

AP10

Keynote - The Middle Cretaceous: A Case for Special Treatment?

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SUMMARY

The middle Cretaceous (Base Aptian to Top Turonian) was “different”. Do our analogues allow us to understand it? The middle Cretaceous is characterized by: (1) a period of consistent sea-level rise leading up to a perhaps unprecedented large flooding of the continental crust; (2) an open equatorial world ocean connection; (3) the largest recorded rate of oceanic crust production and the highest frequency of Large Igneous Provinces with its profound impact on climate warming via CO₂ degassing; (4) near-record, sea-surface temperatures; (5) possibly also near-record storm intensity; (6) the anomalous C34n SuperChron or Cretaceous magnetic quiet zone; and (7) the evolutionary explosion of flowering plants.

These characteristics are clearly linked one to another via deeper causal mechanisms, which are actively being diagnosed. Nonetheless the symptoms are clear: (1) creating ideal conditions for the accumulation of thick carbonate sequences of predominantly calcitic mineralogy in a wide equatorial belt. (2) Carbonate platforms of extreme width trapping huge quantities of carbonate mud to form sequences dominated by wackestones and mud-dominated packstones. (3) Increased weathering of cratons with consequential periodic shedding of fine clastics over the distal outreaches of the vast carbonate platforms to form regional seals (e.g. Nahr Umr Formation). (4) A sluggish oceanic circulation with bad waters and possibly the highest frequency ever seen of Oceanic Anoxic Events, in turn leading to the widespread deposition of organic-rich strata with source rock potential.

But the uniqueness doesn't stop with depositional environments: the situation had to reverse towards collision of the initially quietly drifting plates with their carbonate deposition at the leading edges. The subsequent upheaval in the Late Cretaceous and later, caused the creation of structures, the maturation of source rocks and pathways for the circulation of porosity creating and destroying burial fluids ahead of oil charges.

This paper explores the implications of the uniqueness of this period on understanding the creation of some of the great reservoirs of the Arabian Plate in the context of clearly “non actualistic” conditions. How much does the uniqueness of the period really need to be taken into account in predicting the static and dynamic properties of oil and gas fields?