# Integrating lake carbon fluxes into the landscape carbon balance: Importance of considered organic versus inorganic source of carbon

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Lakes and reservoirs transform, emit, and bury carbon that is exported from land and are thus significant components of terrestrial carbon budgets. Their significance is often assessed by integrating these waterbodies into terrestrial primary production. However, the transfer of inorganic carbon (IC) is likely a sticking point for these integrations because IC is not part of net ecosystem production. In this study, we integrated C evasion and organic carbon (OC) burial in a lake in the context of IC and OC cycling in a karst catchment from a system perspective. The lake emitted CO2 and buried OC at the rates that approximately equals 13% and 11%, respectively, of catchment net ecosystem production, representing significant influences on terrestrial carbon budgets, given an organic origin. However, catchment carbon export is dominated by IC that is derived from carbonates dissolved by soil CO2. Lake CO2 evasion accounts for less than 0.1% of soil CO2 efflux, suggesting little potential in significantly altering terrestrial carbon budgets. This comparison indicates the significance of aquatic CO2 evasion, requiring an adjustment of terrestrial carbon budgets to recognize their dependence on carbon origins. The significance maybe overstated if inorganic origin is ignored. Our study suggests that a careful reassessment to the significance of CO2 evasion and OC burial in freshwater ecosystems to local and global carbon budgets, with full consideration of their sources, is necessary and pressing.