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Palynological Criteria to Identify the Misfar Group in the Eastern Flank of South Oman

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Abstract

The Devonian Misfar Group is the least extensive and least understood of Oman's subsurface lithostratigraphic units due to its limited presence in the subsurface. It has been identified in Central Oman in a few wells (Forbes et al. 2010) and recent hydrocarbon drilling in the Eastern Flank within the South Oman Salt Basin (SOSB) has shown the possible presence of Misfar Group rocks in at least one well in the Petrogas Rima area. The combination of distinct change in palynofacies character from the overlying, post-Hercynian Al Khlata Formation, and the relatively coherent palynological assemblage in the well may be a useful way of distinguishing genuine Misfar Group rocks from other units associated the HU, with similar lithologies, and which are prone to palynological reworking.

Well-A located in the northern part of Petrogas Rima block penetrated around 260m of Al Khlata Formation containing typical Al Khlata Formation palynomorphs and palynofacies character. However the influence of the pre-Hercynian Devonian is seen in the lower part of the Al Khlata Formation because of reworking of Devonian palynomorphs. Towards the base of the Al Khlata Formation (1603m depth) assemblages of 2159A age were recovered (Carboniferous; upper P9; Fig. 1), with a typical phytoclast (plant fragment) dominated palynofacies, The assemblage also contained a small number of reworked Late Devonian spores, mainly Retispora lepidophyta. The sample below at 1633.5m (also 2159A, upper P9) with the same phytoclast-dominated palynofacies also contained a few reworked Devonian palynomorphs including Grandispora libyensis. However at 1661.45m a very different palynofacies type is present (Fig. 2): an organic residue dominated by brown amorphous organic matter (AOM) with a few poorly preserved palynomorphs. The age of this level is uncertain. It contains long ranging palynomorphs such as Retusotriletes and Punctatisporites, which could be Devonian or Carboniferous in age. No monosaccate pollen (a palynomorph type normally indicating a post-Hercynian age) are present however. There are a small number of possible Devonian spores such as ?Rhabdosporites minutus and ?Gneudnaspora sp. The sample could represent a genuine Devonian unit with poor diagnostic palynological recovery, or less likely a palynologically barren Al Khlata unit into which Devonian spores and amorphous organic matter have been reworked.

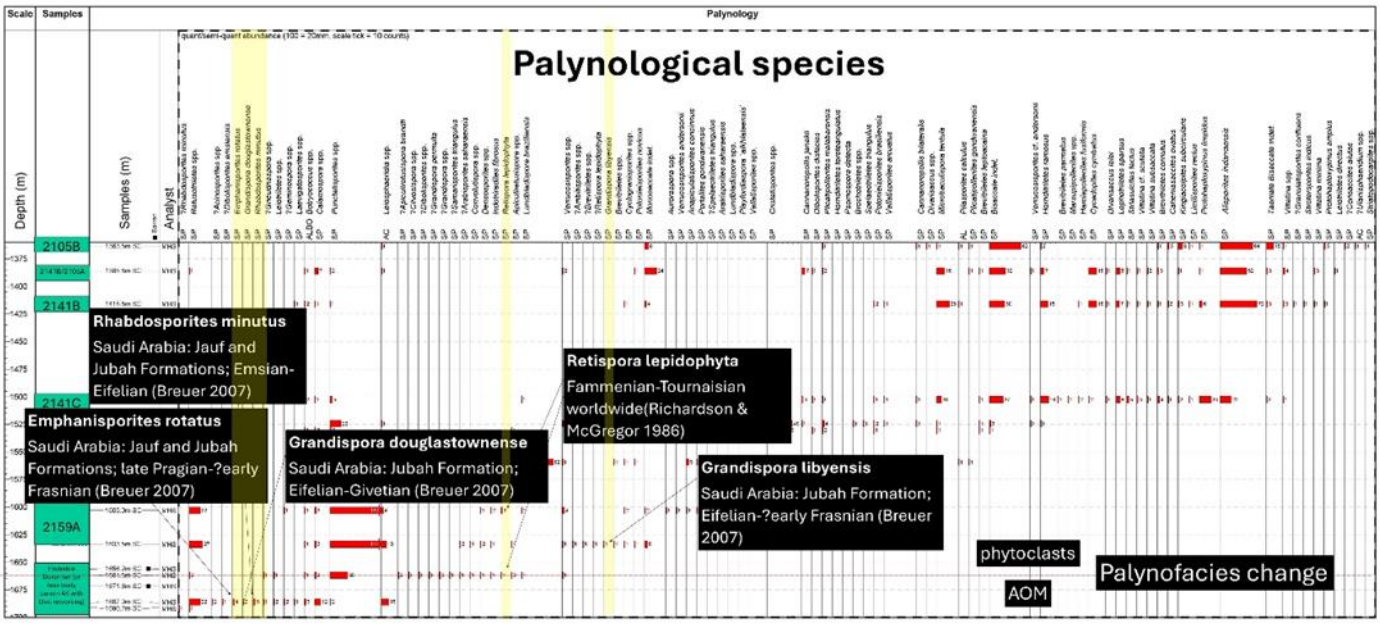

Fig. 1. Palynostratigraphic summary of Well-A.

