



# Serena Molli

## PhD Student of Space Engineering

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I have always been fascinated by the observation of planets, and by how we can gather information on their physical, chemical and biological properties via remote sensing technologies, as well as via deep-space tracking techniques and spacecraft navigation. For these reasons, I am pursuing a PhD in Martian and lunar navigation systems. My research focuses on the radio-tracking techniques employed to make such systems almost completely autonomous. An example is the inter-satellite link, which I am investigating in a study funded by Argotec s.r.l. and the Italian National Research Council (CNR).

During my secondment at the European Space Agency (ESA)-ESTEC, I am collaborating on the Moonlight initiative and internal navigation programs.

## Work History

2020-11 - present

### PhD Student of Space Engineering

*Sapienza University , Rome*

*Supervisor: Prof. Luciano Iess*

*Funded by Sapienza, Argotec and National Research Council (CNR).*

I'm currently investigating Martian and Lunar autonomous navigation system exploiting a novel configuration of inter-satellite link (ISL) using small satellites.

Projects I'm involved in:

- "Fundamental techniques, models and algorithms for a lunar radio navigation system", European Space Agency (ESA) Tender Action
- "New satellite navigation techniques / satellite navigation systems for small satellites on other planets, devices and innovative platforms / developments for space service volume activities in the field of satellite navigation", Italian Space Agency (ASI)

Publications:

- Molli, S., Durante, D., Gascioli, G., & Proietti, S. (2021, October). Performance analysis of a Martian polar navigation system. In Proceedings of the 72nd International Astronautical Congress, Dubai, United Arab Emirates (pp. 25-29).
- Di Benedetto, M., Cappuccio, P., Molli, S., Federici, L., Zavoli, A. ANALYSIS OF 3GM CALLISTO GRAVITY EXPERIMENT OF THE JUICE MISSION. Advances in the Astronautical Sciences, 2021, 175, pp. 4965–4977
- Linty N., Lepore, F., Tricarico, P., Reverberi, G., Manfrini, P.L., Riccobono D., Molli S., ... , & Racioppa, P., (2022). 'Design and Validation of an Autonomous Orbit Determination System for a Smallsat Constellation. In Proceedings of the 73rd International Astronautical Congress, Paris, France
- Molli, S., Boscagli, G., Di Benedetto, M., Durante, D., Vigna, L., Iess, L. (2022, November). Time transfer and orbit determination for a Martian navigation system based on smallsats. In 2022 9th International Workshop on Tracking, Telemetry and Command Systems for Space Applications (TTC) (in press). IEEE.
- Molli, S., Durante, D., Boscagli, G., Cascioli, G., Racioppa, P., Alessi, E. M., ... & Iess, L. (2022). Design and performance of a Martian autonomous navigation system based on a smallsat constellation. Acta Astronautica.

Conferences:

- Asmar, S., Iess, L., Beauchamp, P., Cutts, J., Lazio, J., Freeman, A., ... & Molli, S. (2022). Time Variable Venus

- Atmospheric Structure via Radio Crosslinks with Low-Cost VASCO Mission Concept. 44th COSPAR Scientific Assembly. Held 16-24 July, 44, 337.
- Molli, S., Iess, L., Alessi, E. M., Durante, D., Simonetti, S., & Sesta, A. (2022). Martian user positioning via a semi-autonomous smallsat constellation. 44th COSPAR Scientific Assembly. Held 16-24 July, 44, 422.
  - Iess, L., Sosnica, K., Racioppa, P., Durante, D., Fienga, A., di Stefano, I., Molli, S., ... & Santi, F. (2022). 'ATLAS-Fundamental techniques, models and algorithms for a lunar radio navigation system': a proposal for a lunar navigation system infrastructure. 44th COSPAR Scientific Assembly. Held 16-24 July, 44, 3190.

2022-09 - 2022-11

### Visiting Expert

*Argotec, Torino*

Technology demonstrator for an autonomous orbit determination system for small satellite constellation

2022-12 - present

### Visiting Expert

*ESA-ESTEC, Noordwijk*

- User positioning performance and architecture for Moonlight initiative and for a Martian autonomous navigation system
- Orbit determination using ISL with MARCONI constellation
- Cooperative positioning for Martian constellation using pulsar/star maps

## Education

2018-09 - 2020-10

### Space Engineering, Master's degree

*Sapienza Università di Roma*

*Grade: 110/110 with honors*

#### Remote Sensing curriculum

Optional course projects on polarimetric SAR interferometry and imaging polarimetry, focusing on scattering theory and land parameter characterization.

In my thesis "Expected precision of Europa Clipper gravity measurements", I demonstrated the capability of this future NASA mission to investigate the interior structure of the Jovian moon Europa, with a gravity science study combined with altimetric measurements.

Advisor: Prof. Luciano Iess

Telecommunication System Lead and Team Manager of Sapienza Technology Team (STT), participating in AUVER Student Unmanned Aerial System (SUAS) Competition 2019

2013-09 - 2016-12

### Aerospace, Aeronautical and Astronautical Engineering, Bachelor's degree

*Università degli Studi di Napoli Federico II*

*Grade: 110/110 with honors*

Experimental Thesis: "Effects of secondary interaction rods on the kinematic field of a continuous jet with a fractal square inset"

Advisor: Prof. Tommaso Astarita

Academic Courses: Aerospace CAD, Reliability and Quality, Aerodynamics, Thermo Fluid dynamics, Gasdynamics, Numerical Methods

2009-09 - 2013-07

### Classical high school

*Liceo G. Carducci, Nola (NA)*

Grade: 100/100

## Skills

Project Management

Practised and improved during my experience as Team Manager of the Sapienza Technology Team.

## Public speaking

Outreach is a fundamental part of the PhD. I regularly participate in international meetings and public conferences, such as the International Astronautical Congress (IAC), in Dubai (Oct 2021), the COSPAR Scientific Assembly in Athens (2022), and the TT&C International Workshop in the Netherlands (2022).

## Writing reports

I collaborate in drafting the periodic reports for the projects I'm involved in as part of the team.

## Writing proposals

I took part in the writing of the proposal funded by ESA "Fundamental techniques, models and algorithms for a lunar radio navigation system".

## Software

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Python

C++

Matlab, Simulink

MONTE (JPL's signature astrodynamics computing platform)

ENVI, SNAP, PolSARpro (image processing and analysis softwares)

Zemax (optical design program used to design and analyze imaging systems)

Fluent, Xfoil

Nastran, Patran

UNIX, bash, Apple iWork, Microsoft Office

Godot (orbit determination)

## Languages

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Italian - Mother tongue

English - Proficient (C1)

Spanish - Beginner (A2)

French - Beginner (A1)

## Hobby

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I enjoy participating in environmental volunteering projects around the world, which are opportunities to take care of the planet and get to know new people and cultures. I am a greedy book reader with a special interest in philosophical and sociological essays. I regularly practise several kinds of sports, ranging from outdoor hiking to aerial dance.

## Awards

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2018-10

**"Wanted the best" (3k €), awarded by Sapienza University**