

Compatibility between the Fracture Trends of Subsurface Sarah Formation, Rub' Al-Khali Basin with the Fracture Trends Associated with Sanamah Formation Outcrop, Southwest Saudi Arabia

Mohammed Benaafi¹ and Mustafa Hariri¹

¹Geosciences Department, College of Petroleum Engineering & Geosciences, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

ABSTRACT

The Late Ordovician clastic Sanamah Formation of Wajid Group in outcrop and its equivalent subsurface Sarah Formation are both tight gas reservoir in the subsurface, Rub' Al-Khali Basin. The Sanamah Formation outcrop, SW Saudi Arabia is mainly glacial to glaciofluvial siliciclastic, and it displays a similarity with Sarah Formation in Rub' Al-Khali Basin in term of rock type and depositional setting. A subsurface study on the reservoir completion and fracture simulation conducted on Sarah Formation by Bu-Khamseen et al. (2010) indicated that the Sarah Formation is a naturally fractured reservoir with dominant fracture trends of NE-SW, NW-SE, E-W, NNW-SSE and WNW-ESE. Those trends were calculated from the azimuthal dips interpreted from image logs. Fracture trends of Sanamah Formation in outcrop were obtained using Spot-5 satellite image with 2.5-m resolution and direct outcrop measurement. This study showed that the dominant fracture trends within the Sanamah Formation are NW-SE, N-S, NNW-SSE, NNE-SSW, NE-SW, and E-W, and ENE-WSW. The fracture trends of Sanamah Formation in outcrop are compatible with the fracture trends determined in subsurface Sarah Formation. This similarity may reveal the same regional stress regime which is probably related to the basement tectonics. This study showed that the Sanamah Formation outcrop can be used as an analogue to characterize and model fracture systems in Sarah Formation of the Rub' Al-Khali Basin. Additionally, the results and information obtained from a study conducted on fracture systems of Sanamah Formation will help to enhance gas exploration and production from subsurface Sarah reservoir in Rub' Al-Khali Basin and as a guide for other areas of similar rock types, age and fracture trends in the region.