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A re-assessment of the organic maturation and palynostratigraphy of the wells Ruivo-1 and Corvina, offshore Algarve Basin, Portugal

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ABSTRACT

The Algarve Basin is the southernmost geological province of Portugal. The knowledge of its offshore geology is limited to a few hydrocarbon exploration wells and seismic profiles. Two of these wells, Ruivo-1 and Corvina, were studied in order to assess its organic maturation levels and age using the biostratigraphy of dinoflagellate cysts. The well Ruivo-1 intercepted a thick Callovian succession whereas the well Corvina intercepted a thick Oxfordian succession. Both Jurassic successions are within the oil-window.

KEYWORDS: Offshore Algarve Basin, Mesozoic, Organic Maturation, Dinoflagellate cysts

1. Introduction

The exploration wells Ruivo-1 and Corvina, located in the offshore Algarve Basin, Portugal (FIG.1), were drilled in the mid 70's. The material (cuttings) available from both wells was studied in order to assess its organic maturation levels and age using the biostratigraphy of dinoflagellate cysts. 31 samples were collected from the wells, 15 from Ruivo-1 and 16 from Corvina. The samples were prepared using standard palynological processing techniques involving acid digestion (Wood et al., 1996). The organic residues obtained were sieved and mounted on microscope slides for palynological, spore colour and fluorescence studies. The organic residues for vitrinite reflectance measurements were mounted using the method described by Hillier & Marshall (1988).

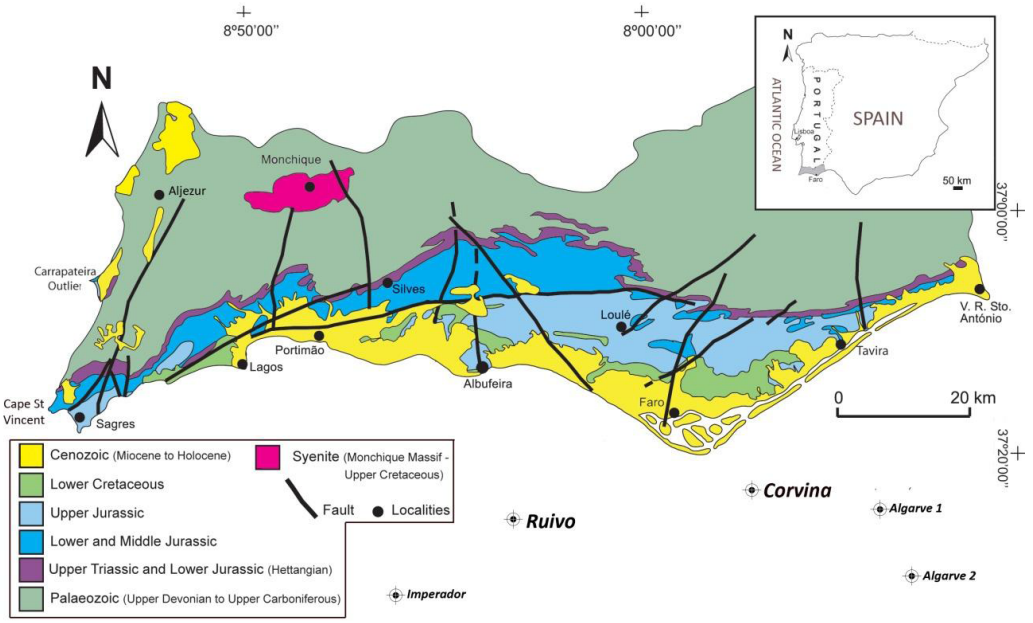

FIG.1 – Location of the wells studied.

