

Reply to “Comment on Aptian faulting in the Haushi-Huqf Oman” by M. Fournier, P. Razin, O. Fabbri and J.P. Breton

Christian Montenat (c.montenat@igal.fr), Pascal Barrier (p.barrier@igal.fr) and
Henry Jean Soudet (henri.soudet@total.com)

In reply to the comment by M. Fournier et al. (2005) relating to our paper “Aptian faulting in the Haushi-Huqf (Oman)” we note the following points.

- (1) The faulted Qishn limestones are not merely composed of grainstone. They comprise a number of levels which include a notable part of micritic matrix. As previously stated, the study of microfacies indicate an inner-shelf environment, related to a protected bay head, probably a backshoal area. Such deposits might have been incompletely lithified when faulting occurred.
- (2) There are many and clear evidences of soft-sediment deformations. The structures observed are typical and commonly present as a result of syndiagenetic faulting: numerous small scissor faults, hydroplastic faults, collapse of parts of fault scarps, etc.
- (3) Fragments of dismembered beds show evidence of soft deformation (stretched and twisted blocks). Of course, these features cannot be tacked with the result of weathering. In our opinion, the features we described (our p. 651-652 and Figures 9 and 10) were not misinterpreted. As is often observed in such cases, the type of deformation changes from the surface (soft) to a deeper part (more lithified) (our Figure 10).
- (4) Most of the fault-scarp breccias are sedimentary breccias, including a highly visible matrix. Striated, calcite growths are little developed or absent. Such breccias are clearly distinguishable from the nodular facies of some Qishn limestone beds.
- (5) It is noteworthy that these fault-scarp breccias do not show any evidence of tectonic crushing or shearing. Under the microscope numerous thin sections of breccia fragments we prepared do not show the slightest mark of brittle deformation and associated calcite veins. This is generally what is observed in the case of syndiagenetic faulting.
- (6) It is a fact that the ferruginous crusts, on the top surface of the Qishn limestone, and on the fault scarps are diversely developed. This is often the case for submarine fault scarps resulting from syndepositional faulting (for instance, Early Cretaceous faulting of the Subalpine domain): they are covered originally with discontinuous and irregularly developed ferruginous crust.
- (7) It is gratuitous to assume that the syndiagenetic fault-scarps “would not have resisted to post-Qishn Formation emersion”. Moreover, as we pointed out, in the discussed area the manifestation and amplitude of the post-Qishn erosion are not clearly established, far from it. As usually observed, the syndepositional faults have different subsequent evolutions. The small fractures (metric scale) remain with undisturbed features, while the large faults may have been more or less strongly reactivated and integrated in the recent structural pattern. In any case, various typical and confident criteria (which are commonly used in many studies related to syndepositional faults) attest the fact that a syndiagenetic episode of faulting affected the Qishn limestones. It has also been noted that the observed syndepositional fault have limited throws (several metres at the most).

REFERENCES

- Bertotti, G., A. Immenhauser and J.K.T. Koppen 2005. Stratigraphic and regional distribution of fractures in Barremian-Aptian carbonate rocks of Eastern Oman: outcrop data and their extrapolation to Interior Oman hydrocarbon reservoirs. *International Journal of Earth Sciences*. v. 94, no. 3, p. 447-461.
- Fournier, M., P. Razin, O. Fabbri, and J.-P. Breton 2005. Comment on “Aptian faulting in the Haushi-Huqf (Oman) and the tectonic evolution of the southeast Arabian platform-margin” (*GeoArabia*, 2003, v.8, no.4, p. 643-662) by C. Montenat, P.Barrier and H.J. Soudet. *GeoArabia*, v.10, no. 4, p.191-198.
- Immenhauser, A., H. Hillgärtner, U. Sattler, G. Bertotti, P. Schoepfer, P. Homewood, V. Vahrenkamp, T. Steuber, J.-P. Masse, H. Droste, J. Taal-van Koppen, B. van der Kooij, E. van Bentum, K. Verwer, E.H. Strating, W. Swinkels, J. Peters, I. Immenhauser-Potthast and S. Al Maskery 2004. Barremian-lower Aptian Qishn Formation, Haushi-Huqf area, Oman: a new outcrop analogue for the Kharaiib/Shu'aiba reservoirs. *GeoArabia*, v. 9, no. 1, p. 153-194.
- Montenat, C. and P. Barrier 2002. Fracturation d'âge Aptien supérieur sur la bordure orientale de la plate-forme arabique (Haushi-Huqf, Oman). *C.R. Geosciences*, 334, p. 781-787.
- Montenat, C., P. Barrier and H.J. Soudet 2003. Aptian faulting in the Haushi-Huqf (Oman) and the tectonic evolution of the southeast Arabian platform-margin. *GeoArabia*, v. 8, no. 4, p. 643-662.