

ANDREA CITRINI

Biosphere Sciences & Engineering Division
 Carnegie Institution for Science
 Stanford, CA, USA

Email: acitrini@carnegiescience.edu | Personal website: <https://thewatertable.earth/>

CURRENT ACADEMIC POSITION

Postdoctoral Fellow | Carnegie Institution for Science at Stanford University, California, US (from Jun 2024)

Research aimed to investigate the impacts of climate change on water resources, water scarcity issues especially related to irrigated agriculture and energy systems at global level.

- Mentor: Lorenzo Rosa

EDUCATION

Università degli Studi di Milano (UNIMI), Milan, Italy May 2024

Ph.D. in Earth Science, with a focus on Hydrology and Hydrogeology

- Mentors: Corrado A.S. Camera, Giovanni P. Beretta
- Dissertation title: Modelling current and future water resources availability in an alpine catchment exploited for hydropower production

Università degli Studi di Milano (UNIMI), Milan, Italy Dec 2016

M.S. in Earth Sciences

- Mentor: T. Apuani
- Dissertation title: Assessment and zoning of rockfall hazard and risk along the Gallivaggio cliff (San Giacomo Filippo – SO)

Università degli Studi di Milano (UNIMI), Milan, Italy Oct 2014

B.S. in Geological Sciences

RESEARCH INTERESTS

Hydrological and hydrogeological modelling, groundwater sustainability, snowmelt processes, climate impacts on the hydrological cycle, drought monitoring, karst springs, flood risk management, integration of climatic and hydrological models, water resource availability in short and in long-term.

RESEARCH AND WORK EXPERIENCE

Research fellow | Università degli Studi di Milano, Milan, Italy (from Feb 2024 to May 2024)

Fellowship studying the groundwater resources of the Valserina (northern Italy), with particular emphasis on karst springs.

- Mentors: Corrado A.S. Camera, Giovanni P. Beretta

Visiting PhD student – Erasmus traineeship | The Cyprus Institute, Nicosia, Cyprus (May-Jul 2022 and Feb-Mar 2023)

Period abroad in the context of the Ph.D. project to gain knowledge to handle statistical downscaling techniques and weather radar corrections.

- Mentors: Adriana Bruggeman, George Zittis

Junior Research Fellow | Università degli Studi di Milano, Milan, Italy (from Jan 2018 to Dec 2019)

Two-year fellowship studying the groundwater resources of the middle Valseriana (northern Italy), with particular reference to the Nossana and Ponte del Costone springs.

- Mentors: Giovanni P. Beretta

Geologist | Idrotecna – Geological consulting, Vimercate, Italy (from Feb 2017 to Dec 2017)

Fieldwork and elaboration of technical reports on environmental and geotechnical issues, dealing with technical design of wells for agriculture and heat pump. Elaboration of multichannel analysis of surface waves (MASW).

Trainee | Studio Cancelli Associato SCA, Milan, Italy (from May 2016 to Sep 2016)

2D and 3D modelling of rockfall events in collaboration with the Regional Environmental Agency of Lombardy (Italy).

Visiting Master student – Erasmus + program| Universitat de Barcelona, Barcelona, Spain (from Sep 2015 to Feb 2016)

Period abroad following classes focused on hydrology, hydrogeology, GIS and remote sensing and Natural risk management (floods and landslide)

PUBLICATIONS

In preparation

A. Citrini, L. Rosa. A comprehensive global assessment of livestock water consumption and scarcity exposure.

Ruehr S., A. Citrini, Wendland E., Dukes, L. Rosa. Multicropping increases water scarcity and irrigation demand in Brazilian croplands.

