



# Palynologic, petrographic and geochemical composition of the Vanclève coal bed in its type area, Eastern Kentucky Coal Field, Central Appalachian Basin



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## ABSTRACT

The Vanclève coal bed was studied geochemically, palynologically, and petrographically near the type area of the Vanclève coal bed, where new road construction has provided fresh exposures. In the study area, the Vanclève coal is relatively thin (<76 cm), low in ash yield (avg. 7.0%, dry basis), and high in overall total sulfur content (avg. 3.3%, dry basis). Three very thin (<10 cm thick) leader coals are present at two of the six sample locations. The leader coals are high in ash yield (avg. 29.4%, dry basis), and high, but variable, total sulfur content (avg. 5.0%, range 1.1 to 8.8%, dry basis).

Palynologically, the coal is dominated by *Lycospora* (avg. 80.4%), the dispersed spore genus of *Lepidophloios*, *Lepidodendron*, and *Paralycopodites*. *Lycospora micropapillata* and *Lycospora orbicula*, both of which were produced by *Paralycopodites*, an ecotonal, colonizing lycophyte, are more prevalent near the base of the coal bed. *Lycospora pellucida*, *Lycospora granulata* (produced by *Lepidophloios*), and *Lycospora pusilla* (produced by *Lepidodendron*) are more abundant in the middle and upper portions of the bed. Spores and pollen from other Pennsylvanian plant groups are minor in occurrence. Biostratigraphically, the coal is transitional Westphalian A/B in age, containing both Late Langsettian, and Early Duckmantian elements. Petrographically, the coal is high in vitrinite content (avg. 80.5%, mmf), with telovitrinite occurring more commonly than detrovitrinite and gelovitrinite (avg. TV / DV + GV = 3.3). Liptinite (avg. 9.4%, mmf) and inertinite (10.2%, mmf) occur in minor amounts by comparison. The average random vitrinite reflectance of the Vanclève coal is 0.54%, and the average calculated maximum vitrinite reflectance is 0.58%, indicating the Vanclève coal to be high volatile C/B bituminous in rank, in the study area.

Low ash yields are often considered indicative, at least in part, of ombrotrophic (raised) mire origins in Pennsylvanian coal beds. However, the dominance of *Lycospora*, vitrinite macerals, and high sulfur contents indicates that the Vanclève coal bed is most likely formed from a planar, rheotrophic mire, with a consistently high water table. Low ash yields indicate that the paleomire was not subjected to any large influxes of sediment during peat accumulation from extra-mire sources.

Palynologically, the very thin (<10 cm thick) leader coals, more diverse in composition, though remain *Lycospora* dominant. Petrographically, they are high in vitrinite content, but have lower TV / DV + GV ratios (avg. 2.0). Collectively, these data indicate that the leader coals also formed from planar, rheotrophic mires, though with substantially more influence from extra mire sediment sources.

The coal is locally capped and cutout by paleochannels. Sediments from a heterolithic, laterally accreting channel appear to have locally loaded the peat when it was still pliable resulting in sandstone dikes and injection structures. Loading on pliable peat may also have led to slumping in the overlying channel fill.

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## 1. Introduction

The Vanclève coal bed is named for its occurrence, and historic mining, in the vicinity of Vanclève, Kentucky. The town of Vanclève is located in Breathitt County, Kentucky, on the western margin of the Eastern

Kentucky Coalfield, which is part of the Central Appalachian Basin (Fig. 1). In the past, exposures of the coal were limited to some old, and abandoned, underground drift mine openings and old roadcuts, with little vertical exposure. New road cut exposures along Kentucky Routes 15 and 205, near the town of Vanclève, have afforded an opportunity to better constrain the coal's stratigraphic position through detailed field mapping. The new exposures have also provided the opportunity to sample, and analyze, the coal palynologically, petrographically and geochemically near its type area.