2. Ruivo-1

This well was a total depth of 2100 m and intercepted lithologies assigned to the Miocene at the top and Upper Triassic at the bottom of the well (FIG.2). Ten samples were collected from marls and marly limestones between 1715 and 2070 m depth, from the interval belonging to the Jurassic. The organic residues from this interval are abundant, and comprise well-preserved palynomorphs, together with plant and wood fragments. The dinoflagellate cysts recorded from samples between 1800 and 2030 m, include *Batiacasphaera* spp., *Ctenidodinium* sp., *Ctenidodinium sellwoodii* Grp., *Ellipsoidictyum gochtii*, *Ellipsoidictyum/Valensiella* grp., *Gonyaulacysta jurassica* subsp. *adecta*, *Impletosphaeridium* spp., *Korystocysta gochtii*, *Meiourogonyaulax caytonensis* Grp., *Pareodinia ceratophora*, *Sentusidinium* spp., *Systematophora areolata*, *Systematophora penicillata*, *Systematophora* spp. and *Tubotuberella dangeardii*. These associations are indicative of the Middle-Late Callovian (Riding, 2005; Riding & Thomas, 1992). From these stratigraphic interval it was also recorded the species *Nannoceratopsis deflandrei* subsp. *deflandrei*, that marks the interval Toarcian-Aalenian, that appeared reworked into the Callovian sediments. Vitrinite reflectance measured from the Callovian sediments are within the oil-window. Ranging between 0.8 and 1.0%Rm. These values are backed up by the colours of TAI, SCI and UV fluorescence colours shown by the spores (FIG.2). The vitrinite reflectance values measured from the Tertiary sediments are also within the oil-window. However, these values were considered from reworked vitrinite particles, since the UV fluorescence colours from autochthonous palynomorphs, that provide the age for this interval, indicates immature kerogen.

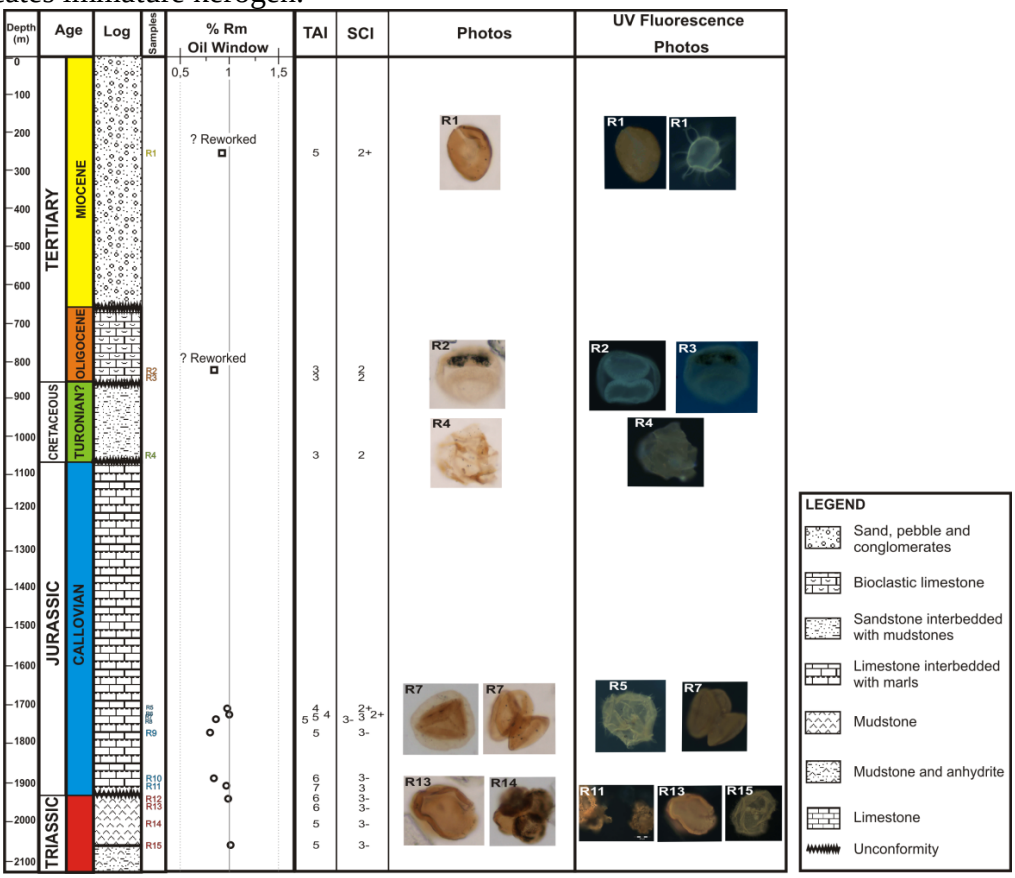

FIG.2 – Stratigraphy and organic maturation indicators of the well Ruivo-1.

