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ABSTRACTS OF POSTERS

Poster 1

A sequence stratigraphic perspective of the Dent Group, Eastern Sabah

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This paper presents parts of the results of geological study conducted by PETRONAS Research and Scientific Services Sdn. Bhd. and Petroleum Management Unit of PETRONAS, in the Dent Peninsula area, eastern Sabah. The purpose of the study is to understand the geology, stratigraphy and the hydrocarbon potential of the area.

The Middle Miocene to Pleistocene Dent Group of Sandakan Sub-basin is part of the Northeast Sabah Basin as defined by Leong and Azlina (1999). It overlies the Segama Group of the Central Sabah Sub-basin. Located in the southern portion of the Sulu sea, with a small part of it lying on the onshore Dent Peninsula, Eastern Sabah. The Dent Group consists of post-rift sedimentary packages, overlying the older syn-rift Tanjong and/or the volcanoclastic of the Segama Group. It consists of fluviodeltaic to marine sediments characterised by strong southeastward progradation. The Dent group has been divided into three lithological units namely, the Sebahat, Ganduman and Togopi formations. A number of stratigraphic schemes have been proposed for subdividing the lithological units in the sub-basin. According to Leong and Azlina (1999), the difficulty remains in assigning lithological units to this scheme due to lateral facies variation and poor biochronostratigraphic control, except for the youngest unit.

The stratigraphy of Eastern Sabah was first documented by Fitch (1955), who had identified two sets of sedimentary packages from the area, described as Lower Miocene and Upper Miocene sets. The Lower Miocene consists of sandstone, shale, limestone and tuffite, and the Upper Miocene of shale, limestone and sandstone with coally films and well preserved plant remains. These two units are separated by an unconformity. It was Haile and Wong (1965) who assigned these units to formal formational units: the Segama and Dent groups respectively.

Ismail Che Mat Zin (1994), extended the study of the Dent Group into offshore Eastern Sabah using the data from exploration wells and seismic sections. He also identified the "Older Sebahat" unit of the Dent Group, occurring as subcrops in the offshore area. A detailed sequence stratigraphic study of offshore Eastern Sabah, was carried out by Wong (1993) using wells and seismic data.

The oldest unit in the Dent Group is the Sebahat Formation, which ranges from late Middle Miocene to Late Miocene (Walker, 1993). Ismail Che Mat Zin (1994) assigned a Pliocene age for the Sebahat Formation equivalent in offshore areas. Palynological and nannofossil analyses of Sebahat mudstone samples, collected at Silasuka Quarry (locality 27) indicate Late Miocene age. While the Sebahat shale sample at Sahabat 7 Block (locality 26) indicates Middle Miocene age, and so the age range suggested by Walker (1993) is likely correct. The overlying Ganduman Formation ranges from late Middle Miocene to Late Miocene (Walker, 1993). Wong (1993), however, extends the Ganduman Formation from Late Miocene to Late Pliocene based on sequence stratigraphic studies.

Ismail Che Mat Zin (1994) assigned a Pliocene age for the Ganduman Formation equivalent in the offshore area. Palynological and foraminiferal analyses of shale samples from localities 34, 35, 36, 38, and 42 suggest the age ranges from Middle Miocene to Pliocene. The age of the Togopi Formation ranges from Pliocene to Pleistocene (Walker, 1993).

From field study, it is believed that there is an unconformity separating the Togopi from the underlying Ganduman Formation. The presence of a conglomeritic unit which is believed to be in the same sequence as the Togopi Formation in Tungku area is interpreted as unconformably overlying the Ganduman Formation. This therefore divides the Dent Group into two separate sequences. The lower sequence consists of the Sebahat Formation, Ganduman Formation and their equivalent and the upper sequence comprises of the Togopi Formation and its equivalent. Hence, the older, lower sequence is referred to here as Sequence 1 and the younger upper sequence as Sequence 2.

In the offshore Dent Peninsula, the lowstand fans that are equivalent to the Sebahat Formation have been interpreted by Wong (1993) as basin floor fans, slope fans and turbidites. These sedimentary packages are believed to be part of a lowstand systems tract of Sequence 1. This unit is also believed to be the lateral equivalent to some of the onshore conglomeritic units that have been described as part of the Tabanak and Tungku formations. At several outcrops of Tabanak and Tungku formations, this conglomeritic unit unconformably overlies well-bedded shoreface strata, interbedded marine tuffaceous sandstone and mudstone with an angular erosional unconformity. The abrupt facies change across the angular erosional surface indicates an unconformity. This unconformity is believed to be a sequence boundary that occurred following major relative sea level fall during early Late Miocene time. The conglomerate unit is thought to have been deposited as alluvial plain within an incised valley.

The shaly Sebahat formation is believed to represent the transgressive systems tract of Sequence 1. It overlies the lowstand conglomeritic unit. The contact between the two sequences has been described by Ismail Che Mat Zain (1994), and it is likely that, the surface represents a major transgressive event prior to deposition of the thick Sebahat Formation. The upper boundary of this formation is transitional, as observed in outcrops. The interbedded sandstone and mudstone of Ganduman Formation, which is interpreted as a lower shoreface deposit, overlies thick dark shelf mudstone of the Sebahat Formation. The contact is believed to be a marine-flooding surface, and is characterised by thin hard calcareous band separating the lower shoreface deposit of the Ganduman Formation above, and the thick shelf mudstone of the Sebahat Formation below.

The highstand systems tract of Sequence 1 are the prograding fluviodeltaic to nearshore packages of the Ganduman Formation. The variation in facies is observed from west to east, indicates the change from a deltaic to a shoreface setting. Further east, the sandy shoreface facies pinches out into shelf mudstone. A marine-flooding surface, as observed at Locality 30, separates the prograding unit of the Ganduman Formation above, from the thick transgressive shelf-mudstone of the Sebahat Formation below.

Sequence 2 consists of sedimentary packages that have been described as the Togopi Formation and its equivalent. The conglomeritic unit as observed at Kg. Tungku, is believed to be part of the lowstand systems tract of the sequence. It consists of a stacked multi-storey braided channel deposit interpreted as a remnant of an incised valley-fill fluvial system. This unit is believed to have been deposited following the late Pliocene tectonic event.

The transgressive to highstand sedimentary packages of Sequence 2 consist of marl, calcareous sandstone and allochthonous carbonate of the Togopi Formation. These packages are interpreted as shallow marine deposits. The limestone is matrix-supported with skeletal fragments and minor quartz grains. The skeletal components are mainly of benthonic foraminifera, red algae, mollusk fragments, echinoderms, coral fragments and bryozoans, indicative of a shoal limestone.