



Petrological and geochemical composition of lignite from the D field, Kolubara basin (Serbia)

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ABSTRACT

The Upper Miocene lignite from the Main coal seam in the D field, Kolubara basin, is a typical humic coal with huminite, liptinite and inertinite concentrations of up to 83.7 vol.%, 17.2 vol.% and 15.5 vol.%, respectively. In the huminite group, textinite and ulminite are the most abundant macerals with variable amounts of densinite and attrinite. Liptodetrinite and sporinite are the most common macerals of the liptinite group, while inertodetrinite is the most abundant maceral of the inertinite group. The mineral matter consists mostly of clay minerals. The main sources of organic matter were gymnosperms (conifers) and microbial biomass, followed by angiosperms. Based on composition of saturated and aromatic diterpenoids it has been established that coal forming plants belonged to the gymnosperm families Taxodiaceae, Podocarpaceae, Cupressaceae, Araucariaceae, Phyllocladaceae and Pinaceae. Peatification occurred in neutral to slightly acidic, fresh water environment. Composition and distribution of biomarkers show that diagenetic changes of the organic matter were mainly governed by bacterial activity in a suboxic to oxic environment. Based on distribution of aromatic diterpenoids a novel diagenetic pathway for transformation of abietane-type precursors under suboxic to oxic conditions is proposed. Variations in compositions of macerals and biomarkers are in concordance with pronounced seasonality during Pontian, which caused changes in the water level, redox conditions during peatification, and to some extent vegetation differences in the paleo-plant communities.

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1. Introduction

The Upper Miocene Kolubara lignite basin is economically one of the most important coal basins in Serbia. It is located about 60 km SSW of Belgrade, and covers an area of almost 600 km², extending in the E–W direction up to 55 km, and in the S–N direction up to 15 km. This basin is divided into several fields ("A", "B", "C", "D", "E", "F", "G", "Veliki Crljeni", "Šopić-Lazarevac", "Tamnava Istok", "Tamnava Zapad", "Radljevo", "Zvizdar" and "Ruklade"; Fig. 1). Lignite is exploited in the fields "C", "D", and "Tamnava Zapad". The D field which is the focus of this study is situated in eastern part of the Kolubara basin. At the beginning of exploitation it extended over an area of almost 20 km² and the remaining surface with mineable coal seams is about 6 km². The northern border is represented by outcropping and erosion of the Main coal seam. The western border of the deposit is a natural extension to the G field and the southern to the E field. The eastern border is also marked by outcropping of the Main coal seam.

Since 1896, within the Kolubara basin about 883.2 Mt lignite, in total, has been produced, of which 866.8 Mt in open pit mines and 16.3 Mt in underground mines being active until 1974 (<http://www.rbkolubara.co.rs>). Annually, the Kolubara basin produces about 30 Mt lignite, which amounts to 70% of total coal production in Serbia. According to the Geological Survey of the Kolubara basin, the lignite resources and reserves are currently estimated at 2811 Mt. Most of the lignite produced (90%) is used for electricity generation in thermal power plants "Nikola Tesla" in Obrenovac and "Kolubara" in Veliki Crljeni, with total capacity of 3160 MW (<http://www.eps.rs>). About 17 billion kWh is annually produced from Kolubara coal, which represents 52% of Serbia's total electricity generation.

Geological exploration began at the eastern part of the basin since the late 19th century. Upper Miocene (Pontian) age of the coal-bearing sediments was confirmed in studies carried out by Stevanović (1951) and Pantić and Dulić (1993).

The distribution of palynomorph assemblages in the lignite from the D field (Pantić and Dulić, 1993) suggests that trees and bushes played an important role in lignite formation. According to this study, the presence of Taxodiaceae–Nyssaceae and Cupressaceae indicates a wet forest

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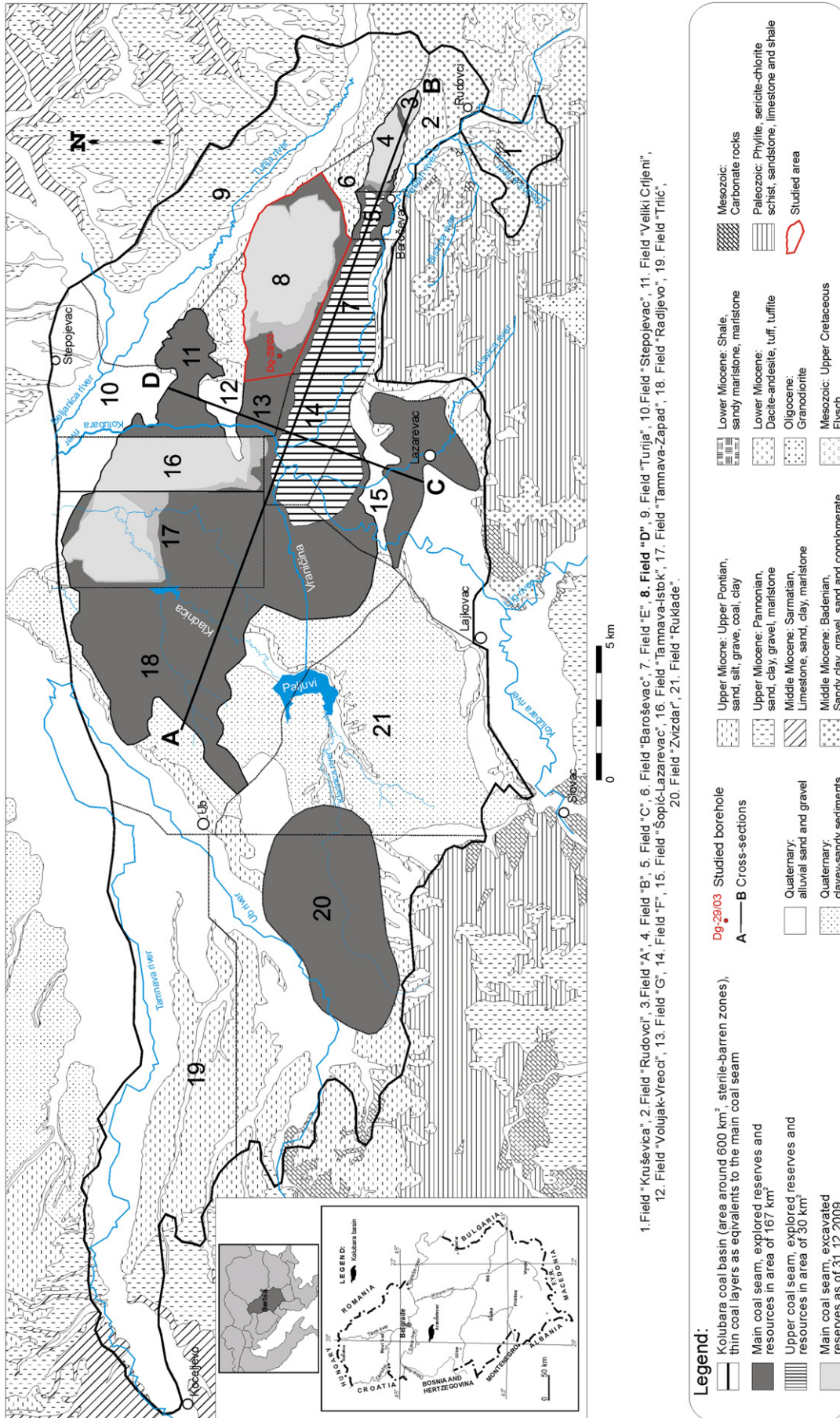


Fig. 1. Simplified geological map of the Kolubara basin.

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