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Modelling the short term dynamic of carbon dioxide in a coastal lagoon

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A carbonate system model was applied to investigate the short term carbon dioxide dynamic in the Lagoon of Venice, Italy, as a function of the dial cycle of photosynthesis and respiration. Carbonate speciation was estimated on the basis of hourly pH data collected by a real time monitoring network and of alkalinity data. The model was applied to estimate the hourly evolution of the inorganic carbon species at lagoon sites which are characterized by the presence of different communities of primary producers, namely phytoplankton, macro algae (*Ulva rigida*), and phanerogamae (*Zostera marina*). The model results are consistent with the short term evolution of the dissolved oxygen time series observed at the same sites. The statistical analysis of the simulated time series shows that the remarkable dial fluctuations of the carbon species can be explained by the circadian cycles, and are strongly influenced by the climate forcing, e.g. temperature and solar radiation, and the community being considered. Carbon budgets based upon the model output highlighted that the Lagoon may act as a carbon source for the atmosphere, depending upon the season and the site under exam. Since the analysis here presented can be easily implemented and applied to other case studies, we think that it could represent a straightforward way to extract valuable information about marine ecosystem functioning and to compute carbon budgets on the basis of data being collected in many estuaries as part of routine monitoring programs.