING AUTHOR ONLY)

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- Science at Sunrise: Solving the Mystery of Frost Hiding on Mars, 2022  
[mars.nasa.gov/news/9184/science-at-sunrise-solving-the-mystery-of-frost-hiding-on-mars/](https://mars.nasa.gov/news/9184/science-at-sunrise-solving-the-mystery-of-frost-hiding-on-mars/)

## TEACHING

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### Teaching Assistant, Sorbonne Université - UFR TEB

2022 - 2024

- Earth, Climate and Environment (1<sup>st</sup> year undergrad. students)
- Applied Mathematics (1<sup>st</sup> year undergrad. students)
- Planetary Geomorphology (1<sup>st</sup> year of M.S students)

### Lecturer, ISAE-SUPAERO

2023

1 lecture on the basics of Climate Numerical Modelling for last year engineering students.

**Oral Examiner for undergrad. students in preparatory classes, Lycée Jacques Decour** 2021 - 2023

Oral in Physics and Chemistry for 2<sup>nd</sup> year undergrad. students.

**Academic Tutor for 1<sup>st</sup> and 2<sup>nd</sup> year students, ISAE-SUPAERO** 2019-2021

**Mentor for High School students, OSE-L'ISAE-SUPAERO** 2017-2024

- 2 hr per week of academic help for students in priority education zones
- Sponsorship of students in preparatory classes
- Participation in workshops to popularize higher education ("Entretiens de l'excellence").

## PUBLICATIONS

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13. Vignon, E., Arjdal, K., Cheruy, F., Coulon-Decorzens, M., Dehondt, C., Dubos, T., Fromang, S., Hourdin, F., **Lange, L.**, Raillard, L., Rivière, G., Roehrig, R., Sima, A., Spiga, A., Tiengou, P., *Designing a fully-tunable and versatile TKE-l turbulence parameterization for the simulation of stable boundary layers*. Journal of Advances in Modeling Earth Systems, 16, 2024.
12. **Lange, L.**, Piqueux, S., Edwards, C.S., Forget, F., Naar, J., Vos, E., Szantai, A., *Observations of Water Frost on Mars with THEMIS: Application to the Presence of Brines and the Stability of (Sub)Surface Water Ice*. Journal of Geophysical Research (Planets), 129, 2024.
11. Pinot, B., Mimoun, D., Murdoch, N., Onodera, K., Johnson, C., Mittelholz, A., Drilleau, M., Stott, A., Pou, L., de Raucourt, S., Lognonné, P., Widmer-Schmidrig, R., **Lange, L.**, Panning, M., Banerdt, B.. *The In Situ Evaluation of the SEIS Noise Model*. Space Science Reviews, 220(3), 26, 2024
10. Murdoch, N., Stott, A.E., Mimoun, D., Pinot, B., Chatain, A., Spiga, A., Temel, O., Pla Garcia, J., Onodera, K., Lorenz, R., Gillier, M., Newman, C., Garcia, R.F, **Lange, L.**, Banfield, D., *Investigating Diurnal and Seasonal Turbulence Variations of the Martian Atmosphere Using a Spectral Approach*, The Planetary Science Journal, 4, 2023.
9. **Lange, L.**, Forget, F., Vincendon, M., Spiga, A., Vos, E., Aharonson, O., Millour, E., Bierjon, A., Vandemeulebrouck, R., *A Reappraisal of Subtropical Subsurface Water Ice Stability on Mars*, Geophysical Research Letters, 50, 2023.
8. **Lange, L.**, Forget, F., Dupont, E., Vandemeulebrouck, R., Spiga, A., Millour, E., Vincendon M., Bierjon, A., *Modeling Slope Microclimates in the Mars Planetary Climate Model*, Journal of Geophysical Research (Planets), 128, 2023.
7. Vos, E., Aharonson, O., Schörghofer, N., Forget, F., **Lange, L.**, Millour, E., *Paleo-Evolution of Martian Subsurface Ice and its Role in the Polar Physical and Isotopic Layering*, Journal of Geophysical Research (Planets), 128, 2023.
6. Stcherbinine, A., Edwards, C.S, Smith, M.D, Wolff, M.J., Haberle, C., Al Tunaiji, E., M Smith, N.M, Saboi, K., Anwar, S., **Lange, L.**, Christensen, P.R, *Diurnal and seasonal mapping of Martian ices with EMIRS*, Geophysical Research Letters, 50, 2023.
5. Delavois, A., Forget, F., Turbet, M. Millour, E., Vandemeulebrouck, R., **Lange, L.**, Bierjon, A, *Water Supersaturation for Early Mars*, Journal of Geophysical Research (Planets), 128, 2023.
4. Grott, M., Piqueux, S., Spohn, T., Knollenberg, J., Krause, C., Marteau, E., Hudson, T.L., Forget, F., **Lange, L.**, Müller, N., Golombek, Nagihara, M. S., Morgan, P., Murphy, J.P., Siegler, M., King, S.D, Banfield, D., Smrekar, S.E., Banerdt, W.B, *Seasonal Variations of Soil Thermal Conductivity at the InSight Landing Site*, Geophysical Research Letters, 50, 2023.
3. **Lange, L.**, Forget, F., Banfield, D., Wolff, M., Spiga, A., Millour, E., Viúdez-Moreiras, D., Bierjon, A., Piqueux, S., Newman, C., Pla-García, J, Banerdt, W.B., *InSight Pressure Data Recalibration, and Its Application to the Study of Long-Term Pressure Changes on Mars*, Journal of Geophysical Research (Planets), 127, 2022.
2. **Lange, L.**, Piqueux, S., Edwards, C. S., *Gardening of the Martian Regolith by Diurnal CO<sub>2</sub> Frost and the Formation of Slope Streaks*, Journal of Geophysical Research (Planets), 127, 2022.
1. Compaire, N., Margerin L., Monnereau, M., Garcia, R.F, **Lange, L.**, Calvet, M., Nikolaaj, L.D, Stähler, S.C, Mueller, N., Grott, M. Lognonné, P., Spohn, T., Banerdt, W.B *Seasonal variations of subsurface seismic velocities monitored by the SEIS-InSight seismometer on Mars*, Geophysical Journal International, 229, 2021.

