



Turbulence measurements in Lake Garda

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Manerba, 10 May 2018

Photo Credit: Andrea Salvadore

Joint collaboration between the Universities of Utrecht and Trento

ready-to-go	- Periodic profiles with a microCTD.
in preparation	 Deployment of a permanent monitoring site (thermistor chain + current meter).
under evaluation/ to be decided	 Velocity transects with an ADCP. Use of a ROV for sediment sampling, videos, support the monitoring, etc. Use of thermal cams (mounted on drones or positioned on surrounding mountains for tracking the surface circulations).

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Microstructure turbulence measurements with a microprofiler (microCTD – Rockland Scientific).

To characterize the **turbulence structure** in the upper 100 m of the lake.

Start on April 2017 (ongoing).



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2017 CALENDAR

2018 CALENDAR

30 31



31

<mark>25</mark> field work days More than **600** profiles A **24 h** field work cruise

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To investigate the effect of **night-day cycle** on the turbulence structure. In collaboration with CNR – ISMAR (characterization of **wind generated surface waves**).



12 people involved - 9 transects - 99 profiles

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Deployment of a permanent monitoring site

To study the seasonal variation in **deep-lake mixing** through internal waves and wind-driven convective turbulence.

Installed on 24 May 2017, and will retrieved on 31 May 2018





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Periodic profiles with a **microCTD**.

Deployment of a **permanent monitoring site** (thermistor chain + current meter).

Velocity transects with an ADCP. Use of a ROV for sediment sampling, videos, support the monitoring, etc. Use of thermal cams (mounted on drones or positioned on surrounding mountains for tracking the surface circulations).



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ongoing

- Installation of a **weather station** on the lake.
- Use of a **weather station** on the boat.



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Installed on 20 March 2018.

Measured variables: wind speed and velocity, air and water temperature, air humidity, atmospheric pressure, solar radiation, precipitation.

- ARPA Lombardia
- ARPA Veneto
- Meteotrentino
- **FEM**

Results: Wind-driven secondary flows induced by planetary rotation

10 March 2017

7 August 2017

W [m/s]

21 April 2017

Lateral gradients (east-west) of temperature and chl-a were observed in the northern elongated trunk of the lake after three persistent northerly wind events.



Piccolroaz S., M. Amadori, M. Toffolom, H. Dijkstra (2018), Importance of planetary rotation for ventilation processes in deep elongated lakes: Evidence from Lake Garda (Italy). Under review for Geophysical Research Letters

Results: Wind-driven secondary flows induced by planetary rotation



Piccolroaz S., M. Amadori, M. Toffolom, H. Dijkstra (2018), Importance of planetary rotation for ventilation processes in deep elongated lakes: Evidence from Lake Garda (Italy). Under review for *Geophysical Research Letters*

Results: Wind-driven secondary flows induced by planetary rotation

- Relevance of **wind-driven flows** as additional, previously not recognized, **ventilation** Marina's talk in **mechanism**, in addition to traditional buoyancy-driven deep convection. the afternoon
- Existence of wind-driven secondary flows induced by planetary rotation.



Piccolroaz S., M. Amadori, M. Toffolom, H. Dijkstra (2018), Importance of planetary rotation for ventilation processes in deep elongated lakes: Evidence from Lake Garda (Italy). Under review for *Geophysical Research Letters*

Results: seasonal cycles of physical, water quality, and turbulence



Results: seasonal cycles of physical and turbulence related quantities

February 2018 (cold Siberian front)



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