

Carbon fluxes from water surface and dry sediments in a Mediterranean reservoir

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The significant role of reservoirs in the carbon cycling and the recent growth of dam building have increased the interest to evaluate carbon fluxes in these systems. In this work, we study the spatial and temporal variability in CO₂ (diffusive) and CH₄ (diffusive and ebullitive) fluxes from the water surface in a Mediterranean reservoir (El Gergal, Spain). During a whole year, CO₂ and CH₄ fluxes were measured monthly from the reservoir lacustrine and riverine zone. Additionally, we measured CO₂ flux from dry sediments of the reservoir drawdown area. CO₂ and CH₄ diffusive fluxes from the water surface were higher during mixing period, and the CO₂ flux was related to pH and Chl-a, suggesting primary production as a relevant driver. Conversely, CH₄ ebullitive flux was higher during thermal stratification. Dry exposed sediments constituted a net CO₂ source to the atmosphere showing higher CO₂ emissions in areas influenced by river or intermittent stream discharges. During the mixing period, the reservoir water surface was a net source of CO₂ to atmosphere whereas it was a CO₂ sink during the stratification period. However during the stratification period the reservoir drawdown zone increased due to lower water input and larger water demand, and consequently larger areas of previously submerged sediments became dry and exposed to the atmosphere. Therefore, ecosystem net CO₂ uptake during the thermally stratified period could be significantly diminished in Mediterranean reservoirs in future conditions, due to the predicted increase in the frequency and intensity of droughts expected for this region.