Biomarkers as lithologic indicators of marine petroleum source rock

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Terrigenous input, nutrient supply and deposition rate control the original productivity, sedimentation types and preservation conditions, thereby affecting the type and abundance of organic matter as well as the molecular geochemical characteristics. This study examines the key characteristics of the marine source beds aross the major petroleum basins, to extract molecular tracers for marine source rock lithology.The types of examinated sedimentary basins include passive continental margin rift basin, intracratonic rift basin, pericrationic basin and foreland basin. Favorable petroleum source facies include but not limited to borderland slope, enclosed bay, continental shelf, evaporatic lagoon and platform depressions. Clay-rich marine muddy source rocks, with terrigenous clastic and in-situ bioclast, developed in enclosed bay or lagoon, continental margin slope and broad shallow bay area, mainly include black silica rock, black grey lime mudstone and marlstone rock. The marine muddy source rock are often characterized by high diasterane, low C_{29}/C_{30} hopane ratios, and lack of C_{35} homohopane predominance. In contrast, marine carbonate source rock, including dark limestone, argillaceous limestone, argillaceous dolomite, calcareous dolomite, developed in the evaporation lagoons, sunken platform, platform slope and basinal facies as biological or biochemical deposits. These carbonate rich sediments show high content of gammacerane, acyclic isoprenoids and sulfides, low pr/ph, and a C_{35} homohopane predominance. Application of the molecular tracers in the study of the main commercial discoveries in the Tarim Basin, NW China has revealed clear evidence for dominantly marine carbonate source contribution, leading to new clues for exploration from the confirmed petroleum provinces.