L. Rosa, A. Citrini, T. Terlouw. Water risks from low-carbon fuels in North America.

Under review

[11] A. Citrini, M. Sangiorgio, L. Rosa. Disentangling the roles of future scenarios and climate/hydrological models in global water gap projections. *Under minor revision. Water Resources Research*

[10] A. Citrini, B.R. Scanlon, A. Rateb, G. Zhao, M. Sangiorgio, L. Rosa. Global managed aquifer recharge potential as a solution to water scarcity. *Under review.*

[9] F. La Vigna, C. Camera, G.P. Beretta, R.M. Gafà, M. Roma, A. Citrini, L. Martarelli, G.M. Monti, A. Silvi, V. Vitale, C. Fiori, M. Masetti, F. Pascarella, R. Proietti, S. Lo Faro, M.P. Congi, M. Gerardi, S. Tersigni, T. Baldoni, S. Ramberti, G. Barbato, P. Mercogliano. Groundwater of Italy: Hydrogeological Mapping at 1:500,000 Scale. *Under review.*

Published

[8] L. Rosa, A. Citrini, T. Terlouw, S. Mingolla. Water Scarcity Risks in Ammonia Fertilizer Production Pose a Threat to Global Food Security. *Environmental Science & Technology* **2025**. <https://pubs.acs.org/doi/10.1021/acs.est.5c14489>

[7] A. Citrini, A. Bruggeman, I. Sofokleous, G. Zittis, G. Lazoglou, G.P. Beretta, C. Camera. Streamflow Projections in Valgrosina Valley: Climate Change Calls for Adaptation in the Alpine Region. **2025**. *Hydrological Processes*, 39(10), e70276. <https://doi.org/10.1002/hyp.70276>.

[6] A. Citrini, M. Sangiorgio, L. Rosa. Global multi-model trends of unsustainable irrigation under climate change scenarios. *Environmental Research Letters*. **2025**. <https://iopscience.iop.org/article/10.1088/1748-9326/adfcee>

[5] G.P. Beretta, F. La Vigna, C. Camera, R.M. Gafà, A. Citrini, L. Martarelli, G.M. Monti, M. Roma, A. Silvi, V. Vitale, C. Fiori, M. Masetti, F. Pascarella, R. Proietti, S. Lo Faro, M.P. Congi, M. Gerardi, S. Tersigni, T. Baldoni, S. Ramberti, G. Barbato, P. Mercogliano, G. Giugliano. **2025**. Hydrogeological Map of Italy 1:500,000 scale. 4 Sheets, Supplementary Notes and online tables. ISPRA - Geological Survey of

Italy. Roma.

<https://sinacloud.isprambiente.it/portal/apps/sites/#/idrogeologia/pages/cartaidrogeologica500k>

- [4] **A. Citrini**, G. Lazoglou, A. Bruggeman, G. Zittis, G.P. Beretta, C. Camera. **2024**. Advancing Hydrologic Modelling Through Bias Correcting Weather Radar Data: The Valgrosina Case Study in the Italian Alps. *Hydrological Processes*, 38(11), e15339. <https://doi.org/10.1002/hyp.15339>
- [3] **A. Citrini**, A. Mayer, C. Camera, A. Erőss, J. Sütlenfuß, G. Pezzerà, G.P. Beretta. **2024**. Hydrogeochemical and isotopic characterization of the main karst aquifers of the middle Valseriana (Northern Italy): Nossana and Ponte del Costone springs. *Applied Geochemistry*, 169, 106046. <https://doi.org/10.1016/j.apgeochem.2024.106046>
- [2] **A. Citrini**, C. Camera, F. Alborghetti, G.P. Beretta. **2021**. Karst groundwater vulnerability assessment: application of an integrative index-based approach to main catchments of middle Valseriana springs (Northern Italy). DOI: <https://doi.org/10.1007/s12665-021-09860-8>. In *Environmental Earth Sciences* vol. 80 (17)
- [1] **A. Citrini**, C. Camera, G.P. Beretta. **2020**. Nossana Spring (Northern Italy) under Climate Change: Projections of Future Discharge Rates and Water Availability. DOI: <https://doi.org/10.3390/w12020387>. In *WATER* vol. 12 (2)

