

Fractured Carbonates

Facies and Fracture Analogs for Reservoir Characterisation



*A training course in Catalonia
presented by Geoplay Pyrenees Ltd and GeoScience Ltd*



Course Objectives

Carbonate reservoirs are a (major) subset of 'fractured reservoirs'

- *highly heterogeneous both in depositional / diagenetic sense and*
- *in fractureswith many potential uncertainties*

→ To lay the geological 'foundation' :

fracture types, origins, scales, connectivity
fracture 'drivers' (controls on distributions)

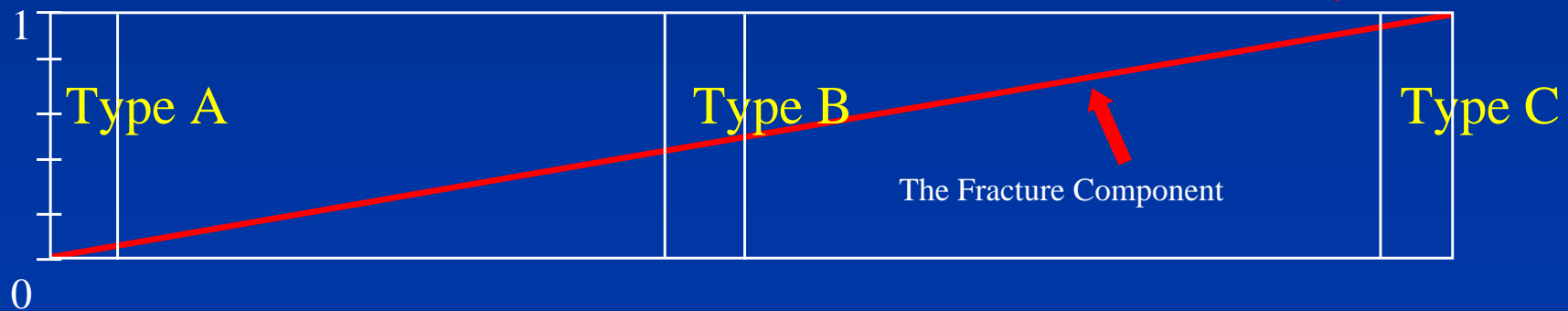
→ To illustrate and discuss issues using the outcrop

→ And relate to reservoir characterisation of hydrocarbon fields (case histories)



Fractured Reservoir Types

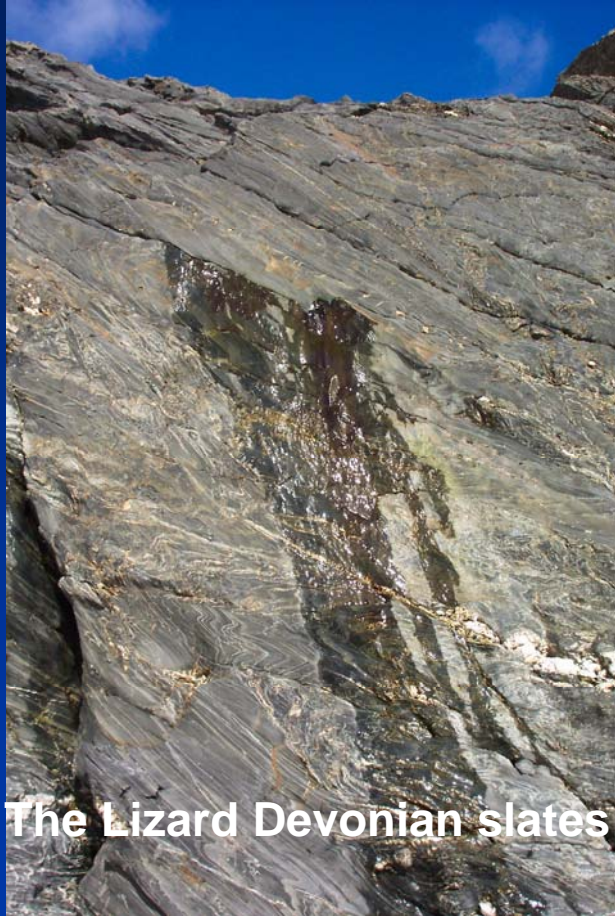
Vuggy joint in Ordovician Sandstone,
Algeria (matrix $k \sim 0.1$ mD)



Geology in Fractured Reservoirs : Key Issues

- The challenge is to map reservoir heterogeneity especially porosity and effective permeability
 - * In carbonates: matrix and fracture components interacting
- What is the porosity ? type(s), quantity, controls
- Where is it ? predict the 3D distribution (*The Holy Grail*)
- How does it work ? Evaluate **connectivity** and dynamic behaviour (eg anisotropy) using fracture models, simulations

Connectivity: Fracture Network 'plumbing'



The Lizard Devonian slates



Orkney Eday Marls (ORS)

Flow is channelised, but
connected

Stress, Fractures, Fluid Flow are Intimately Associated (dynamic behaviour)

Jurassic
micrite
Somerset UK



FRC Data : Scales of Observation

