

## SALLY MACINTYRE UNITED STATES

Limnologist known for her research about the biogeochemical and ecological implications of physical processes in Arctic, Subarctic and tropical lakes and coastal zones.

She is one of the main references in the field of the greenhouse gas fluxes in lakes.

Professor at the University of California since 2004 and editor of important journals, such as Limnology and Oceanography.

Sally has contributed in the understanding of the transport processes in lakes. She has been precursor of the using of mechanistic approaches in hydrodynamics and gas transfer, having implications for global climate change understanding.

## **BUOYANCY FLUX**

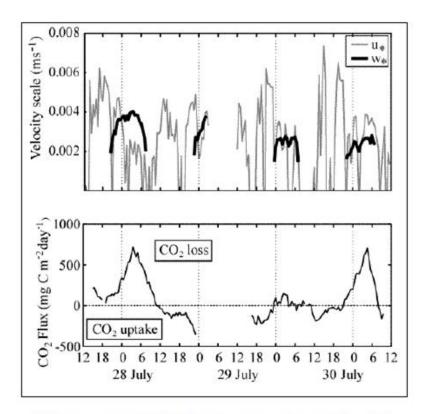


Figure 3. Shear and convective velocity scales (upper panel) and gas fluxes (lower panel) from Toolik Lake, Alaska, during a four day period in July 1995. Maximum gas fluxes are not correlated with wind speed, as represented by u\*, but by whether or not heat was being lost from the surface layer (w\* > 0). Gas fluxes are less than 100 mg C m<sup>-2</sup> day<sup>-1</sup> at highest wind speeds, but increase above 500 mg C m<sup>-2</sup> day<sup>-1</sup> when buoyancy flux led to convective overturning.

Sally MacIntyre, et al. (2001). Geophysical Monograph-American Geophysical Union

**Buoyancy flux (\beta):** expression of density variations into the Turbulent Kinetic Energy (TKE).  $\beta$  is directly related to the effective surface heat flux.

**Convection**: Fluid motion driven by temperature gradients. For example, when the surface water of a lake is cooler than deep water, heavy fluid particles fall through the fluid, generating turbulence.

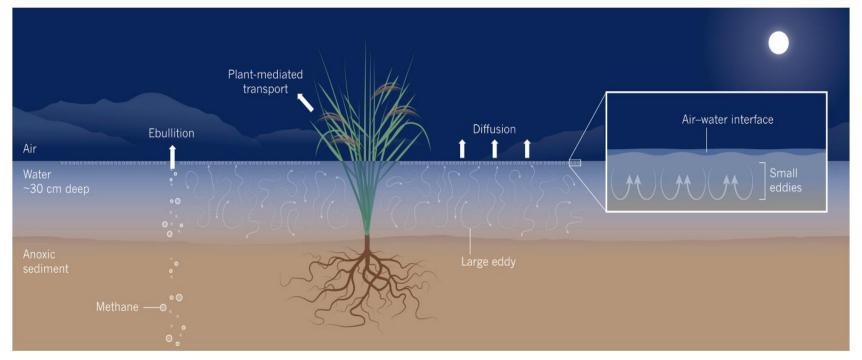
Thus, additional to wind stress, convection importantly contributes to the gas transfer velocity at the air-water interface.

Shear (w\*) and convective velocity (u\*) scales are used to compare the relative contribution of cooling vs. wind stress to the vertical fluxes of gases in lakes.

## **CONVECTION & NOCTURNAL GAS FLUXES**

Greenhouse gases (CO2 and CH4) from inland waters are emitted via **diffusion** at higher rates during night than day time due to **convection**.

"During night, cooling surface water go down, displacing the underlying water and forming eddies. Large eddies circulate CH4 throughout the water column, whereas smaller, near-surface eddies renew the CH4 at the air-water interface, increasing CH4 flux to the atmosphere".



Katey W. Anthony & Sally MacIntyre. (2016). Nature.

## RELEVANT CONTRIBUTIONS

**MacIntyre, S.** (1993). Vertical mixing in a shallow, eutrophic lake: Possible consequences for the light climate of phytoplankton. Limnology and Oceanography, 38, 798-817.

**MacIntyre, S.**, Melack, J. M. (1995). Vertical and horizontal transport in lakes: linking littoral, benthic, and pelagic habitats. Journal of the North American Benthological Society, 14, 599-615.

**MacIntyre, S.**, Flynn, K. M., Jellison, R., Romero, J. R. (1999). Boundary mixing and nutrient fluxes in Mono Lake, California. Limnology and Oceanography, 44, 512-529.

**MacIntyre, S.**, Romero, J. R., Kling, G. W. (2002). Spatial-temporal variability in surface layer deepening and lateral advection in an embayment of Lake Victoria, East Africa. Limnology and Oceanography, 47, 656-671.

**MacIntyre, S.**, Jonsson, A., Jansson, M., Aberg, J., Turney, D. E., Miller, S. D. (2010). Buoyancy flux, turbulence, and the gas transfer coefficient in a stratified lake. Geophysical Research Letters, 37.

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You can find more information about her story and research at:

https://scholar.google.com/citations?user=GPlRHI8AAAAJ&hl=es https://www.eemb.ucsb.edu/people/faculty/macintyre