

Increase of sedimentation rate on coastal areas in southern Brazil

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Introduction: The Rio Grande do Sul coastal plain typically consists of unconsolidated Quaternary deposits, all related to transgressive events, which developed depositional systems, consisting of barriers and lagoons. The plain has an extensive number of lagoons and coastal lakes occupying almost one third of the coastal plain which has 33.000 km².

The short-term sedimentation rates calculated in cores by ²¹⁰Pb measurements were developed in sediments collected in the Lagoa dos Patos (lagoon) and the Lagoa Itapeva (lake), (Fig. 1). Sediments of the lagoon floor have less than 4% sand, and consist mainly of the silt and clayey silt in the northern half of the lagoon and silty clay in its southern half. Terrigenous organic matter is exceptionally abundant, as much as 30% occurs in some core [1]. The muds of the lagoon are believed to be largely derived from the Guaíba river, chiefly because its large section traps most of the river's sand.

The Itapeva Lake is located in the northern region of the state (Fig. 1). The texture patterns of bottom samples showed that the grain size decreases, from coarse silt to fine silt. The content of organic matter also has this pattern, with a steady increase in the central area of the lacustrine body and near the mouths of the rivers. Fine sediment in the deepest spots and in the most sheltered areas shows the influence of less effective currents, which enables deposition in these areas [2].

Methods: Two cores were taken from lagoon floor of the Lagoa dos Patos and range in length from 2.02 to 2.14 m. Each of the sediment-cores were sliced into 3 cm discs with a diameter of 7.5 cm. The resulting samples were analyzed to obtain grain-size distributions and determinations of sedimentation rates by the method of ²¹⁰Pb, and in the Lagoa Itapeva the sedimentation rate was estimated by collecting three shallow cores and also applying the ²¹⁰Pb geochronology method.

Results: The short-term rates sedimentation (decades), calculated in the Lagoa dos Patos are quite different when compared with the long-term rates (thousands of years). This study used samples from the uppermost 10 cm of the cores and obtained rates of 3.5 and 8.3 mm/yr, which are nearly 10 times more rapid than the short-term sedimentation [1].

In the Lagoa Itapeva the values showed sedimentation rates in the order of 2.9 mm/yr, 2.4 mm/yr and 3.2 mm/yr in the N-S direction. The contribution of the drainage of the Três Forquilhas river was mainly responsible for the difference among these sectors since it increased the sedimentation rate near its mouth.

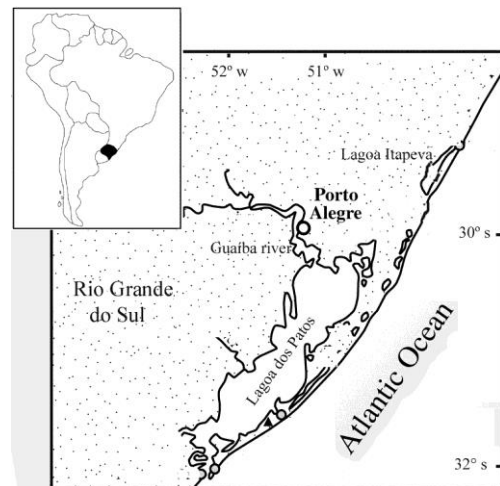


Fig. 1: Location of the site in southern Brazil and morphological details surrounding the Lagoa dos Patos and Lagoa Itapeva.

Discussion: The muddy deposits developed a flat bottom in the Lagos dos Patos along the 240 km. These sediments are rich in organic matter and were accumulated in the last 8,000 years, where the sedimentation rates ranged from 0.52 to 0.75 ± mm/yr. These sedimentations are much slower than those of ²¹⁰Pb in the last 150 years, which yielded values of 3.5 and 8.3 mm/yr.

Quite possibly, the high ²¹⁰Pb rates may be the result of more rapid lagoonal sedimentation related to deforestation of the watershed of the lagoon [1].

The increase of mud content in the sedimentary column over the past several years suggests that the changes in the drainage basin of the Lagoa Itapeva have increased the production of sediments and deposition on the lake bottom. Urbanization and the introduction of agriculture within the last century are the main explanatory variables for this behavior [2].

References: [1] Toldo, E.E. et al. (2000) *J. Coastal Research* **16**(3):816-822; [2] Ivanoff, M.D. 2013. *Dissertação de Mestrado*, UFRGS.