

Comparison of laminitite fracture features at different scales

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INTRODUCTION

Laminites (NE Brazil) are well laminated carbonates that provide insight into the geo-mechanical behaviour of layered systems, especially when comparing deformation characteristics observed in the laboratory with outcrop / field scale deformations.

This is useful in order to

- validate where laboratory experiments can reproduce field scale deformation types
- understand which feature characteristics can or cannot be scaled

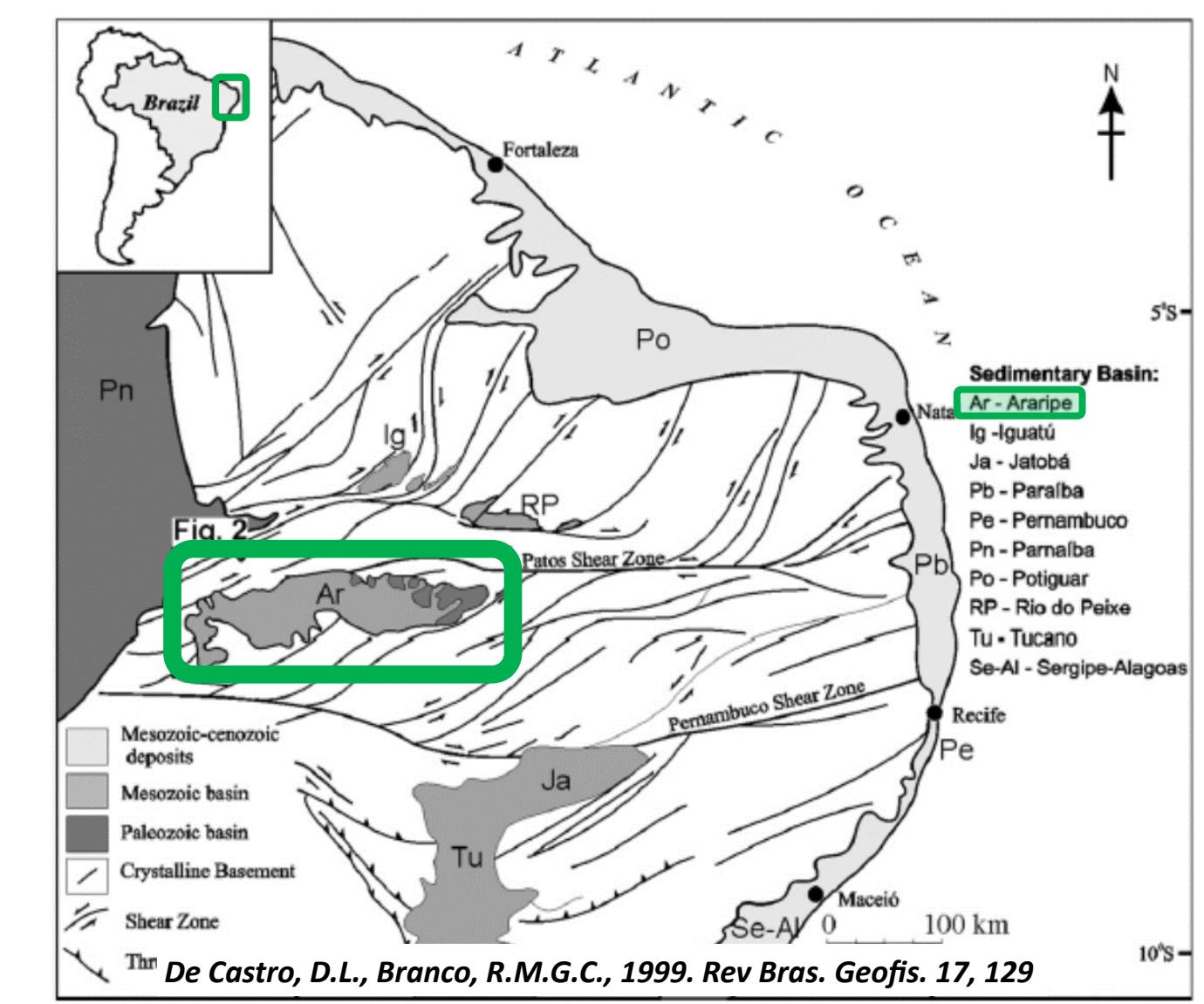


Fig 1: Map of NE Brazil showing the Araripe

LABORATORY DEFORMATION EXPERIMENTS



Fig 2: Crato Formation laminitite (crystal size ~10µm, horizontal ~mm laminae)
A: Sample from Araripe Basin NE Brazil
B: Sampled core plugs for triaxial deformation

