Irene Palazzoli

Postdoctoral fellow

Department of Civil, Chemical, Environmental, and Materials Engineering
Alma Mater Studiorum – University of Bologna

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Research interests

- Hydrology and climate extremes
- Human impacts on freshwater systems
- Machine learning and remote sensing

Work experience

Feb 2022 – present
Bologna, Italy

Postdoctoral Research Scientist
Department of Civil, Chemical, Environmental, and Materials Engineering
Alma Mater Studiorum – University of Bologna

May – Dec 2022
New York, NY, USA

Visiting Postdoctoral Research Scientist
Department of Earth and Environmental Engineering
Columbia University in the City of New York

Sept 2017 – Dec 2018
Boston, MA, USA

Research Assistant
Department of Earth and Environment
Boston University

Nov 2014 – March 2015
Milan, Italy

Research Assistant
Department of Civil and Environmental Engineering
Polytechnic of Milan

April – Sept 2014
Milan, Italy

Facility Management Intern
Robert Bosch GmbH

Education

June 14, 2022
Bologna, Italy

Ph.D. in Structural and Environmental Health Monitoring and Management
Alma Mater Studiorum – University of Bologna

- Thesis: Anthropogenic and climatic controls on surface water across the contiguous United States.
- Supervisors: Prof. Serena Ceola (primary), Prof. Alberto Montanari (co-supervisor).

May 17, 2017
Boston, MA, USA

Master of Arts in Earth Sciences
Boston University

- Thesis: Identification of the most effective factors responsible for the flushing of a tracer in a system of shallow bays.
- Supervisor: Prof. Sergio Fagherazzi.

Dec 18, 2013 — **Master of Science in Environmental Engineering**
Milan, Italy — *Polytechnic of Milan*

- Thesis: Assessing the impact of climate change on agriculture in Indrawati Basin, Nepal.
- Supervisors: Prof. Daniele Bocchiola (primary), Prof. Dr. Stefan Uhlenbrook, Prof. Dr. Shreedhar Maskey (co-supervisors).

Sept 21, 2010 — **Bachelor of Science in Environmental Engineering**
Milan, Italy — *Polytechnic of Milan*

- Thesis: Laboratory Investigation on the Compressibility of Reconstituted Soils (original: Indagine di laboratorio sulla compressibilità di terreni ricostituiti).
- Supervisor: Prof. Cristina Jommi.

Presentations at conferences

The underlined name identifies the presenter.

Oral presentations

- **Palazzoli, I.**, Ceola, S., and Gentine, P., "Predicting Terrestrial Water Storage Anomalies at the Global Scale with a Machine-Learning Model". Session HS3.1 – Hydroinformatics: data analytics, machine learning, hybrid modelling, optimisation. *EGU General Assembly 2023*, Wien, Austria. 24/04/2023 – 28/04/2023.
- Montanari, A., **Palazzoli, I.**, Ceola, S., "Contribution of Anthropogenic and Climatic drivers to the Surface Water Extent Change in the Contiguous United States". Session HS7.4 – Steps towards future hydroclimatic scenarios for water resources management in a changing world. *EGU General Assembly 2023*, Wien, Austria. 24/04/2023 – 28/04/2023.
- **Palazzoli, I.**, Zhao, W., Ceola, S., and Gentine, P., "A Machine-Learning Model of Terrestrial Water Storage Changes at the Global Scale". H26A: Advances in Machine Learning for Earth Science: Observation, Modeling, and Applications. *AGU Fall Meeting 2022*, online. 12/12/2022 – 16/12/2022.
- **Palazzoli, I.**, Ceola, S., and Montanari, A., "Anthropogenic and Climatic Factors Contributing to the Change in Surface Water Extent across the Contiguous United States". H25G: Water and Society: Water Resources Management and Policy in a Changing World. *AGU Fall Meeting 2022*, online. 12/12/2022 – 16/12/2022.
- **Palazzoli, I.**, Ceola S., and Montanari A., "Urbanization Effects on Surface Water Loss Across the Contiguous United States". Session 20 – Socio-idrologia e dinamiche di interazione tra società, gestione sostenibile delle risorse idriche e rischio idrogeologico. *XXXVIII National Assembly of Hydraulic and Hydraulic Constructions, IDRA 2022*, Università degli Studi Mediterranea di Reggio Calabria, Reggio Calabria, Italy. 04/09/2022 – 07/09/2022.
- **Palazzoli, I.**, Montanari, A., and Ceola, S., "Spatial influence of urban areas on surface water loss across the contiguous United States". Session S6 – Understanding the human footprint on the hydrological cycle/processes in a changing world. *IAHS XIth Scientific Assembly*, Montpellier, France. 29/05/2022 – 03/06/2022.
- **Palazzoli, I.**, Montanari, A., and Ceola, S., "Spatial Distribution of Surface Water Losses from Urban Areas Across the Contiguous United States". Session HS1.1.4 – Panta Rhei: Hydrology, Society & Environmental Change. *EGU General Assembly 2022*, online. 23/05/2022 – 27/05/2022.
- **Palazzoli, I.**, Montanari, A., and Ceola, S., "Spatial Influence of Urban Areas on Surface Water Loss Across the Contiguous United States". Session E31E –

