Accepted Manuscript

Genesis of natural hydraulic fractures as an indicator of basin inversion

Qingfeng Meng, John Hooker, Joe Cartwright

PII: S0191-8141(17)30135-9

DOI: 10.1016/j.jsg.2017.07.001

Reference: SG 3497

To appear in: *Journal of Structural Geology*

Received Date: 13 February 2017

Revised Date: 28 June 2017

Accepted Date: 3 July 2017

Please cite this article as: Meng, Q., Hooker, J., Cartwright, J., Genesis of natural hydraulic fractures as an indicator of basin inversion, *Journal of Structural Geology* (2017), doi: 10.1016/j.jsg.2017.07.001.

Genesis of natural hydraulic fractures as an indicator of basin inversion

Qingfeng Meng, John Hooker, and Joe Cartwright

Department of Earth Sciences, University of Oxford, South Parks Road, Oxford, OX1 3AN, UK

meng.qingfeng@hotmail.com

ABSTRACT

Satin spar (fibrous gypsum) veins, which occur in evaporite basins worldwide, provide significant insights into host rock deformation and fluid flow, although the genetic mechanism remains obscure. Satin spar veins in the red marls of the Triassic Mercia Mudstone of the Bristol Channel Basin were characterized in the context of regional and local setting. The vein network in the Keuper Marl (lower Mercia) exhibits a lack of systematic cross-cutting between three distinct vein sets. Two sets of veins are observed in the overlying Tea Green Marl, with one set clearly crossing the other. The gypsum veins commonly contain a blocky median zone of multiple thin bands of host−rock inclusions and alabastrine gypsum crystals, exhibiting crack-seal patterns. Fibrous zones on either side of the median zone consist of pure parallel-aligned gypsum fibres that are oblique to vein walls, indicating a hybrid shear-extensional mode of vein widening. Veins developed within reverse-reactivated faults contain fibre lineations in the median zones and also on vein surfaces, suggesting a minimum of two phases of fault slip. The veins are interpreted to have formed as a result of overpressure in the low-permeability mudstones by tectonic compression during basin inversion, giving rise to the median zone.