## PRESENTATIONS (FIRST AUTHOR ONLY)

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7. Lange L., Bertrand T., Belissa V., Carpry S. , *Modeling Slope-Driven Microclimates and Methane Frost Deposition on Pluto*, Progress in Understanding the Pluto System: 10 Years After Flyby, 2025.
6. Lange, L., Forget, F., Clément, J.B., Millour, E., Vos, E., Grau Galofre, A., Conway, S., Roelofs, L., *Mars at Low Obliquity*, The Tenth International Conference on Mars, 2024.
5. Lange, L., Forget, F., *Ice on the Surface and in the Subsurface of Mars: Review and New Ideas*, PlanetoExo-bio, 2024.
4. Lange, L., Forget, F., Meslin, P.Y., Vos, E., Clément, J.B., Naar, J., *Stability of (Sub)Surface Water Ice on Mars*, Eighth International Conference on Mars Polar Science and Exploration, 2024
3. Lange, L., Forget, F., Vandemeulebrouck, R., Millour, E., Delavois, A., Naar, J., Spiga, A., Bierjon, A., Dupont, E., *Climate Simulations of Mars at Low Obliquity*, Seventh International Workshop on the Mars Atmosphere: Modelling and Observations, 2022
2. Lange, L., Forget, F., Vandemeulebrouck, R., Millour, E., Delavois, A., Naar, J., Spiga, A., Bierjon, A., Dupont, E., *Climate Simulations of Mars at Low Obliquity*, EGU General Assembly Conference, 2022
1. Lange, L., Forget, F., Spiga, A., Banfield, D., Millour, E., Newman, C., Pla-García, J., Viúdez-Moreiras, D., *Comparison of the Seasonal Pressure Variations Recorded by InSight and Viking 1 and Recalibration of InSight Data*. European Planetary Science Congress 2021.