Monitoring the Effects of Human Management of Hydrological Systems: From in Situ Observations to Remote Sensing and Modeling. *AGU Fall Meeting 2021*, online. 13/12/2021 – 17/12/2021.

- **Palazzoli, I.**, Montanari, A., and Ceola, S., "Influence of urban areas on surface water loss across the contiguous United States". Theme 03 – Water Resources and Human Behavior: Analysis and Modeling of Coupled Water-Human Systems Feedbacks and Coevolution. *Delft International Conference on Sociohydrology*, online. 06/09/2021 – 08/09/2021.

Poster presentations

- Winbourne, J.B., **Palazzoli, I.**, Schifman, L., Gately, C., Smith, I.A., Hutyra, L.R., "Spatial and seasonal trends in biogenic and fossil fuel carbon dioxide fluxes among three metropolitan regions". Session A41N-1754. *AGU Fall Meeting 2024*, Washington, D.C., USA. 09/12/2024 – 13/12/2024.
- **Palazzoli, I.**, Ceola, S., and Gentine, P., "Predicting Terrestrial Water Storage Anomalies at the Global Scale with Machine-Learning". *Sub-Riemannian Geometry Harmonic Analysis, PDEs and Applications conference*, Department of Mathematics, University of Bologna, Bologna, Italy. 03/07/2023 – 05/07/2023.
- **Palazzoli, I.**, Montanari A., and Ceola S., "Interaction between Anthropogenic and Hydroclimatic Factors and Surface Water Extent in the Contiguous United States". *Hydrology Days 2022 by the Italian Hydrological Society*, Università degli Studi di Genova, Genova, Italy. 09/11/2022 – 11/11/2022.
- **Palazzoli, I.**, and Ceola, S., "Contribution of Anthropogenic and Climatic Drivers on the Variation of Surface Water Extent Across the Contiguous United States". Session H55V – Panta Rhei: Hydrology, Society, and Environmental Change. *AGU Fall Meeting 2021*, online. 13/12/2021 – 17/12/2021.
- **Palazzoli, I.** and Ceola S., "Anthropogenic controls on surface water loss across USA". Session 15 – Risorse idriche e scarsità: monitoraggio, previsione, gestione, resilienza e adattamento ai cambiamenti climatici e socioeconomici. *XXXVII National Assembly of Hydraulic and Hydraulic Constructions, IDRA 2020*, online. 14/06/2021 – 16/06/2021.
- **Palazzoli, I.**, Montanari, A., and Ceola, S., "Influence of urban areas on surface water loss across USA watersheds". Session HS3.3 – Advanced geostatistics for water, earth and environmental sciences & Spatio-temporal and/or (geo) statistical analysis of hydrological events, floods, extremes, and related hazards. *EGU General Assembly 2021*, online. 19/04/2021 – 30/04/2021.
- Ceola, S. and **Palazzoli, I.**, "Contribution of urbanization and climate variability on surface water depletion across USA watersheds". Session HS7.4 – Hydroclimatic change and unchange: exploring the mysteries of variability, nature and human impact. *EGU General Assembly 2021*, online. 19/04/2021 – 30/04/2021.
- **Palazzoli, I.** and Ceola, S., "Urbanization influence on surface water loss across USA watersheds". Session H139 – Hydrology, Society, and Environmental Change: Convergent Approaches to Human – Water Interactions. *AGU Fall Meeting 2020*, online. 01/12/2020 – 17/12/2020.
- **Palazzoli, I.** and Ceola, S., "Anthropogenic and climatic controls on surface water loss across USA". Session HS1.2.4 – Panta Rhei: Hydrology, Society & Environmental Change. *EGU General Assembly 2020*, online. 04/05/2020 – 08/05/2020.
- **Palazzoli, I.** and Ceola, S., "Anthropogenic and climatic controls on surface water decrease across USA". Virtual Poster Division: Environmental Sciences.

