Climate Evolution and its Impact on Sediment Dispersal in the Eastern Mediterranean

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ABSTRACT

The recent, large gas discoveries in the Eastern Mediterranean have demonstrated the potential of this region, but questions remain about the timing and source of clastics comprising the pre- and post-salt plays. In this study we investigate these questions using palaeoclimatology and drainage analysis. Climate exerts a strong control on the processes dictating the distribution and composition of lithofacies.

During the Cretaceous-Eocene the East Mediterranean climate was dominated by the maritime influence of the closing Tethys Ocean. An abrupt warming at the Paleocene- Eocene boundary (PETM) punctuated an otherwise overall cooling trend. This was followed by emergence and the establishment of river systems. The palaeo-Nile began discharging into the Tethys around the Eocene-Oligocene boundary draining a tropical region further south. Closure of the Tethys and development of global thermo-haline circulation led to aridity in the Mediterranean during the Late Miocene and initiation of the Asian Monsoon. The resulting fluctuations in hydrology then dictated the variability in sediment supply. During the Southwest Monsoon, Nile River discharge increased despite Egypt being arid, due to more humid conditions further south in the Ethiopian Highlands. Carbon-rich sapropels only occur during the Southwest Monsoon (mainly Pliocene-Quaternary) when high freshwater input from southern rivers, runoff and/or direct precipitation produce a lowsalinity surface-water layer or lenses. Increasing regional aridity continued through the Messinian Salinity Crisis and to the Present Day. Modern ocean-atmospheric circulation patterns became established during the Piacenzian. From ~2.5 Ma Nile sourced sediments are shale-prone due to extensive erosion of the trap basalts in Ethiopia where wet, humid conditions occur. The northern (Turkish and Greek) sourced Pleistocene deposits indicate uplifted, temperate areas, heavy winter precipitation and increased summer precipitation due to the activity of Mediterranean depressions.

Palaeobiome maps for selected time-slices (Maastrichtian-Last Glacial Maximum) are presented that summarise the climatic evolution of the region.