3. Corvina

This well intercepted a 2700 m depth succession with Miocene sediments at the top and Jurassic sediments at the bottom of the well (FIG.3). The twelve samples collected between 1595 and 2680 m depth, yielded relatively abundant organic residues dominated by dinoflagellate cysts. Miospores observed include bisaccate pollen, *Callialasporites dampieri*, *Callialasporites turbatus*, *Callialasporites* spp., *Classopollis classoides* and *Perinopollenites elatoides*. The dinoflagellate cyst floras from these samples are indicative of ?Early/Middle Oxfordian age due, principally, to the occurrence of *Ctenidodinium ornatum*, *Compositosphaeridium polonicum*, H*ystrichosphaerina orbifera*, *Endoscrinium luridum*, *Gonyaulacysta jurassica* subsp. *jurassica*, *Rigaudella aemula*, *Surculosphaeridium vestitum*, *Stephanelytron redcliffense*, *Systematophora* spp., and *Wanaea acollaris* (Riding, 2005). The vitrinite reflectance values from this thick Oxfordian succession are within the oil-window and range between 0.9 and 1.1%Rm. These values are compatible with the results attained by other thermal maturity indicators, namely TAI, SCI and UV fluorescence (FIG.3). A similar condition to the well Ruivo-1 was also found in the Corvina well, with the Tertiary sediments being immature regarding to the oil-window, but with reworked vitrinite particles.