AGU Virtual Poster Showcase, online. Fall 2019.

- **Palazzoli, I.**, Bocchiola, D., Nana, E., Maskey, S., Uhlenbrook, S., "Assessing the impact of climate change on agriculture in Indrawati basin, Nepal". Session HS2.4.5 – Hydrological change: Regional hydrological behaviour under transient climate and land use conditions. *EGU General Assembly 2014*, Wien, Austria. 27/04/2014 – 02/05/2014.

Seminars

- **Palazzoli, I.**, "Understanding the influence of changing human societies and climate on water resources". *Department of Earth and Environmental Engineering Spring 2023 – Special Seminar*, Columbia University in the City of New York, New York, NY, USA. Invited Seminar. 13/02/2023.
- **Palazzoli, I.**, "Anthropogenic and climatic controls on surface water across USA". *Gentine Lab Group Meeting*, Columbia University in the City of New York, New York, NY, USA. 02/08/2022.
- **Palazzoli, I.**, "Estimating the biological exchange of CO2 in urban environments". *DICAM Hydro Meeting*, University of Bologna, Bologna, Italy. 08/03/2019.
- **Palazzoli, I.**, "Urban Vegetation Photosynthesis and Respiration Model". *Hutyra Lab Meeting*, Boston University, Boston, MA, USA. 15/02/2018.

Teaching experience

Jan – May 2017 — *Boston, MA, USA*

Teaching Assistant
Department of Earth and Environment
Boston University

- Undergraduate course: "Environmental Earth Sciences".
- Topic: study of the environmental issues from the Earth Sciences perspective.

Sept – Dec 2015 — *Boston, MA, USA*

Teaching Assistant
Department of Earth and Environment
Boston University

- Undergraduate course: "Natural Environments: The Atmosphere".
- Topic: introduction to the science of weather and climate.

Students supervision and mentoring

Oct 2024 – present

Mentor of the visiting student Anne Maria Allegonda Fransen from Wageningen University. Department of Civil, Chemical, Environmental, and Materials Engineering, Alma Mater Studiorum – University of Bologna, Bologna, Italy.

April – Dec 2023

Co-supervisor of Sepehr Norouzi. Thesis: *Understanding surface water loss in the Zayandeh-Rud Basin, Iran: an interdisciplinary analysis of anthropogenic and climatic factors*. Master's Degree in Environmental Engineering, Department of Civil, Chemical, Environmental, and Materials Engineering, Alma Mater Studiorum – University of Bologna. Primary advisor: Prof. Serena Ceola.

Sept 2021 – Feb 2022

Co-supervisor of Gianluca Lelli. Thesis: *Influence of urban and irrigated areas on surface water loss across Italy*. Master's Degree in Environmental Engineering, Department of Civil, Chemical, Environmental, and Materials Engineering, Alma Mater Studiorum – University of Bologna. Primary advisor: Prof. Serena Ceola.

April – July 2019 **Co-supervisor** of Andrea Mazzola. Thesis: *Evolution of anthropogenic pressure on river systems in South-East Asia by using satellite data*. Master's Degree in Environmental Engineering, Department of Civil, Chemical, Environmental, and Materials Engineering, Alma Mater Studiorum – University of Bologna. Primary advisor: Prof. Serena Ceola.

Fellowships, grants, and awards

2023 **High-performance computing resources on HPC CINECA system GALILEO**
PI of the ISCRA Class-C project "Human pressure on surface water at the global scale" (15,000 CPUh).

2020 **Marie Skłodkowska-Curie grant – EU RISE GHAIA Project**
Funding for a 7-month visiting period at Columbia University in the City of New York (New York, USA). Visit postponed to May – December 2022 due to the COVID-19 pandemic.

