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Spatio-temporal survey of the coastal carbonate system offshore Lebanon-Levantine Mediterranean Sea

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The coastal carbonate system regulates the pH of the coastal waters and controls the circulation of CO_2 between land-sea interfaces and open sea system. In the context of the ELME (Evaluation of the Lebanese Marine Environment: A multidisciplinary study) project, a seasonal survey of the carbonate system has been started in 2019 through the sampling of 3 different transects starting from the coast towards the open sea, offshore two Lebanese cities (Beirut and Tyre) to evaluate the spatio-temporal variations of this system in coastal areas. The carbonate chemistry is being studied by measuring both total alkalinity (A_T) and total dissolved inorganic carbon (C_T), together with other critical parameters in coastal ecosystems such as temperature, salinity, pH, dissolved oxygen, nutrients (phosphates, nitrates, nitrites, silicates), and chlorophyll a. The preliminary results show that the highest carbonate system inventories (2546.4 and 2266 µmol kg^{-1} for A_T and C_T respectively) were measured in transects influenced by discharges of dumpsite and port areas (offshore Beirut) where positive and significant correlations ($p << 0.005$) have been recorded with nutrients, particularly with nitrites (> 10 µmol kg^{-1}). Furthermore, TrOCA approach was used to estimate the anthropogenic CO_2 concentrations (C_{ANT}) below the mixed layer depth. The results demonstrate that all waters in both studied areas are contaminated by C_{ANT}, even the deep ones (> 400 m) located in the furthest monitored station, with values greater than 70 µmol kg^{-1}. This fact raises concerns about the effects of such relatively high C_{ANT} concentrations on coastal organisms therein. This work presents the preliminary results of an ongoing study. The continuity of this project will help to assess the relationship between land-based anthropogenic pressures and the coastal biogeochemistry in a changing Eastern Mediterranean Sea.