Abstract

A ternary plot is proposed to represent the palynoenvironmental context of palynologically recovered sedimentary particulate organic matter (POM). This plot identifies three major marine palynoenvironmental parameters, namely redox conditions, proximal-distal distributions, and terrestrial influence. It also facilitates hydrocarbon biomarker (kerogen) type interpretation on the basis of the overall POM composition as well as the ratio of marine to non-marine organic components.

In this plot, palynofacies data are categorized into three end-members, each of which has a palynoenvironmental indication. Phytoplankton and non-marine palynomorphs are combined in the top end-member and indicate the degree of terrestrial and freshwater influx. Amorphous marine organic matter (AMOM) is plotted base-left to reflect the oxygenation state, while the base-right end-member represents marine palynomorphs, which together with AMOM mark the approximate basinward distance from the shoreline.

Although inspired by the widely used plot of Tyson (1989, 1993) and the subsequent modifications by Roncaglia and Kuijpers (2006), the proposed sedimentary POM ternary plot has the advantage of categorizing genetically related palynomorph components based on their palynoenvironmental significance rather than diagnostic structural morphology or palynological classification. This prevents illusory proximal-distal and redox interpretations arising from (1) combining decomposition products from marine and non-marine sources into one (ACOM) end-member based solely on the lack of visible definitive internal structures under the light microscope, and (2) grouping terrestrial and marine palynomorph taxa under one (palynomorph) end-member. Such problems have been resolved by counting the amorphous non-marine macrofossils as degraded phytoplankton preserving their correct palynoenvironmental implication. In addition, non-marine palynomorphs have been separated from the marine palynomorphs and grouped with terrestrial phytoplankton. One important precaution to consider is that this sedimentary POM ternary plot is not intended to interpret the depositional conditions of submarine fan systems and turbidite sequences where large terrigenous components are known to be transported to the deep sea realm.