EDITORIALS AND COLUMNS

- [3] **A. Citrini**, D. Lepore, D. Sartirana. 2025. Innovation and the Future of Hydrogeology: the point of view of ECHN-Italy. *Acque Sotterranee-Italian Journal of Groundwater*, 14(1). <https://doi.org/10.7343/as-2025-867>.
- [2] R.M. Gafà, F. La Vigna, C.A.S. Camera, L. Martarelli, G.M. Monti, M. Roma, A. Silvi, V. Vitale, M.P. Congi, S. Lo Faro, **A. Citrini**, G.P. Beretta. 2024. The activity plan for the realization of the Hydrogeological Map of Italy at 1: 500,000 scale. *Acque Sotterranee-Italian Journal of Groundwater*, 13(1), 127-130. <https://doi.org/10.7343/as-2024-758>.
- [1] A. Di Giovanni, **A. Citrini**, E. Edigio. 2024. ECHN-Italy: overview of activities from the last year and future challenges. *Acque Sotterranee-Italian Journal of Groundwater*, 13(1), 123-125. <https://doi.org/10.7343/as-2024-756>.

CONFERENCE PRESENTATIONS & INVITED TALKS

- [18] 2025. **A. Citrini**. Kick-off meeting. **TRIEM – Tritium Release Information Exchange Meeting**. (Online).
- [17] 2025. C. Casarotto, **A. Citrini**, A. Morcioni, C.A.S. Camera. Field, geomechanical and laboratory investigations to develop and parametrize a numerical stress-strain model for the reconstruction of the Sasso Maurigno instability events (Valgrosina, northern Italy). <https://doi.org/10.5194/egusphere-egu25-11430>. **EGU 2025**, Vienna, Austria.
- [16] 2024. **A. Citrini**, M. Sangiorgio, L. Rosa. Projected timelines of water depletion in world's major irrigated agriculture hotspots. **AGU 2024**, Washington, D.C., USA.
- [15] 2024. **A. Citrini**. Internal Talk Series. **MC³ – Max Planck Center** (<https://mc-3.org/>). (Online).
- [14] 2023. **A. Citrini**, G.P. Beretta, C. Camera. Unveiling the hydrological response to climate change in the alpine environment: the case study of Valgrosina (northern Italy). **AGU 2023**, San Francisco, USA.
- [13] 2023. A. Morcioni, T. Apuani, **A. Citrini**, F. Cecinato, M. Veveakis. Prediction of the evolution of a large landslide under different climate scenarios: a physics-based model applied to the Ruinon Landslide (Italian Alps). **World Landslide Forum**, Florence, Italy.
- [12] 2023. **A. Citrini**, G.P. Beretta, C. Camera. Weather radar precipitation as functional input for the operative calculation of potential infiltration water volume: the pilot case of the Lombardy Region. **Flowpath 2023**, St. Julian, Malta.
- [11] 2023. C. Camera, **A. Citrini**, A. Morcioni, C. Casarotto, G.P. Beretta. Verification of snow-pillow measures through snow stratigraphy profiles for the determination of the Snow Water Equivalent in Valgrosina (northern Italy). **Flowpath 2023**, St. Julian, Malta.

[10] 2023. **A. Citrini**, G. Lazoglou, A. Bruggeman, G. Zittis, G.P. Beretta, C. Camera. Correction of hourly radar precipitation data based on rain-gauges values: what is the most efficient method for hydrologic modeling purposes?. DOI: <https://doi.org/10.5194/egusphere-egu23-15902>. **EGU 2023**, Vienna, Austria.

[9] 2022. **A. Citrini**, C. Camera, S. Bertocchi, G.P. Beretta. The exploitation of the middle Valseriana springs (northern Italy): current situation, studies undertaken, and next challenges. **Sustain Valencia 2022**, Valencia, Spain.

[8] 2022. **A. Citrini**, C. Camera, S. Bertocchi, G.P. Beretta. Preservation of drinking water: examples and applications of new technologies for the quality and quantitative monitoring of the resource. **Food Safety and Healthy Living FSHL**, Brasov, Romania and Online (**Invited**).