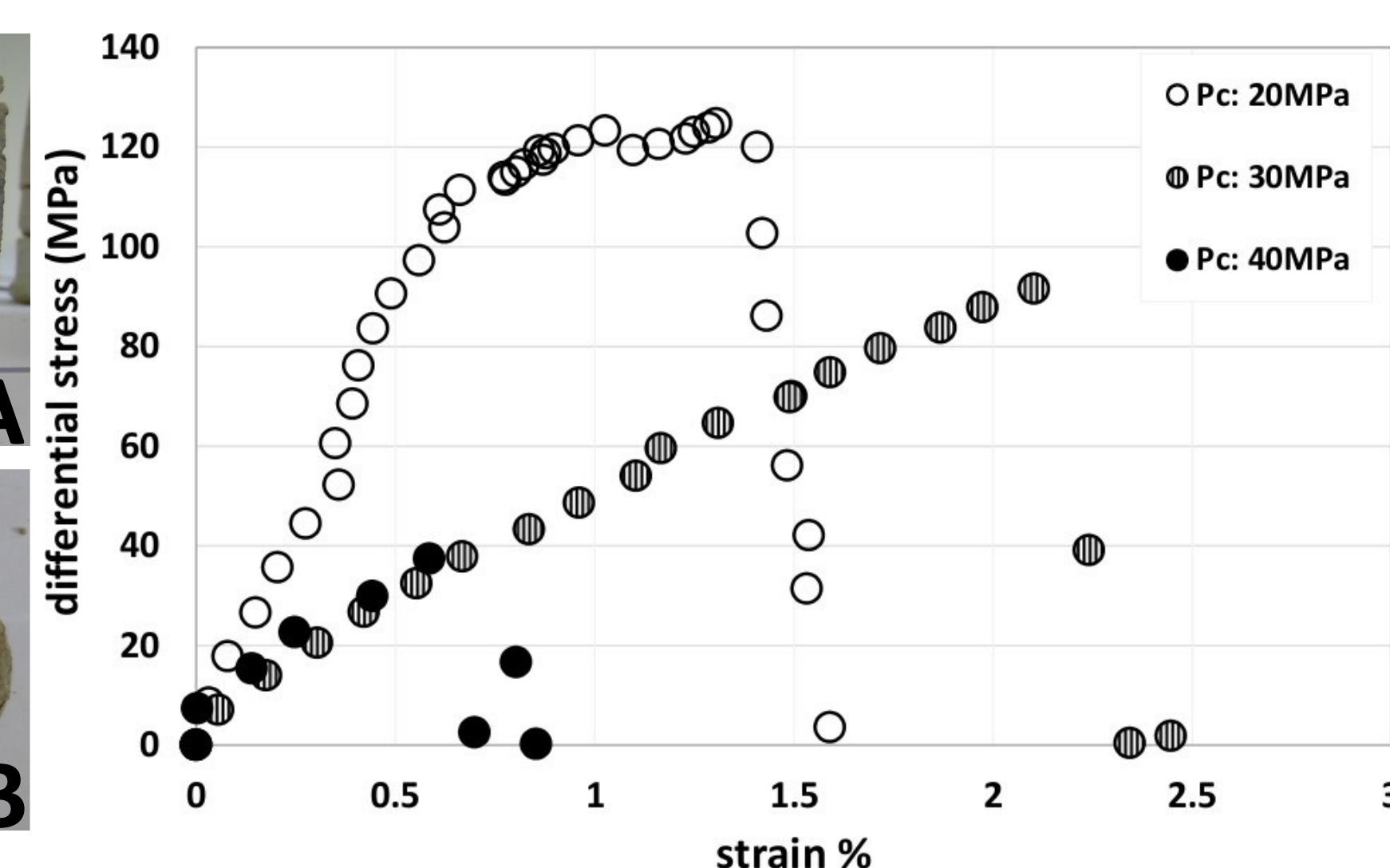


Fig 3: Stress-strain curve for laminitite triaxial deformation experiments

Triaxial deformation under dry conditions & three different confining pressures - simulating reservoir conditions

