Organic molecular evidence of seafloor hydrocarbon seepage in sedimentary intervals down a core in the northern South China Sea

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The hydrocarbons in sedimentary organic matter (OM) at Site 4B in the Pearl River Mouth Basin (PRMB), northern South China Sea (SCS) were analyzed. The odd/even predominance (OEP) of long chain \(n\)-alkanes (\(> n-C_{24}\)) with CPI (carbon preference index) values from 1.62–3.80 and \(n-C_{29}/n-C_{31}\) being the two most abundant in most of the samples are strongly indicative of a terrestrial higher plant source, and the even/odd predominance (EOP) distribution of mid-chain \(n\)-alkanes (\(n-C_{16-22}\)) suggests a marine bacterial input, probably chemical autotrophic bacteria. However, the biomarker distributions at the 65–70 cm, 80–85 cm and 85–90 cm intervals show a similar to those of crude oils, which were characterized by a dominance of an unresolved complex mixture (UCM) in the \(n-C_{20}\) region, low CPI values (< 1.5) of long chain \(n\)-alkanes, low values of \(\beta\)-\((\alpha\beta+\beta\alpha)\)-\(C_{30}\) hopane (< 0.15), and high values (> 9) of total tricylic terpanes/\(\alpha\beta\)-\(C_{30}\) hopane. These features are typical characteristics of mature OM that has experienced catagenesis and metagenesis, suggesting that outside hydrocarbons migrated into these three intervals. In terms of petroleum systems developed in the PRMB, hydrocarbon seepage from deep source rocks via a diaper structure and fault system is proposed to be responsible for the occurrence of this mature OM.