[7] 2022. **A. Citrini**, C. Camera, L. Marini, G.P. Beretta. Preliminary results regarding the simulation of a streamflow strongly influenced by anthropogenic use in an alpine context: the case of the Grosina valley (northern Italy). DOI: <https://doi.org/10.5194/egusphere-egu22-1882>. **EGU 2022**, Vienna, Austria.

[6] 2021. **A. Citrini**, C. Camera, F. Alborghetti, G.P. Beretta. The COPA+K method: an index-based approach for the karst groundwater vulnerability assessment. The Valseriana springs case (Northern Italy). **Flowpath 2021**, Naples, Italy.

[5] 2021. **A. Citrini**, A. Mayer, C. Camera, A. Eröss, G.P. Beretta. Characterization of the main karst aquifers of the middle Valseriana (northern Italy) based on isotopic and hydrogeochemical data: Nossana and Ponte del Costone springs. **48th IAH congress**, Brussels, Belgium.

[4] 2021. **A. Citrini**, C. Camera, F. Alborghetti, G.P. Beretta. Vulnerability assessment of karst aquifers using the COPA+K index based method: the case of the Valseriana springs (Northern Italy). **International Symposium on Geofluids**, Online.

[3] 2021. **A. Citrini**. Climate Change and karst water resources: the Nossana spring case (northern Italy). **Jo.In Hydrocafe**, Online (**Invited**).

[2] 2020. C. Camera, **A. Citrini**, G.P. Beretta. Effects of climate change on the Nossana karst spring (northern Italy): future discharge projections and water distribution system sustainability. DOI: <https://doi.org/10.5194/egusphere-egu2020-3448>. **EGU 2020**, Vienna, Austria.

[1] 2019. **A. Citrini**, C. Camera, and G.P. Beretta. Nossana Karst Spring Behaviour under future Climate Change Scenarios. **Flowpath 2019**, Milan, Italy

TEACHING EXPERIENCE

Teaching Assistantships for Bachelor and Master courses

M.S. Environmental Science (UNIMI - UNIMONT) – 2023. Filed trip of Environmental geology for mountain areas

M.S. Earth Sciences (UNIMI) – 2019, 2020, 2021, 2022. Groundwater Exploration and Management with Laboratory.

M.S. Earth Sciences (UNIMI) – 2019, 2020, 2021, 2023. Geotechnical and Hydrogeological Survey and Laboratory.

B.S. Environmental Science and Policy (UNIMI) – 2021, 2024. Environmental and Landscape Geology. GIS courses.

Tutoring for Bachelor and Master thesis

[13] Anna Giulia **De Biaggi** – M.S. Student (UNIMI) – “Streamflow scenario to an alpine catchment exploited for hydropower purposes: the case of Valgrosina (SO) under different levels of global warming”, **2025**

[12] Christian **Casarotto** – M.S. Student (UNIMI) – “Modelling the Cima Piazzu Rockfall events”, **2024**

[11] Alessandro Maria **Borrelli** – M.S. Student (UNIMI) – “*Groundwater resources of Piedmont region and Aosta Valley region*”, **2024**

[10] Greta **Tornaghi** – M.S. Student (UNIMI) – “*Groundwater resources of Lombardy region*”, **2024**

[9] Matilde **Di Nardo** – M.S. Student (UNIMI) – “*Creation of a raster dataset of hourly precipitation (1 km x 1 km) from the integration of data from stations and radars for Lombardy region (2005-2020)*”, **2023**

[8] Lorenzo **De Simoni** – M.S. Student (UNIMI) – “*Groundwater resources of Tuscany region*”, **2022**

[7] Lorenzo **Marini** – M.S. Student (UNIMI) – “*Hydrological characterization and modeling of an anthropized mountain basin for hydropower purposes: the case of Valgrosina (SO)*”, **2022**

[6] Massimiliano **Francone** – B.S. Student (UNIMI) – “*Correlation between the Lambro, Olona and Seveso floods and changes in the water table*”, **2021**

[5] Lucia **Mauri** – M.S. Student (UNIMI) – “*Groundwater resources of Sardinia region - prototype hydrogeological mapping*”, **2021**

[4] Daniele **Buggio** – B.S. Student (UNIMI) – “*Organization of a hydro-meteorological climate data archive in Valchiavenna (SO) and analysis of temperature variation trends*”, **2021**

[3] Alicia **Garcin** – M.S. Student (UNIMI & UV) – External internship supervised within a collaboration agreement between Université d'Avignon and Università degli Studi di Milano, focusing on karst springs, **2019**.