OUTCROP OBSERVATIONS

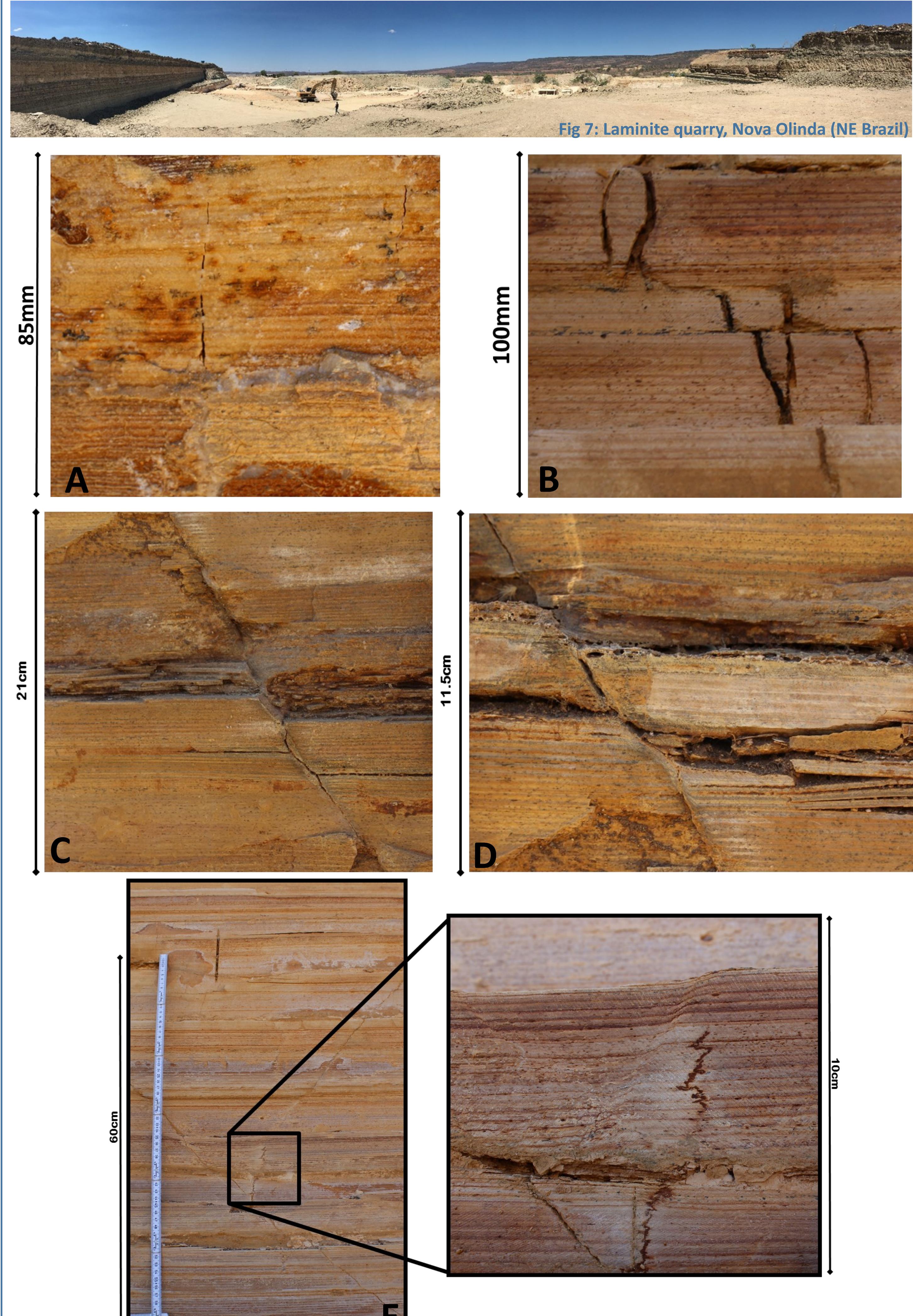


Fig 7: Laminitite quarry, Nova Olinda (NE Brazil)