2018 **SEHM2 PhD Programme Scholarship**
Scholarship covering the SEHM2 doctoral programme at University of Bologna (Bologna, Italy) from January 1, 2019 to January 31, 2022.

2013 **Exchange Program – Master Thesis Abroad**
Fellowship supporting the 6-month research visit (Febraury – July 2013) at UNESCO-IHE Delft Institute for Water Education (Delft, The Netherlands) to develop the master's thesis.

Activity as reviewer

From 2024 Reviewer for **Environmental Research Letters** (IOP Science), **Climate and Atmospheric Science** (Springer Nature), **Journal of Hydrology: Regional Studies** (Elsevier), **Scientific Reports** (Springer Nature), **Irrigation Science** (Springer Nature), **Discover Water** (Springer Nature).

From 2018 Reviewer for **Hydrological Sciences Journal** (Taylor & Francis).

Computational skills

Programming languages R, Python, Terminal Commands, Bash/Shell, basic knowledge of Matlab, C++ and SQL

Software RStudio, Numpy, Tensorflow, Keras, Scikit-Learn, SciPy, Matplotlib, GIS (expert in QGIS, good control of ArcGIS, SagaGis), SWAT, Delft3D, Latex, Microsoft Word, Microsoft Excel, Microsoft PowerPoint

Operating Systems Mac OS, MS Windows, Linux

Workshops and schools

- *Data science: an algorithmic approach*, Case Western Reserve University, Cleveland, Ohio, USA (Online). 04/05/2021 – 03/06/2021.
- *Python Seminar, Institute for Artificial Intelligence*, University of Georgia, USA (Online). 05/02/2021 & 12/02/2021.
- *Runoff Predictions in Ungauged Basins (PUB) - Summer School*, Centre for Water Resource Systems, Vienna University of Technology, Wien, Austria. 01/07/2019 – 05/07/2019.

- *ESA Living Planet Symposium 2019*, MiCo Milano Congressi, Milano, Italy. 13/05/2019 – 17/05/2019.
- *Data Rich Hydrology - International Winter School on Hydrology*, UNESCO WWAP Headquarter, Villa la Colombella, Colombella, Perugia, Italy. 28/01/2019 – 01/02/2019.
- *CO2 - Urban Synthesis and Analysis Workshop*, University of Utah, Salt Lake City, Utah, USA. 24/10/2018 – 25/10/2018.

Courses and qualifications

- *Risorse Bibliografiche e Servizi Bibliotecari per l'Ingegneria e l'Architettura*, University of Bologna, Bologna, Italy. 06/02/2019 – 15/02/2019.
- *Seminars in Geomorphology*, Massachusetts Institute of Technology, Boston University, and Boston College, Boston, MA, USA. 01/02/2015 – 30/04/2015.
- *Teaching Skill Seminar*, Boston University, Boston, MA, USA. 15/08/2015 – 10/12/2015.
- *Qualification to practice Engineering profession*, University of Florence, Florence, Italy. 13/11/2015.

Outreach activity

May 31, 2022 **Invited article**
News journal *Society for Industrial and Applied Mathematics – SIAM News Online* (link)

March 7, 2022 **Interview for an article**
Italian newspaper *Corriere di Bologna* (link)

Feb 10, 2022 **Editor highlight**
Science news magazine *Eos* by AGU (link)

Feb 10, 2022 **Press release**
Science news-release platform *EurekAlert!* by the AAAS (link)

June 13, 2020 **Contributor for a documentary**
Documentary series *SEVA Project – Serviamo il pianeta insieme* (link)

Publication list

International peer-reviewed journals

[1] **Palazzoli I.**, Ceola S., and Gentine P. (2025). GR*Ai*CE: reconstructing Terrestrial Water Storage Anomalies with recurrent neural networks. *Scientific Data.*, 12, 146. doi:10.1038/s41597-025-04403-3

[2] Ceola S., Muttarak R., Binelli C., Puglisi C., Fransen A., **Palazzoli I.**, and Tamer D.K. (2024). Living with floods: strengthening adaptation and preparedness through better risk communication. *Submitted to Environment and Planning E: Nature and Space.*

[3] **Palazzoli I.**, Lelli G., and Ceola S. (2024). Land cover and spatial distribution of surface water loss hotspots in Italy. *Sustainability*, 16, 8021. doi:10.3390/su16188021

