

**Compound-Specific Carbon and Hydrogen Stable Isotope Ratios of Coalbed Gases in Southeastern Illinois Basin**, Dariusz Strapoc and Arndt Schimmelmann, Department of Geological Sciences, Indiana University, 1001E 10th St., Bloomington, IN 47405-1405; Maria Mastalerz and John Rupp, Indiana Geological Survey, Indiana University, 611 N. Walnut Grove, Bloomington, IN 47405; and Cortland Eble, Kentucky Geological Survey, University of Kentucky, Lexington, KY 40506-0107

Coalbed gases and associated waters from exploratory and production gas wells in the Springfield and Seelyville Coal Members of the southeastern Illinois Basin (Indiana and western Kentucky) were sampled to geochemically assess the origin of coalbed gases. Spectroscopic analyses of hydrocarbon gases ( $C_1$ ,  $C_2$ ,  $C_3$ ,  $n$ - $C_4$ ,  $i$ - $C_4$ ) yielded chemical concentrations,  $\delta D$ , and  $\delta^{13}C$  values that suggest a spectrum from purely biogenic to thermogenic gas. The low thermal maturity of Indiana coals ( $R_o \sim 0.6$  percent) is in agreement with the observed biogenic isotopic signature of coalbed gas ( $\geq 96$  percent methane generated via bacterial  $CO_2$ -reduction). In contrast, thermogenic gas was generated by the stratigraphically equivalent coalbeds in western Kentucky (Rough Creek Graben), where higher maturities of  $R_o \sim 0.8$  percent resulted from tectonic and hydrothermal activity. The lack of secondary biogenic methane observed in Kentucky coalbed gases probably resulted from greater burial depths and limited recharge of meteoric water.