

# **A Molecular Organic Carbon and Hydrogen Isotope Record of Depositional Environment and Organic Influx Changes in a Coaly Sequence: Implications for Coal-Derived Oil Correlation**

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There is considerable debate on how to characterize oils derived from coals. Our previous study demonstrated that compound-specific stable carbon isotope analysis can be a tool for correlating coal-sourced oil and interbedded shale-sourced oil in coal measures (*Organic Geochemistry* 31, 1349-1362). In this paper, we conducted a further investigation on this topic using molecular organic carbon and hydrogen isotopic composition in a coaly sequence with a maturity of ~1.0 Ro%. Quantified analyses clearly showed that there were organic influx dynamics in the profile.

Compared to the interbedded shale deposit, coal deposit had a higher content of long chain n-alkanes and isoprenoids. Due to the differences on the carbon pathway for different biomass, this source input variation was well overprinted on the  $\delta^{13}\text{C}$  of long chain n-alkanes and isoprenoids. The long chain n-alkanes from coal extracts are enriched in  $^{13}\text{C}$  relative to those of interbedded shale extracts and carbon isotope excursions are up to 4 per mil. However, there was no significant change on the  $\delta^{\text{D}}$  of long chain n-alkanes from coal and interbedded shale extracts, possibly indicating that a major source pool of these compounds was remains of terrestrial vegetation with atmospheric water using during both coal and interbedded shale deposition and few from submerged biomass.

The results suggested that the  $\delta^{13}\text{C}$  of specific compounds can provide a greater resolution to enhance oil-source correlation in coal-bearing basins. While the  $\delta^{\text{D}}$  of specific compounds has more limited diagnostic potential than the  $\delta^{13}\text{C}$ . On the other hand, using end-member isotopic data, it opens the possibility of quantitative estimation of coal and interbedded shale contributions to petroleum reserve discovered because both coal and interbedded shale in coal-bearing basin are usually the source beds.