[4] Domeneghetti A., Ceola S., Pugliese A., Persiano S., **Palazzoli I.**, Castellarin A., Marinelli A., and Brath A. (2024). Potential legacy of SWOT mission for the estimation of Flow-Duration Curves. *Remote Sensing*, 16, 2607. doi:10.3390/rs16142607

[5] **Palazzoli I.**, Montanari A., and Ceola S. (2023). Contribution of anthropogenic and hydroclimatic factors on the variation of surface water extent across the contiguous United States. *Environmental Research Communications*, 5, 051006. doi:10.1088/2515-7620/acd510

[6] **Palazzoli I.**, Montanari A., and Ceola S. (2022). Influence of urban areas on surface water loss in the contiguous United States. *AGU Advances*, 3, e2021AV000519. doi:10.1029/2021AV000519. ***Editor's highlight***

[7] **Palazzoli I.**, Leonardi N., Jiménez-Robles A. M., and Fagherazzi S. (2020). Velocity skew controls the flushing of a tracer in a system of shallow bays with multiple inlets. *Continental Shelf Research*, 192, 104008. doi:10.1016/j.csr.2019.104008

[8] **Palazzoli I.**, Maskey S., Uhlenbrook S., Nana E., and Bocchiola D. (2015). Impact of prospective climate change on water resources and crop yields in the Indrawati Basin, Nepal. *Agricultural Systems*, 133, 143–157. doi:10.1016/j.agsy.2014.10.016

International conference abstracts

[9] Montanari A., **Palazzoli I.**, and Ceola S. (2023). Contribution of anthropogenic and climatic drivers to the surface water extent change in the contiguous United States. *Geophysical Research Abstracts*, EGU23, 16278. doi:10.5194/egusphere-egu23-16278

[10] **Palazzoli I.**, Ceola S., and Gentine P. (2023). Predicting terrestrial water storage anomalies at the global scale with a machine-learning model. *Geophysical Research Abstracts*, EGU23, 16641. doi:10.5194/egusphere-egu23-16641

[11] **Palazzoli I.**, Montanari A., and Ceola S. (2022). Spatial influence of urban areas on surface water loss across the contiguous United States. *IAHS-AISH Scientific Assembly 2022*, IAHS2022, 7. doi:10.5194/iahs2022-7

[12] **Palazzoli I.**, Montanari A., and Ceola S. (2022). Spatial distribution of surface water losses from urban areas across the contiguous United States. *Geophysical Research Abstracts*, EGU22, 8511. doi:10.5194/egusphere-egu22-8511

[13] Ceola S. and **Palazzoli I.** (2021). Contribution of urbanization and climate variability on surface water depletion across USA watersheds. *Geophysical Research Abstracts*, EGU21, 484. doi:10.5194/egusphere-egu21-484

[14] **Palazzoli I.**, Montanari A., and Ceola S. (2021). Influence of urban areas on surface water loss across USA watersheds. *Geophysical Research Abstracts*, EGU21, 554. doi:10.5194/egusphere-egu21-554

[15] **Palazzoli I.** and Ceola S. (2020). Anthropogenic and climatic controls on surface water loss across USA. *Geophysical Research Abstracts*, EGU2020, 254. doi:10.5194/egusphere-egu2020-254

[16] **Palazzoli I.**, Bocchiola D., Nana E., Maskey S., and Uhlenbrook S. (2014). Assessing the impact of climate change upon hydrology and agriculture in the Indrawati Basin, Nepal. *Geophysical Research Abstracts*, 16, 12732. url:https://ui.adsabs.harvard.edu/abs/2014EGUGA..1612732P

Datasets

[17] **Palazzoli I.**, Ceola S., and Gentine P. (2024). GRAiCE: Terrestrial water storage anomalies reconstructions [data set]. *Zenodo*. doi:10.5281/zenodo.10953658

[18] **Palazzoli I.**, Lelli G., and Ceola S. (2024). Surface water loss hotspots and areas of human pressure in Italy [data set]. *Zenodo*. doi:10.5281/zenodo.12547464

[19] **Palazzoli I.**, Montanari A., and Ceola S. (2021). Surface water loss map and urbanization map [data set]. *Zenodo*. doi:10.5281/zenodo.4472831