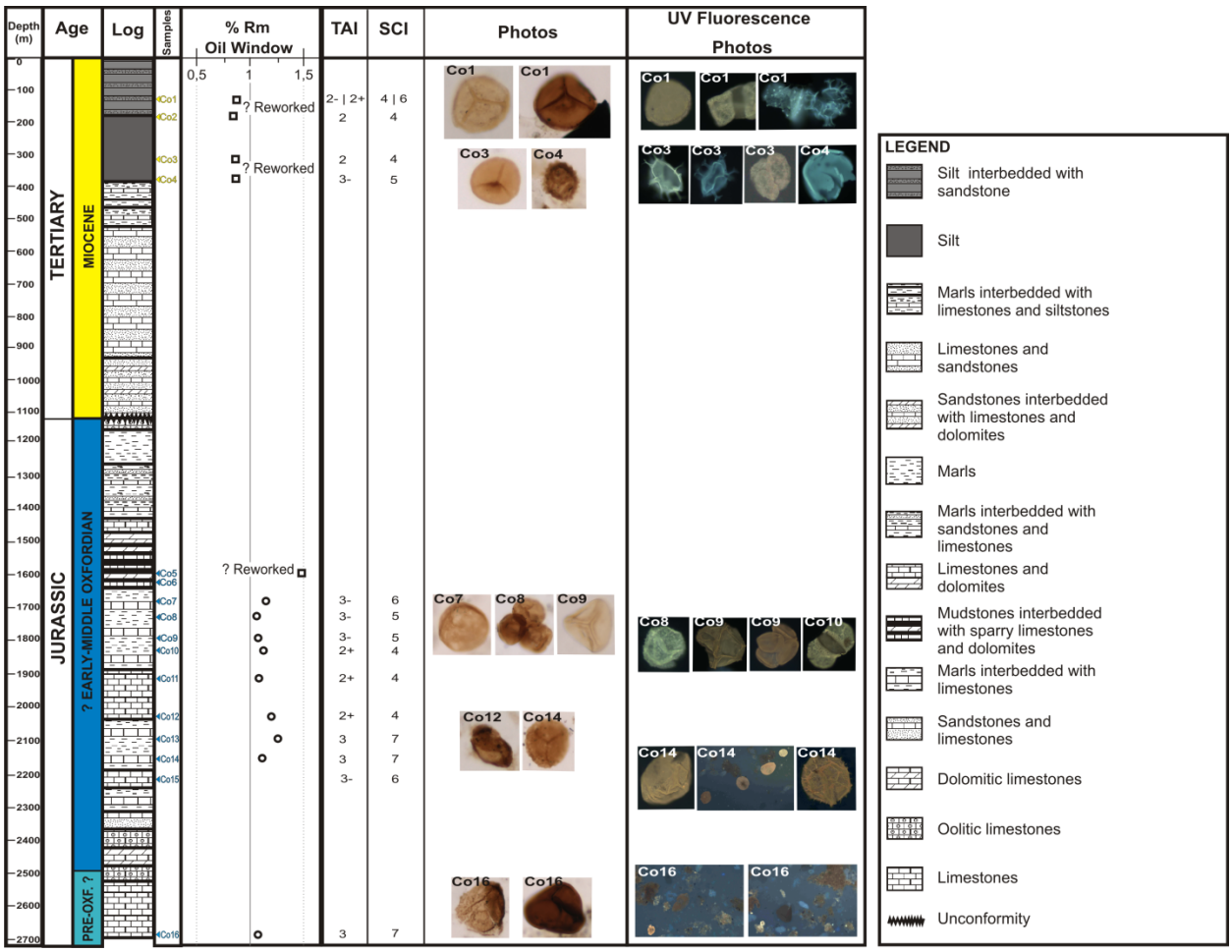

FIG.3 – Stratigraphy and organic maturation indicators of the well Corvina.

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References

Hillier, S., Marshall, J. (1988) – A rapid technique to make polished thin sections of sedimentary organic matter concentrates. Journal of Sedimentary Petrology 58, p. 754-755.

Riding, J.B. (2005) – Middle and Upper Jurassic (Callovian to Kimmeridgian) palynology of the onshore Moray Firth Basin, northeast Scotland. Palynology 29, p. 87-142.

Riding, J.B., Thomas, J.E. (1992) – 2. Dinoflagellate cysts of the Jurassic System. In: Powell, A.J. (Ed.), A stratigraphic index of dinoflagellate cysts. British Micropalaeontological Society Publications Series, Chapman and Hall, London, p. 7-97.

Wood, G.D., Gabriel, A.M., Lawson, J.C. (1996) – Palynological techniques - processing and microscopy. In: Jansonius, J., McGregor, D.C. (Eds.), Palynology: Principles and Applications. American Association of Stratigraphic Palynologists Foundation, Dallas 1, p. 29-50.

PLATE 1

Selected dinoflagellate cysts from the Ruivo - 1 and Corvina wells. The sample and England Finder coordinates are provided.

1. *Compositosphaeridium polonicum* (Górka 1965) Lentin and Williams 1981. Ruivo-1 well, Sample R8; P11/2
2. *Ctenidodinium sellwoodii* (Sarjeant 1975) Stover & Evitt 1978. Corvina well, Sample CO 2235; S33
3. *Gonyaulacysta jurassica* (Deflandre 1939) Norris & Sarjeant 1965 subsp. *adecta* Sarjeant 1982. Corvina well, Sample CO 1995; F44/4
4. *Impletosphaeridium* spp. Ruivo-1 well, Sample R9; T39/3
5. *Ctenidodinium ornatum* (Eisenack 1935) Deflandre 1939. Corvina well, Sample CO 2195; N7/2
6. *Pareodinia ceratophora* Deflandre 1947. Ruivo-1 well, Sample R10; K23
7. *Korystocysta gochtii* (Sarjeant 1976) Woollam 1983. Corvina well, Sample CO 2235; Q32
8. *Meiourogonyaulax caytonensis* (Sarjeant 1959) Sarjeant 1969. Ruivo-1 well, Sample R8; U35
9. *Stephanelytron redcliffense* Sarjeant. 1961. emend. Stover *et al.* 1977. Corvina well, Sample CO 1995; J26/1
10. *Surculosphaeridium vestitum* (Deflandre 1939) Davey et al. 1966. Corvina well, Sample CO 2195; N21/4
11. *Wanaea acollaris* Dodekova 1975. Corvina well, Sample CO 2495; M22/1
12. *Nannoceratopsis deflandrei* Evitt 1961 subsp. *deflandrei* (autonym). Ruivo-1 well, Sample R9; Q35/3