



## CO<sub>2</sub> air-sea fluxes across the Portuguese estuaries Tagus and Sado

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Generally, estuaries and proximal shelves under the direct influence of river runoff and large inputs of organic matter are mostly heterotrophic and, therefore, act as a carbon source. In this context the CO<sub>2</sub> dynamics in Tagus and Sado estuaries (SW Portugal) was studied under two different climate and hydrological situations. These moderately productive mesotidal coastal-plain lagoon-type estuaries, localised in the center of Portugal and distant 30-40 km apart, present quite different freshwater inflows, surface areas and water residence times.

A study performed in 2001 revealed that the magnitude of CO<sub>2</sub> fluxes in the two estuarine systems varied seasonally. CO<sub>2</sub> emissions during the huge rainfall winter were similar in both estuaries, reaching a mean value of  $\sim 50$  mmol m<sup>-2</sup> d<sup>-1</sup>, while in spring emissions from Sado were  $\sim 6$  times higher than Tagus ones, attaining a mean value of 62 mmol m<sup>-2</sup> d<sup>-1</sup>. Nevertheless, in both sampling periods, Sado estuary showed, within the upper estuary (salinity <15), a decrease of CO<sub>2</sub> associated with a decrease of suspended particulate matter. Mainly in spring, the observed CO<sub>2</sub> fluxes decrease occurred right in the turbidity maximum (salinity 0-10) being found out positive relationships between the respective fluxes and suspended particulate matter and chlorophyll *a*, simultaneously with the occurrence of a decline in values of dissolved oxygen. These features point out to mineralisation processes possible being responsible for the elevated CO<sub>2</sub> emissions in the upper estuary by that time. For salinities above 20, biological activity (namely photosynthesis) seemed to be the main process regulating the relatively low CO<sub>2</sub> emissions. By contrast, Tagus estuary does not display a marked maximum of turbidity, being CO<sub>2</sub> dynamics, during the productive period, apparently governed by biological mechanisms, in particular photosynthesis.

Despite different hydrology and processes responsible for the CO<sub>2</sub> dynamics, Tagus and Sado estuaries follow the general tendency of acting as carbon sources. At an annual basis, Tagus and Sado CO<sub>2</sub> emissions in 2001 were, respectively, 13 and 21 mol m<sup>-2</sup>. Comparing to other European estuaries these two studied estuaries function as moderate CO<sub>2</sub> sources to the atmosphere.