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EFFECTS OF THE MASSIVE INFLUX OF PELAGIC SARGASUM IN CARBONATED SEDIMENTS FROM MEXICAN CARIBBEAN

The beaches of the Mexican Caribbean are composed of carbonate sediments of biogenic origin. According to previous studies, the textural characteristics of these sediments correspond to medium-sized, moderately selected sands, mesokurtic kurtosis towards the north and more leptokurtic towards the south and asymmetry towards coarse sands. The sediments are mainly composed of pellets, foraminifera, mollusks and calcareous algae. Meanwhile, its mineralogy corresponds to aragonite (61.4%), calcite (37.1%) and 1.5% to terrigenous [1, 2].

Sargassum is a brown macroalgae of the genus *Sargassum* of the holopelagic type. This means that it spends its entire life floating in the sea. Since the summer of 2014, the beaches of the Mexican Caribbean have been affected by the massive influx of *pelagic sargassum* [3, 4, 5]. From a geocological point of view, this massive influx can alter the sedimentological, mineralogical and geochemical characteristics of carbonate sediments. Sargassum leachates cause a reduction in pH, due to sulfidation conditions [4], making carbonate sediments to dissolve, especially in the finer fractions, which does not occur in medium- and coarse-grained sediments. Another important aspect to consider of sargassum is its function as a sediment exporter from the communities of calcareous that colonize this macroalgae. [6]. Species such as serpulid worms (polychaetes) and red algae (Rhodophyta) are common. However, bryozoans are the most abundant and can cover a third or more of the surface of this macroalgae, which suggests that sargassum provides an important pelagic source of magnesian calcite [7].

This research aims to analyze the influence of massive arrivals of pelagic *Sargassum* on the sands of the Mexican Caribbean, particularly in Puerto Morelos (Figure 1), and determine the impact of this macroalgae on sediments.

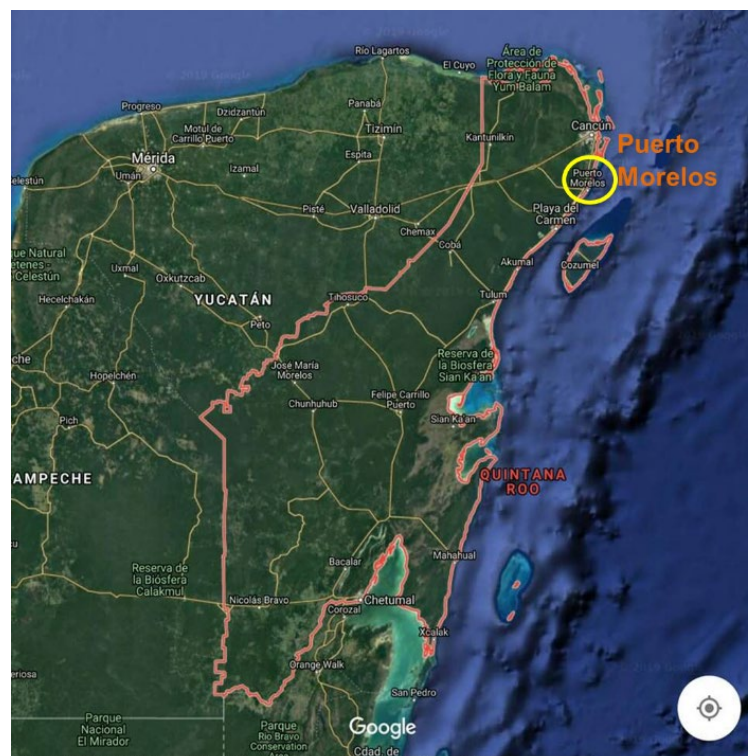


Fig. 1. Location of the study area. In the circle Puerto Morelos, Quintana Roo, México

There is a total of 30 sediment samples, collected between 2015 and 2022, in the months of February/March, April/May, June/July and October/November. Of them, 4 samples correspond to the year 2015, 6 to 2016, 2 to the year 2017 and 18 samples to 2022. On Puerto Morelos beach, surface sediment sampling was carried out biweekly for the period from April to October 2022.

Textural parameters were determined on a laser particle analyzer (LS 13 320). An X-ray diffraction (XRD) analysis was performed on the 18 samples corresponding to 2016 and 2022 in Puerto Morelos, to determine the mineralogy of the sediments and to know if any variation of the composition of the same has occurred over time, based on the fact that there is a prior knowledge of the mineralogical composition of the sites under study.

The results of the analysis of the textural parameters obtained to date seem to indicate that the effect of sargassum leachates has not affected the average grain size of the carbonate sediments of Puerto Morelos. Which have a granulometry with a medium grain size, with an average of 327 μm , with some small variations that have occurred over the years (1982 – 2022). However, in the period (2017 – 2022) there has been a trend towards a decrease in grain size, from 583 μm in 2017 to 381 μm in 2022, in Puerto Morelos. This decrease in average grain size coincides with the periods of highest influx of pelagic sargassum to these coasts. This suggests a decrease in grain size due to mechanical breakage due to the method of cleaning and transporting the sargassum on the beach and/or the action of the sargassum leachate on the calcareous sediment. The X-ray diffraction (XRD) analysis showed a tendency to modification in the mineralogical composition of the carbonate sediments of Puerto Morelos, taking into account previous studies and from calcareous epiphytic species exported by sargassum such as bryozoans, which are a pelagic source of magnesian calcite, being able to cover a third or more of the surface of this macroalgae and are incorporated into the existing sediment, adding up to a considerable percent of the total carbonate sediment. Such is the case of the year 2022 where there is an increase in the percentage of magnesian calcite compared to previous years to the detriment of the percentage of aragonite. The decrease in the average grain size and the mineralogical modification occurred in the period of highest mass influx of Sargassum. This indicates a real impact of the pelagic sargassum arrivals on the carbonate sediments of Puerto Morelos.

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