

## A Plunge into the Depths of Italy's Lake Garda

First International Scientific Workshop on GARDEN (Lake Garda Environmental system); Trento, Italy, 2 February 2017



A view of the northern part of Italy's Lake Garda, taken from the surrounding mountains. Researchers are interested in learning more about the lake's physical properties. Credit: [Ampfinger](#)

By [Marco Toffolon](#), Sebastiano Piccolroaz, and Henk Dijkstra 7 mins ago

Lake Garda is the largest lake in Italy, located in a region where the subalpine mountains encounter the large Po Valley. The lake is full of natural beauty, history, and culture, which makes it a popular attraction for more than 20 million tourists every year. Nevertheless, from a physical point of view, Lake Garda is one of the least explored large Alpine lakes. Several studies have been published concerning the lake's ecology and biology, but almost nothing is known about the lake's thermodynamics and hydrodynamics, particularly about its deep mixing processes.



A view from the surface of Lake Garda. Credit:

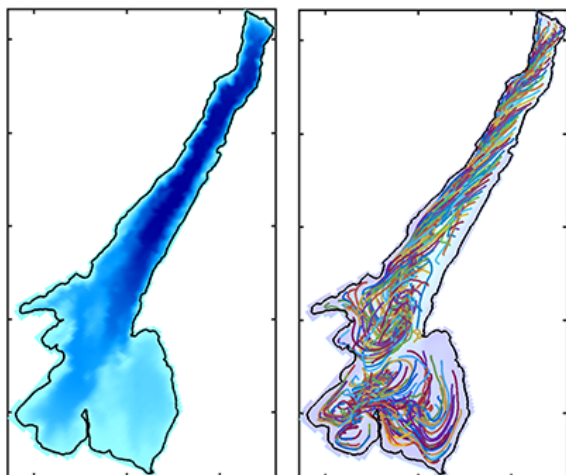
Sebastiano Piccolroaz

Because of the lack of knowledge about the lake's physics (<https://eos.org/research-spotlights/how-much-carbon-dioxide-does-sunlight-release-from-lakes>), the University of Trento, Italy, organized a workshop on the Lake Garda environmental system (GARDEN). Scientists from different disciplines (limnology, atmospheric physics, ecology, and remote sensing), professionals, and public officers met in Trento on 2 February 2017 to discuss future directions of the scientific research on Lake Garda. Boosted by rapidly growing interest in developing a deeper understanding of the lake, the workshop attracted participants from several national and international universities and research centers, with almost 30 invited participants from Italy, the Netherlands, and Switzerland.

The design of a systematic measurement campaign, with the installation of a permanent monitoring station, clearly emerged as the main priority.

The morning session was dedicated to presentations of past, ongoing, and future research activities on Lake Garda. The presentations included recent research experiences with monitoring and modeling programs carried out on other large Alpine lakes like Lake Iseo in Italy and [Lake Geneva](https://eos.org/research-spotlights/past-phosphorus-runoff-causes-present-oxygen-depletion-in-lakes) (<https://eos.org/research-spotlights/past-phosphorus-runoff-causes-present-oxygen-depletion-in-lakes>) in Switzerland. In the afternoon, the participants were divided into four breakout groups (data collection, interactions with society, modeling, and scientific questions) to brainstorm current limits, relevant scientific topics, and new ideas for possible joint research activities on Lake Garda.

The design of a systematic measurement campaign, with the installation of a permanent monitoring station, clearly emerged as the main priority. The importance of directly involving citizens, lake users, and stakeholders for collecting, sharing, and using environmental data also arose as a key issue. Furthermore, participants agreed that it was crucial to develop a [coupled lake-atmosphere model](http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-16-0225.1) (<http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-16-0225.1>) providing short-term forecasts for scientific, management, and recreational use.



(left) The bathymetry of Lake Garda, with darker shades of blue representing deeper waters, and (right) trajectories of modeled particles released at the lake surface as obtained from numerical simulations. Credit:

Marina Amadori

The workshop revealed a great opportunity to build a new international partnership for synergistic research on Lake Garda through the integration of monitoring and modeling tools. Researchers from the universities of [Utrecht](https://www.uu.nl/en) (<https://www.uu.nl/en>) (the Netherlands) and [Trento](http://www.unitn.it/en) (<http://www.unitn.it/en>) (Italy) have already taken a first collaborative step. Beginning in March 2017 and continuing for the next 2 years, researchers from these two institutions will be involved in an intensive monitoring campaign of turbulence microprofiles and currents in the lake.

Workshop organizers intend to convene similar workshops dedicated to Lake Garda on an annual basis as an opportunity for researchers to facilitate collaboration, to exchange knowledge, and to foster dialogue among colleagues from different disciplines.

For more information, readers may contact [Marco Toffolon](mailto:marco.toffolon@unitn.it) (<mailto:marco.toffolon@unitn.it>). Program details and a list of participants are available on the [University of Trento website](http://webmagazine.unitn.it/en/evento/dicam/14603/garden) (<http://webmagazine.unitn.it/en/evento/dicam/14603/garden>).

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**Citation:** Toffolon, M., S. Piccolroaz, and H. Dijkstra (2017), A plunge into the depths of Italy's Lake Garda, *Eos*, 98, <https://doi.org/10.1029/2017EO074499>. Published on 30 May 2017.

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