POST-DEFORMATION OBSERVATIONS

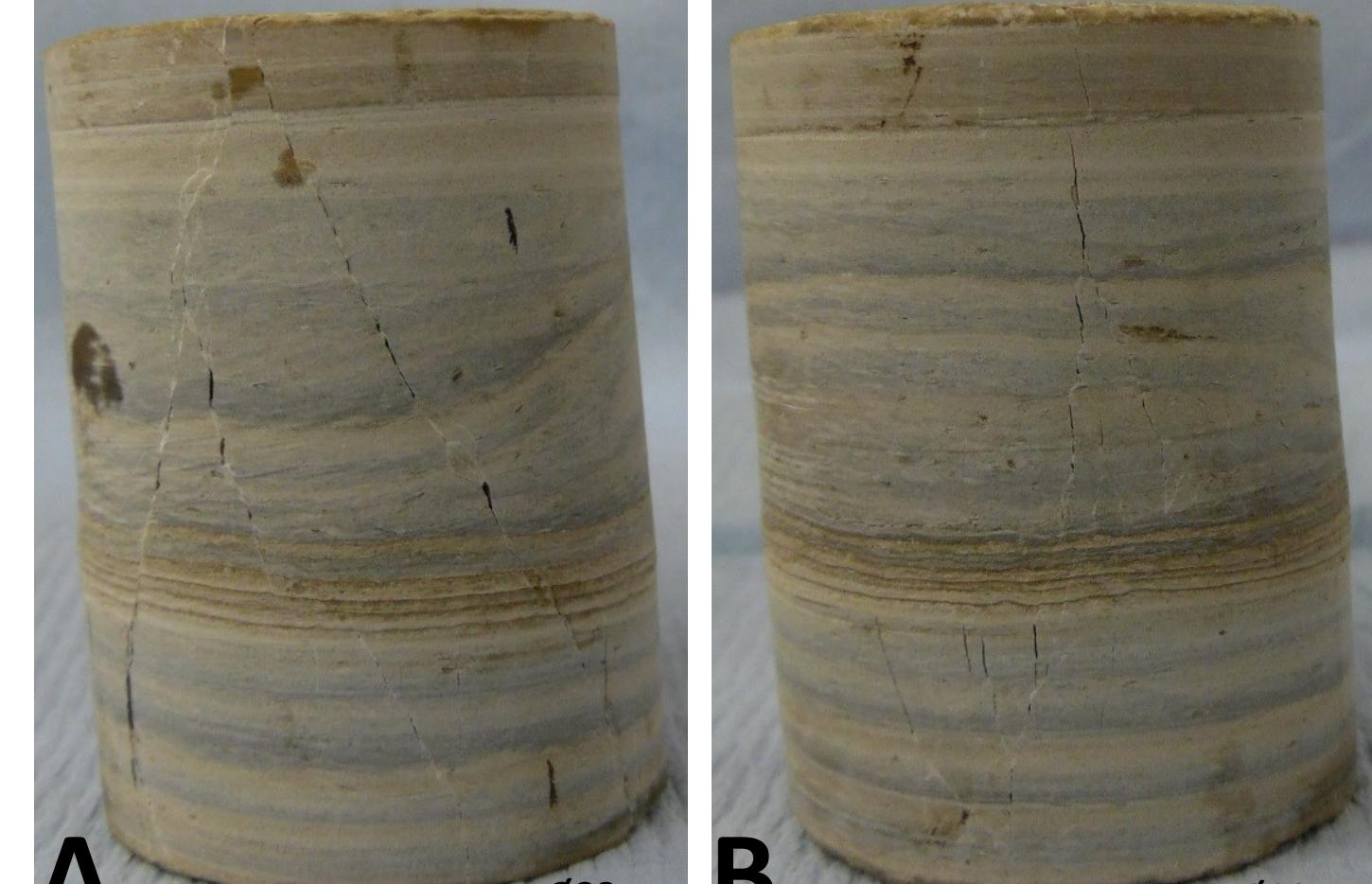


Fig 4: Post-deformation core plugs deformed at P_c: 20MPa (A) and P_c: 30MPa (B)



Fig 5: Schematic surface core plug deformation for core plugs A and B Fig 4. (Plugs Ø 38mm)