[2] Lucie **Bryon** – M.S. Student (UNIMI and UV) – External internship supervised within a collaboration agreement between Université d'Avignon and Università degli Studi di Milano, focusing on karst springs, **2019**.

[1] Francesca **Alborghetti** – M.S. Student (UNIMI) – “*Hydrogeological study and vulnerability to pollution of the Ponte del Costone spring basin (Seriana Valley - BG)*”, **2019**

WORKSHOPS AND TRAINING ATTENDED

Tritium Release Information Exchange Meeting (TRIEM), workshop 1 – CERN, 1-4 December 2025 (online).

The initiative was established to foster international collaboration and knowledge exchange on tritium-related topics at accelerator facilities. Key areas: Estimation of tritium production using Monte Carlo simulation codes, and Assessment of tritium diffusion in materials and facility environments.

Every Semester Needs a Plan – ncfdd, November 2025. “Every Semester Needs a Plan is broader than just a professor approaching a semester, as the organizational, time management, and prioritization skills are applicable to any role, academic or otherwise.”

Mentoring 101 – ncfdd, November 2025. “Mentoring 101 includes how to approach mentoring from a mentee's perspective and how to network effectively for your career as a researcher.”

ACADEMIC SERVICE AND OUTREACH

Co-chair and member of

ECHN-IAH Italy: Early Career Hydrogeologists' Network of International Association of Hydrogeologists, Italian chapter (<https://www.iahitaly.it/echn-members>)

CIPA at BSE Stanford campus: the Carnegie Institution Postdoctoral Association at the Biosphere Sciences & Engineering based at Stanford. It is an organization composed of all postdocs at Carnegie Science and serves to build community amongst campus postdocs, share useful resources, and collectively advocate for BSE postdoc-specific issues (<https://carnegiescience.edu/about/working/postdoctoral-fellow-opportunities>).

Editor for

Acque Sotterranee - *Italian Journal of Groundwater*

Reviewed manuscripts for

Water Resources Research, Acque Sotterranee - *Italian Journal of Groundwater*, International Soil and Water Conservation Research, Communications Earth & Environment, Environmental Research: Food Systems, EGUsphere

Media coverage

2025-07-13. **La Stampa**. “Pronta la nuova mappa delle riserve idriche italiane; «Parte da Milano il progetto di misurazione delle falde da cui proviene l'85% dell'acqua potabile»”. https://www.lastampa.it/milano/2025/07/13/news/pronta_la_nuova_mappa_delle_riserve_idriche_italiane-15230667/?ref=LSHRT-NOR-Pnull-S1-T1

2023-04-15. **L'Eco di Bergamo**. “Sorgente Nossana, lo studio dei geologi della Statale con Uniacque: «Fasi critiche destinate a crescere»”. https://www.ecodibergamo.it/stories/premium/valle-brembana/sorgente-nossana-studio-dei-geologi-della-statale-uniacque-fasi-critiche-o_1467666_11/

COMPUTATIONAL AND SOFTWARE TOOLS

R code, Python, MATLAB, MODFLOW code.

QGIS, ArcGIS.

LANGUAGES

Italian: native

English: fluent (C1)

Spanish: fluent (B2/C1)

EXTRACURRICULAR ACTIVITIES

I have a deep passion for sports, including soccer, running, tennis, climbing, and hiking. Over the years, I have consistently been involved in both individual and team sports, which have strengthened my perseverance and shaped my collaborative mindset. Playing soccer since the age of six and earning a black belt in Karate-Do (1998–2004) have taught me discipline, resilience, and respect for others. These experiences have made me a committed team player, both on the field and in my professional life, where I value working collaboratively toward shared goals while taking on leadership roles with fairness and integrity.