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## Full Length Article

# Comparative study between well logging and core analysis of Hawaz reservoir in Murzuq Basin, Libya

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## ABSTRACT

Murzuq Basin is one of the most important basins in Libya. It has many oil fields; H-field is one of the new discoveries in NC-186 concession in Murzuq Basin, Libya. This field has been affected by the structural and tectonic movements of Murzuq Basin and created paleo-high during the post-Hawaz erosional events. Ten exploratory wells were drilled for that field and well logging data were collected. The well logging data include Self potential, Gamma ray, Calipee, Resistivity, and Porosity logs (sonic, neutron, density). The recorded well logging data have been used for quick look interpretation and then correlated with both core data report and the plotted crossplots. The quick look results indicate that this reservoir is clean, highly porous and permeable. This reservoir is divided into 8 units/horizons (from H1 to H8), which are mainly sandstone with few intercalations of clay. Both well logging and core data are highly concordant. The results of the petrophysical characteristics have ascertained that H4–H6 are oil bearing zones while H7–H8 are water bearing horizons.

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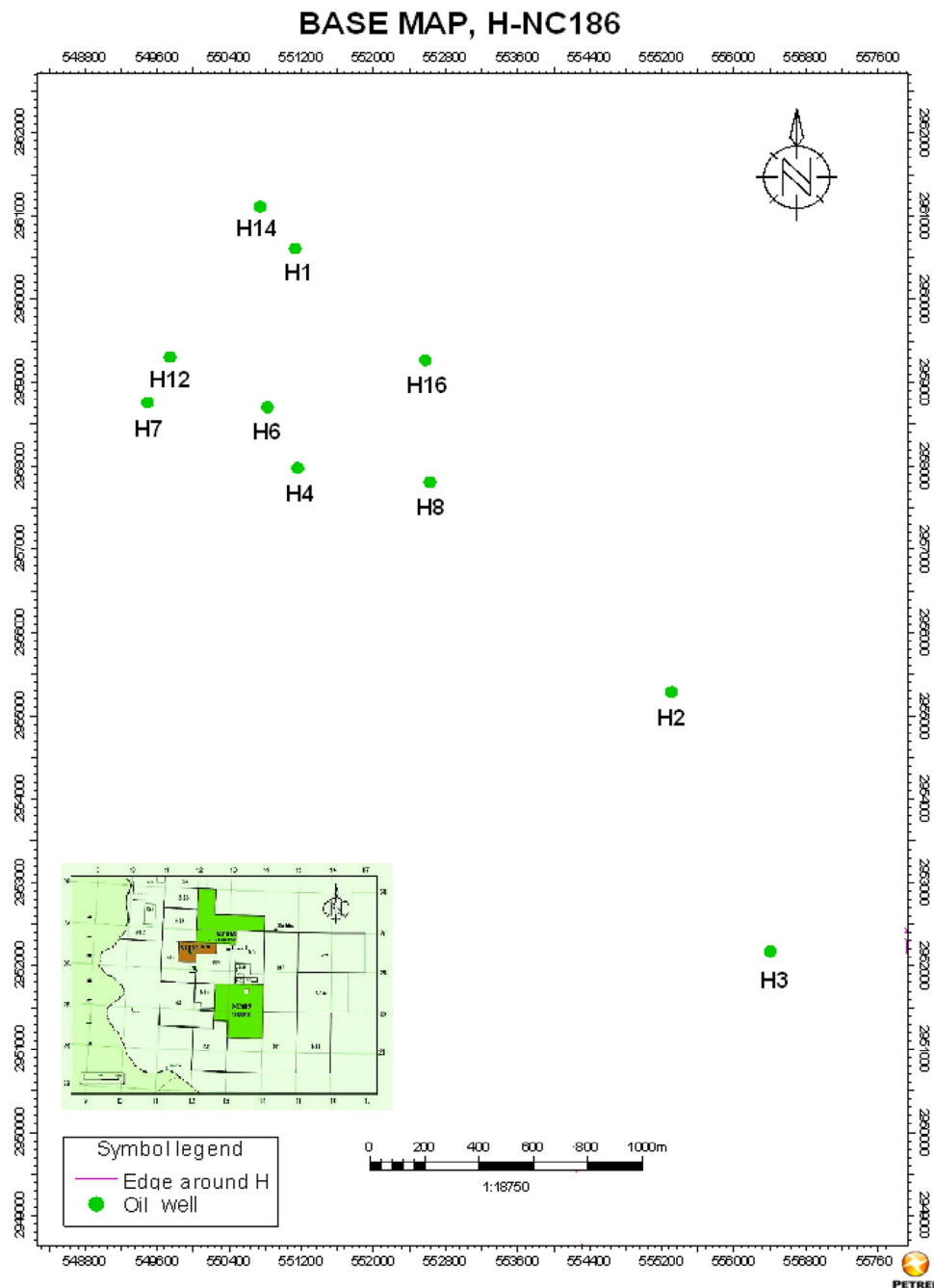
## 1. Introduction

The area of study is located in Murzuq Basin and covers a huge area extending southward into Niger [1]. This area is one of the Murzuq oil fields and it is called H field. It is located in concession NC186 that was encountered by several exploratory and development wells, distributed on the northwestern flank of Murzuq Basin, southwestern part of Libya (Fig. 1). It has been affected by the structural and tectonic movements of Murzuq Basin and created paleo-high during the post-Hawaz erosional events. This feature of paleo-high is clearly represented in the 2-D seismic line shown in

Fig. 2 by Repsol Oil Operation [2] represented in the area of study. On the other hand, structure contour maps have been carried out for H field and illustrates the same structural feature of paleo-high (Fig. 3). The petroleum system is represented by structural Hawaz paleo-high created during the post-Hawaz erosional event, the main regional seal is the Silurian Tanezzuft shale formation, and the basal Tanezzuft hot shale member displays also as the main source rock in the area of study. Ten exploratory wells distributed in H oil fields in concession NC186 will be the focus of this study. These wells were drilled in Hawaz reservoir of Middle Ordovician. This formation is informally subdivided into 8 horizons, named H1 to H8. Some units have been subdivided into

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**Fig. 1 – Location map of the concession 186, Murzuq Basin, Libya.**

sub-units. Each horizon is characterized by its own petrophysical parameters.

This research paper is carried out as an extension to the previous studies [3] to analyze the petrophysical characteristics of Hawaz formation in H oil field, but here it will be focusing mainly on the quick look analysis of log curves and plotting crossplots between the petrophysical parameters and then compare the results with core data. The following data have been taken to achieve the objectives of this research: The geological data are represented by composite logs. The well logging data comprise resistivity, sonic, neutron, density, spontaneous potential, caliper, gamma ray and natural gamma ray spectrometry logs. These data have been taken from Repsol Oil

Operation [2], where the core data are represented by an internal report.

## 2. Geologic background

Murzuq Basin is one of the most significant basins in South-western Libya. This basin has a triangular shape and extended toward the border of south from Libya with Niger. The sedimentary fill is predominately Paleozoic in age, while the Mesozoic and Cenozoic sediments are also represented and located above the Precambrian crystalline basement (Fig. 4).

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