DISSOLVED METHANE IN ALPINE LAKES

Pighini S.[1], Tomelleri E.[1], Tonon G.[1], Sommaruga R.[2],Scholz K.[2], Wohlfahrt G.[2]

[1] Free University of Bolzano, Bolzano (ST), Italy

[2]Innsbruck University, Institute of Ecology, Innsbruck, Austria

@ : sylvie.pighini@unibz.it

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PURPOSE

Freshwaters systems - 3 % of Earth's surface - **receive** as much as **carbon** as the oceans. The increasing number of studies show that **inland waters** may negate a substantial fraction of the carbon sink through methane (CH_4) emissions and should be viewed as **'reactors' processing** a large fraction of the **terrigenous carbon**. To date, most of our knowledge on freshwater CH_4 concentrations derives from studies in tropical and boreal regions, while temperate freshwater ecosystems are understudied.

We focused on **Alpine lakes** to:

1) assess the CH_4 dissolved content;
2) individuate the drivers of dissolved CH_4 and evaluate their potential emissions.

FIELD SITES

11 lakes sampled along **Trentino**, **South Tyrol** (IT) and **North Tyrol** (AU)

200 < elevation> 1900 m a.s.l

0,16 < surface area > 46 km^2

6 < depth> 170 m

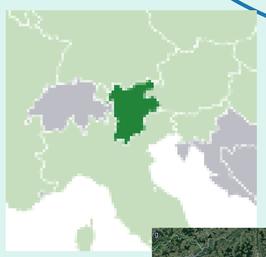
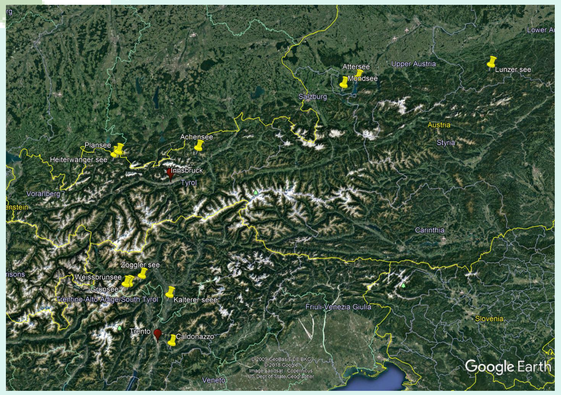


Fig. 1: Map of the sampling site area



Dissolved CH_4 surface water sampling were combined with automated fluxes measurement.

RESULTS

Supersaturation: **5 to 944 higher** respect to CH_{4atm}

$0.015<[CH_4]>2.615$ µmol L^{-1}; mean 0.474±0.104 µmol L^{-1}

Modelling:
CH_4 depends on Latitude, Turbidity, Phopshorus, Nitrogen, Particulate Organic Nitrogen and Carbon.

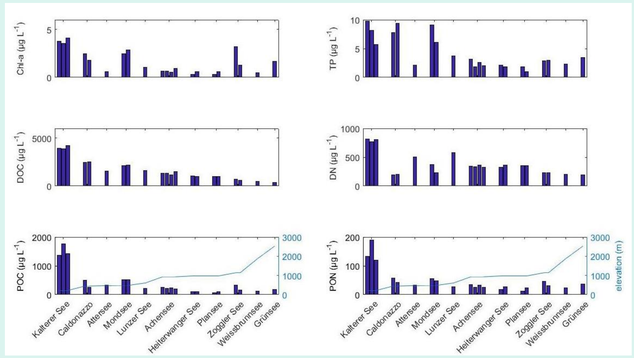


Fig. 4: ancillary measurement for all the field campaign

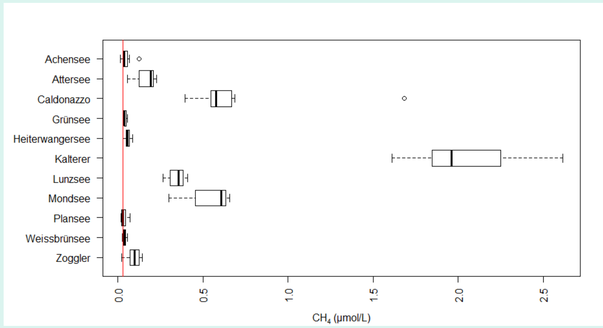


Fig. 2: Boxplot of concentration of surface dissolved CH_4 samples

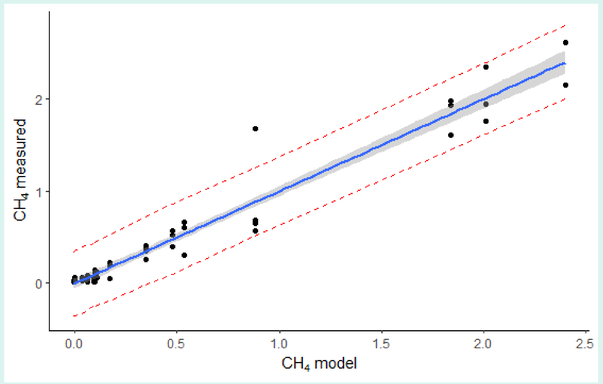


Fig. 3: CH_4 modeled vs CH_4 measured; grey zone represents the confidence interval, dashed red line represent the prediction interval

CONCLUSIONS

- Lakes are supersaturated compare to CH_4 atm concentration;
- CH_4 concentrations drivers are the bio-physical parameters and not the geomorphological one like depth (West et al. 2016);
- Upcoming field campaign focus on 3 representative lakes: low-medium-high dissolved $[CH_4]$;
- Comparison of the flux method measurements: gradient calculation, floating chamber and Eddy Covariance