EAGE

AP27

A Transition from a Passive to a Tectonically Active Margin and Foreland Basin Development in the Late Cretaceous of the Fars Area and Offshore (Zagros)

A.R. Piryaei* (NIOC-Exploration directorate), J. Reijmer (Vu university of Amsterdam), J. Borgomano (Provence university of France) & F.S.P. van Buchem (IFP, now Maersk Oil Qatar)

SUMMARY

The northeastern margin of the Arabian plate in the Fars Area was influenced by a series of tectono-sedimentary events during the Late Cretaceous. These events are well documented by significant variations in sedimentary facies and sedimentation patterns and thickness. The presence of igneous dikes is another significant phenomenon at the top of Cenomanian platform.
Nine regional transects parallel and perpendicular to the Zagros trend were prepared. These transects vertically contain three tectono-sedimentary phases: Phase I (Late Albian to Turonian), Phase II (Coniacian to Late Campanian) and Phase III (Late Campanian to Maastrichtian).
Phase I is characterised by shallow-water carbonate platforms bordering intrashelf basins. Eustatic sea-level variations can be the main factor controlling the accommodation space in parts of the area, whereas to the southeast the role of the regional and salt tectonic are more dominant.
Phase II is marked by major changes in the depositional environments and sedimentary facies, as a result of obduction and foreland basin creation. The pelagic marls host large volumes of carbonate and siliciclastic gravity flows and far-traveled radiolarites and ophiolites as well as thrust slices of older carbonates.
Phase III is dominated by pelagic facies interfingering with shallow-water Omphalocyclus and Loftusia-bearing facies.

The northeastern margin of the Arabian Plate in the Fars Area was influenced by a series of tectono-sedimentary events during the Late Cretaceous. The sedimentary successions show an evolution from a passive to a tectonically active margin. This evolution could be linked to uplift and erosion of the Arabian platform, followed by tilting of the platform and the formation of a foreland basin. This process is well documented in the sedimentary succession studied by significant variations in sedimentary facies and sedimentation patterns, changes in sediment thicknesses, changes in accommodation space and shifting depocentres. The presence of igneous dikes at the top of Cenomanian platform is the other important issue, which is reported in the Zagros by this study for the first time. These intrusives show a zonation with a clear metamorphosed areole.

In total fourteen outcrop sections were measured, and then combined with data from numerous, re-interpreted wells. The sedimentary sequences are dated based on foraminifera, but also on new age dating of nannoplankton, radiolaria and ammonites. Strontium isotope stratigraphy provided additional information for a few intervals. The datasets are organised in the nine regional transects parallel and perpendicular to the Zagros trend. These transects show three tectono-sedimentary phases: Phase I (Late Albian to Turonian), Phase II (Coniacian to Late Campanian) and Phase III (Late Campanian to Maastrichtian).

Phase I is characterised by shallow-water carbonate platforms bordering intra-shelf basins. The platform facies consists of a rudist and benthic foraminifera-bearing facies, while the intra-shelf basins contain the ‘oligosteginid’ and other pelagic facies. Eustatic sea-level variations can be interpreted as the main factor controlling the accommodation space in parts of the area, whereas to the southeast the role of the regional and salt tectonic are more dominant.

Phase II is marked by major changes in the depositional environments and sedimentary facies, as a result of obduction and foreland basin creation. This phase commences with the deposition of sediments in an isolated platform carbonate setting (Santonian) that grade laterally and vertically to pelagic marls of the Santonian and Campanian. In the NW Fars the pelagic marls host large volumes of carbonate and siliciclastic gravity flows and far-traveled radiolarites and ophiolites as well as thrust slices of older carbonates. In the SE Fars, Phase II contains far less siliciclastic gravity flows and radiolarite/ophiolitic materials, which are only present at a few localities. Proposed as controlling factor on the sedimentary system are regional tectonic processes associated with local salt tectonic processes.

Phase III is dominated by pelagic facies that, in the NW Fars, interfingers with autochthonous shallow-water Omphalocyclus and Loftusia-bearing facies (Tarbur Formation). In the SE Fars, at the top of the interval, Phase III occurs associated with slumped conglomeratic/brecciated units with clasts of the underlying carbonate platform.