At 1687m, a similar organic residue dominated by brown AOM contained a richer palynological assemblage consisting of long ranging palynomorphs such as Retusotriletes, but also a significant number of Devonian palynomorphs including Emphanisporites rotatus, Grandispora douglastownense and Rhabdosporites minutus. These together represent a coherent assemblage in the sense that they indicate a broad Eifelian-Givetian (Middle Devonian) age. Such a narrow age range is usually uncharacteristic of reworked assemblages. The age range is also consistent with assemblages of the central Saudi Arabian Jauf and Jubah formations.

Taken overall this suggests that Misfar Group rocks are present at least between 1661.45 and 1687.0 m. The work also suggests that downhole palynofacies change from phytoclasts to AOM, and a relatively narrow coherent age range could be useful in further identifying Misfar Group rocks elsewhere in Rima Field and the Eastern Flank.

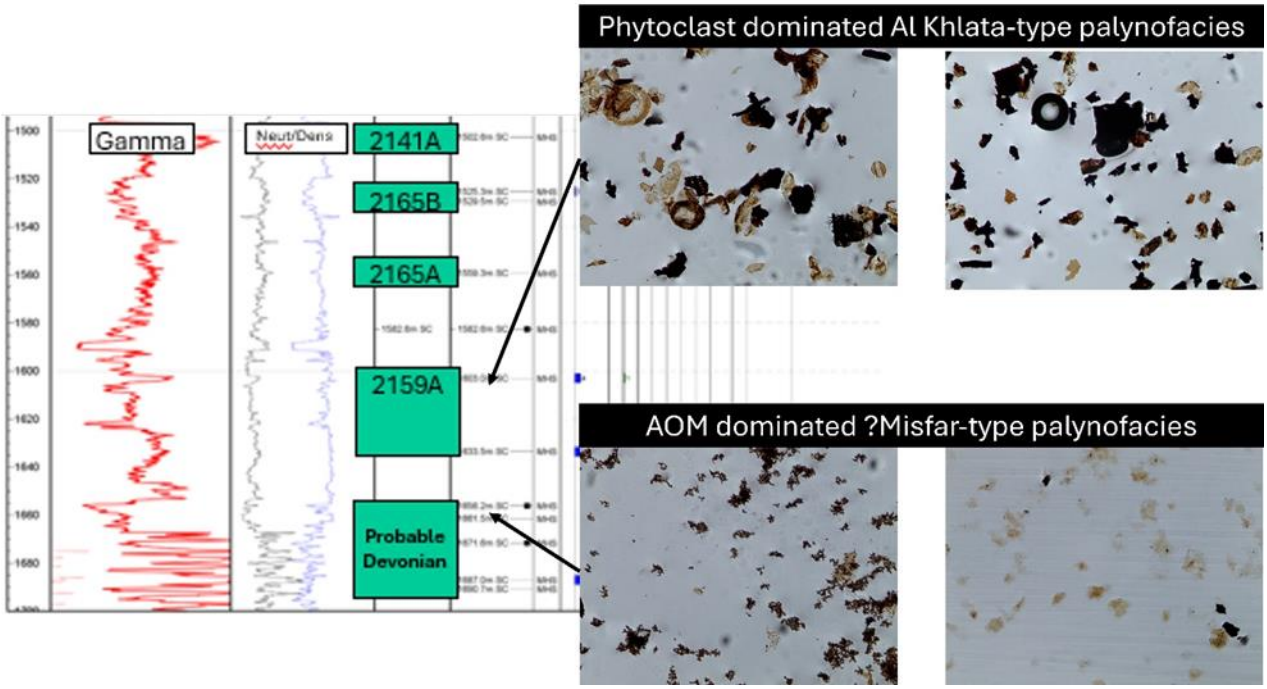

Fig. 2. Contrast in palynofacies type between the Al Khlata Formation and the ?Misfar Group

These two criteria may be useful because palynological identification of Misfar Group rocks is sometimes made difficult by reworking into palynologically barren strata of the Al Khlata Formation above the Hercynian Unconformity, which overlies the Misfar Group and is closely similar in lithology. Similar challenges occur in the Ghawar area of central Saudi Arabia (Stephenson 2024). This causes difficulties for dating and assignment of formations, and assessment of their position in relation to the HU.

Identifying the Devonian rocks within Eastern Flank has allowed the unlocking of a new exploration play in the area.

References

Forbes, G. A., Jansen, H. S. & Schreurs, J., 2010. Lexicon of Oman: Subsurface Stratigraphy. GeoArabia Spec. Publ., 5, 371p

Stephenson, M H 2024. Palynology of strata associated with the Hercynian Unconformity across the Arabian Plate, from the Levant to southern Arabia, Geological Society, London, Special Publications Volume 550 https://doi.org/10.1144/SP550-2023-182