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Coal petrology of coal seams from the Leão-Butiá Coalfield, Lower Permian of the Paraná Basin, Brazil — Implications for coal facies interpretations

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Abstract

In the Leão-Butiá Coalfield, Rio Grande do Sul the coal seams occur in the Rio Bonito Formation, Guatá Group, Tubarão Supergroup of the Paraná Basin, Brazil and are of Permian (Artinskian–Kungurian) age.

This study is the first detailed investigation on the coal petrographic characterization of the coal-bearing sequence in relation to the depositional settings of the precursor mires, both in terms of whole seam characterization and in-seam variations. The study is based on the analyses of nine coal seams (I2, CI, L4, L3, L2, L1, S3, S2, S1), which were selected from core of borehole D-193, Leão-Butiá and represent the entire coal-bearing sequence.

The interpretation of coal facies and depositional environment is based on lithotype, maceral and microlithotype analyses using different facies-critical petrographic indices, which were displayed in coal facies diagrams. The seams are characterized by the predominance of dull lithotypes (dull, banded dull). The dullness of the coal is attributed to relatively high mineral matter, inertinite and liptinite contents. The petrographic composition is dominated by vitrinite (28–70 vol.% mmf) and inertinite (>30 vol.% mmf) groups. Liptinite contents range from 7 to 30 vol.% (mmf) and mineral matter from 4–30 vol.%. Microlithotypes associations are dominated by vitrite, duroclarite, carbominerite and inertite. It is suggested that the observed vertical variations in petrographic characteristics (lithotypes, microlithotypes, macerals, vitrinite reflectance) were controlled by groundwater level fluctuations in the ancient mires due to different accommodation/peat accumulation rates.

Correlation of the borehole strata with the general sequence-stratigraphical setting suggests that the alluvial fan system and the coal-bearing mudstone succession are linked to a late transgressive systems tract of sequence 2. Based on average compositional values obtained from coal facies diagrams, a deposition in a limno-telmatic to limnic coal facies is suggested.

Keywords: Paraná Basin; Leão-Butiá Coalfield; Permian coal; Coal facies

1. Introduction

The southern region of Brazil, comprising the Paraná Santa Catarina, and Rio Grande do Sul states (Fig. 1), has been known for its abundant and economically important

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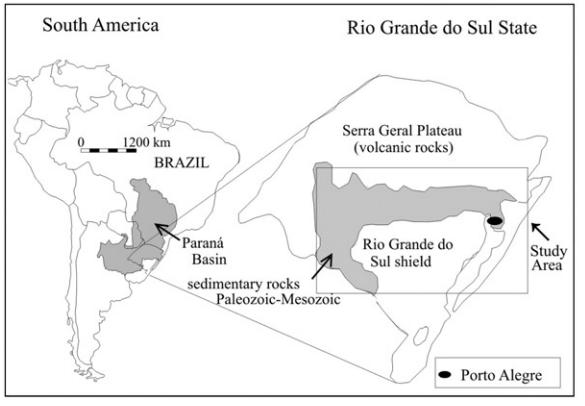

	Stage	Lithostratigraphy	
PERMIAN	KUNGURIAN	Passa Dois Gp.	Irati Formation
		Guatá Group	Palermo Formation
	ARTINSKIAN		Rio Bonito Formation
	SAKMARIAN	Itararé Group	Rio do Sul Formation

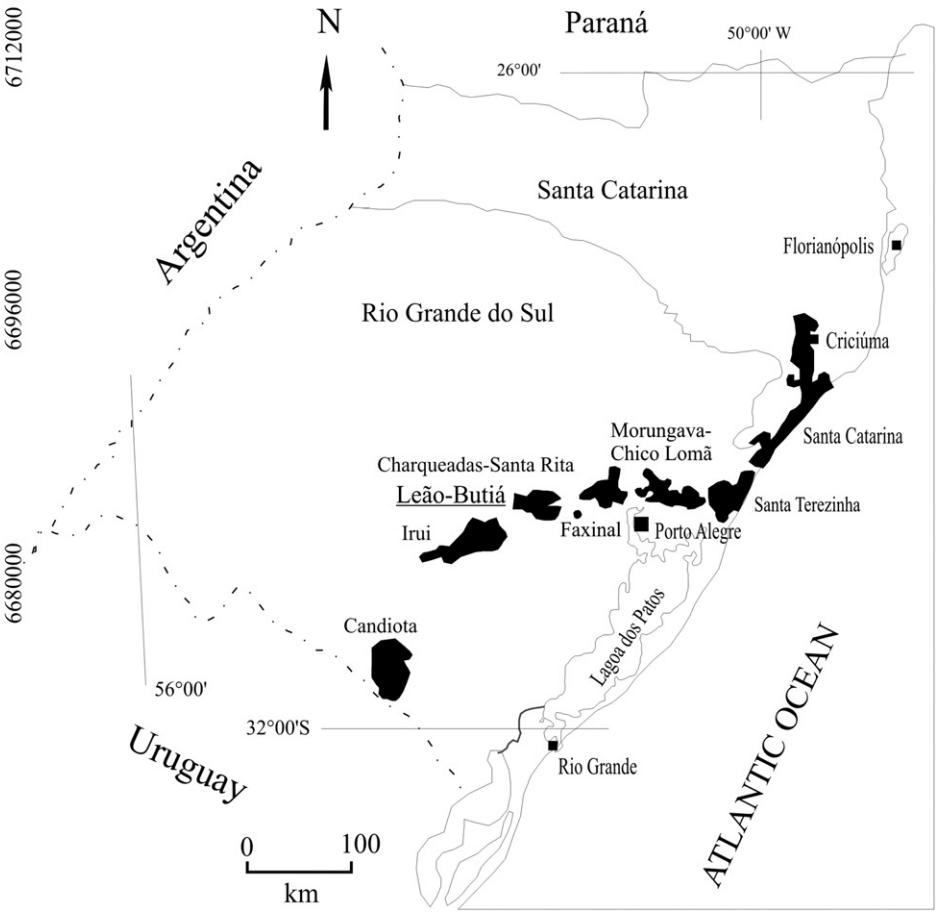

Fig. 1. Location of the Leão-Butiá Coalfield in the south of the Paraná Basin with coal-bearing Rio Bonito Formation highlighted.