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

WEN YAN[134], YONGGE SUN[2], XIAOWEI ZHU[1,3], WEIHAI XU[1,3]

1 CAS Key Laboratory of Ocean and Marginal Sea Geology, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou 510301, China
2 Institute of Environmental and biogeochemistry (eBig), School of Earth Sciences, Zhejiang University, Hangzhou 310027, China
3 Innovation Academy of South China Sea Ecology and Environmental Engineering, Chinese Academy of Sciences, Guangzhou 510301, China
4 University of Chinese Academy of Sciences, Beijing 100049, China

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 ββ/(αβ+ββ+βα)-C_{30} hopane (< 0.15), and high values (> 9) of total tricyclic terpanes/αβ-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.