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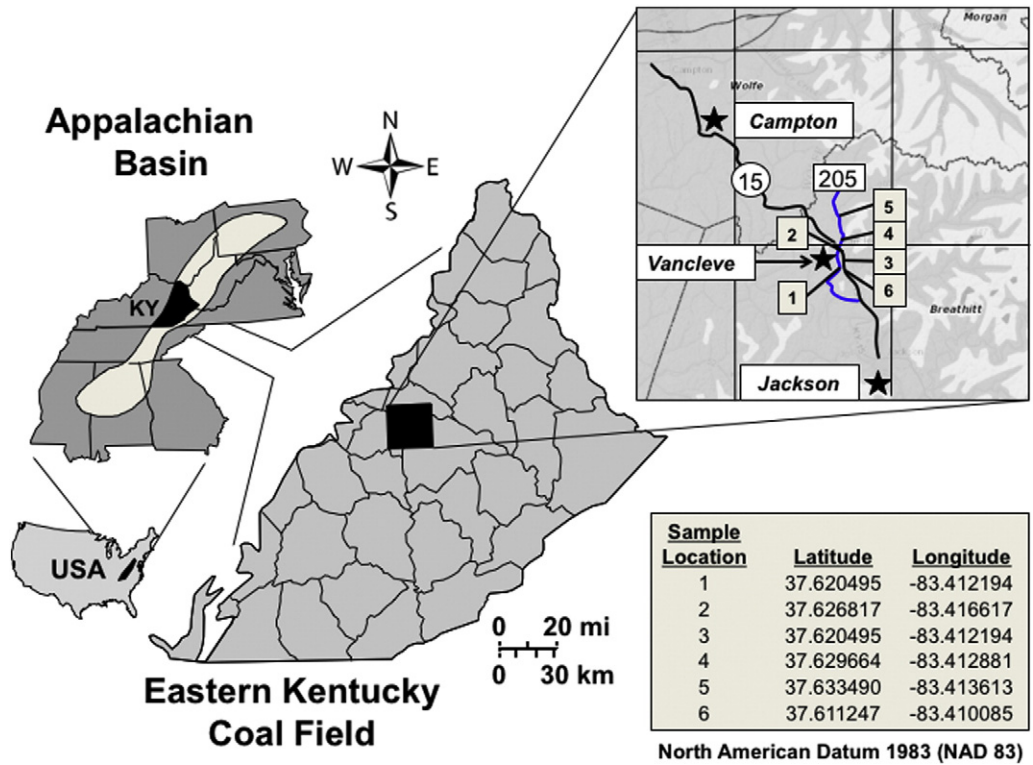


Fig. 1. Study area location map.

1.1. Regional stratigraphy

In general, Pennsylvanian strata thicken basin-ward (NW to SE direction) in eastern Kentucky, and thin onto the western margin of the

basin (Fig. 2). The Pennsylvanian section in the Eastern Kentucky Coal Field can be divided into (1) a Lower Pennsylvanian section, in which coal-bearing strata are truncated by, or juxtaposed against, thick, quartz-pebble-bearing quartzarenites; (2) a Middle Pennsylvanian

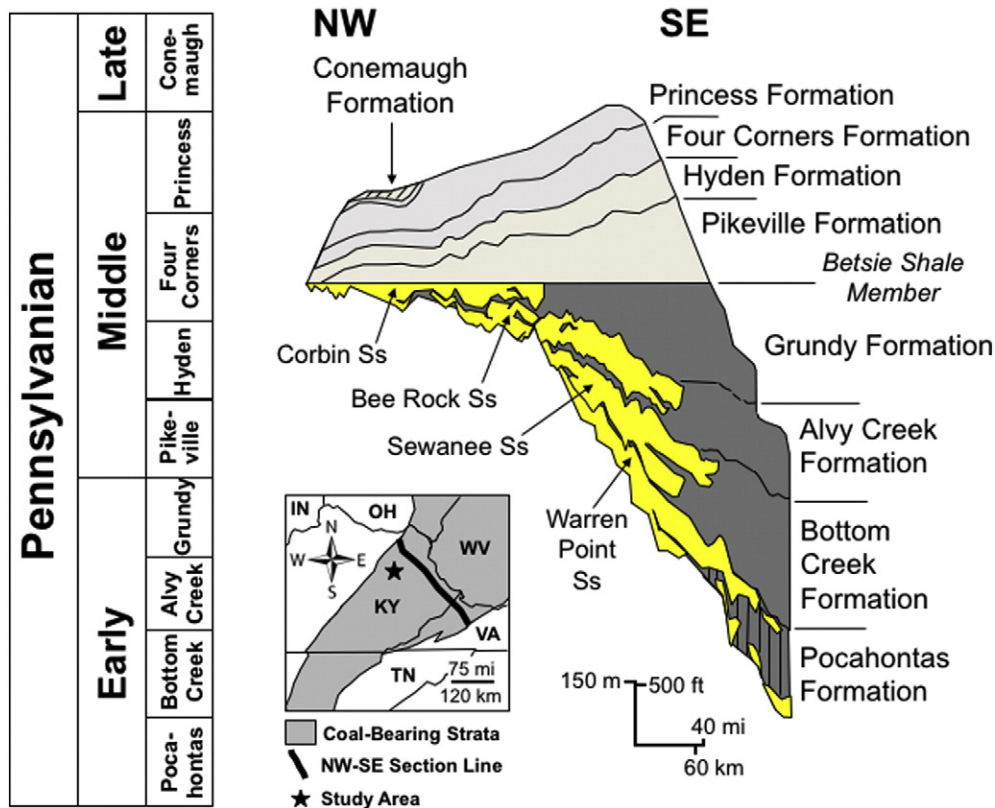


Fig. 2. Generalized stratigraphic column for the Eastern Kentucky Coal Field, showing an increase in strata thickness in a NW to SE (basin margin to basin center) direction.

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