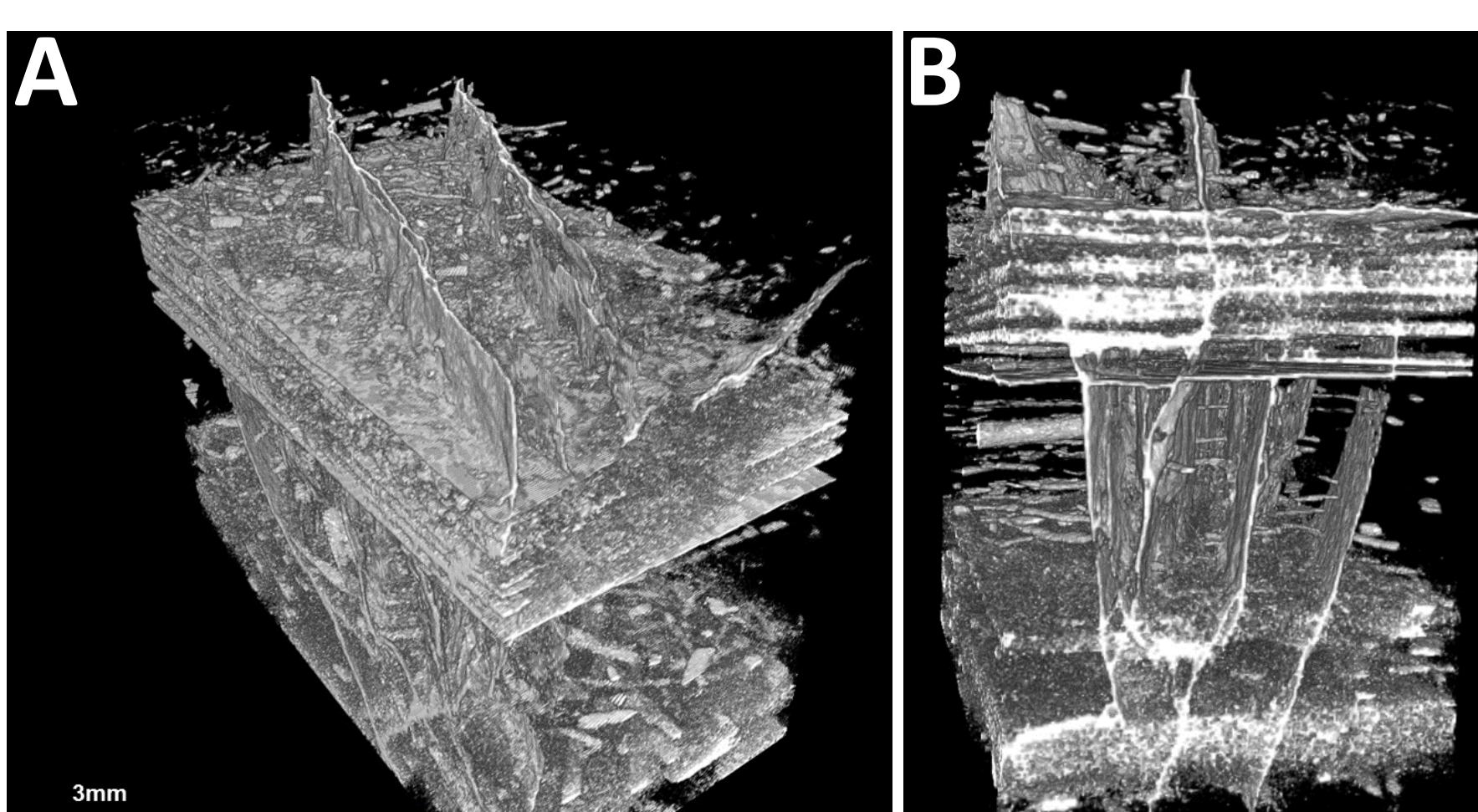


Fig 6 A & B: 3D reconstruction of post-deformation core plug (P_c:30MPa) using X-ray tomographs

Observe a combination of

- ⇒ Now-open fractures
- ⇒ Shear fractures
- ⇒ Across lamination
- ⇒ Parallel to lamination

CONCLUSIONS

Comparison of laminitite fracture characteristics shows similarities between lab-induced deformation features & deformations observed in outcrop. This suggests that the response to accommodate strain in these laminitites is scale independent. If we consider laminitites as analogues for layered systems this could mean that layered systems - independent of rock type - might have a similar scale independent response to accommodate strain.

Further investigation is required into the relationships between different fracture types and their evolution under changing strain conditions during deformation.