

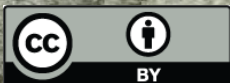


# Dyke segmentation: an experimental approach

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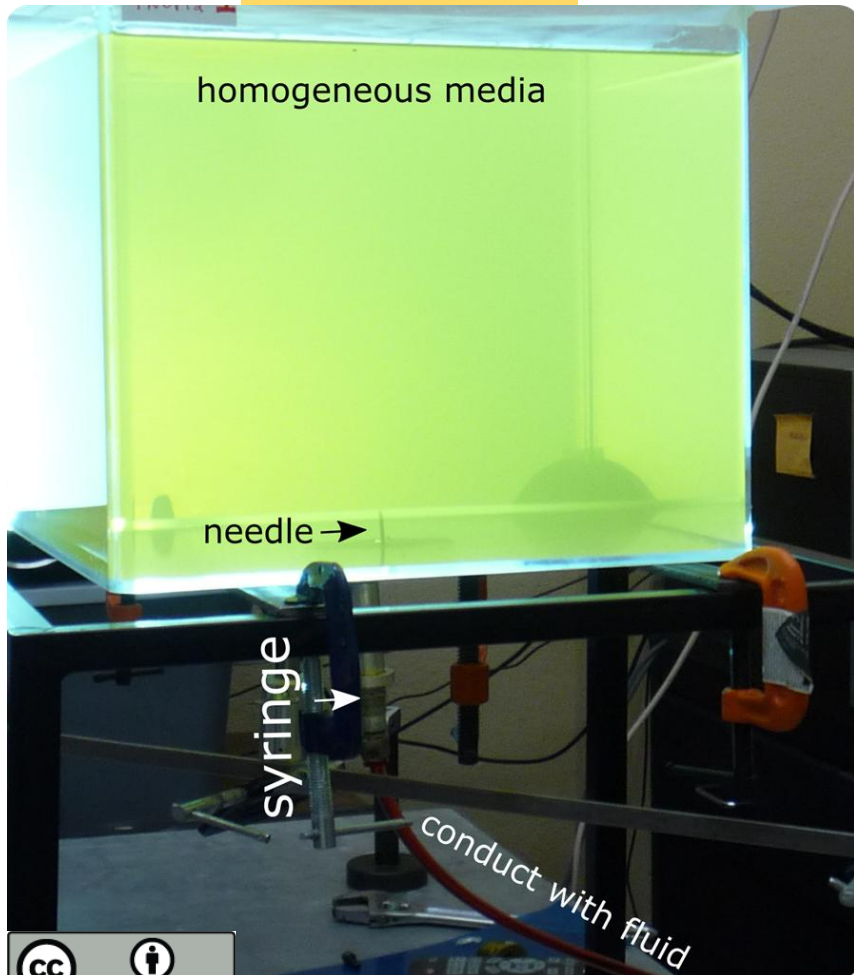
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Dykes often emplace as individual, symmetric and planar structures, although they can also split into segments. Dyke segmentation have been associated with pre-existing structures (Magee et al., 2019), mixed-mode I+III loading (Pollard et al., 1982) and instabilities of dyke growth process as fluidization (Schofield et al., 2010).

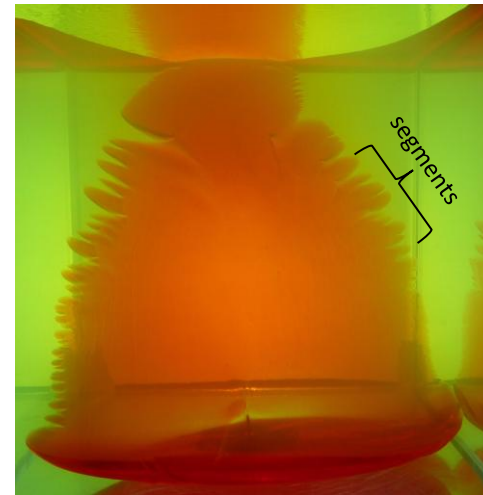


- Results of an experimental study of fluid injection in gelatin where we observe segmentation of the fractures transporting shear thinning fluids in the absence of stress rotation and heterogeneity of the host media.
- Hydrofractures transporting Newtonian fluid at the same conditions remain planar until its eruption at the surface.

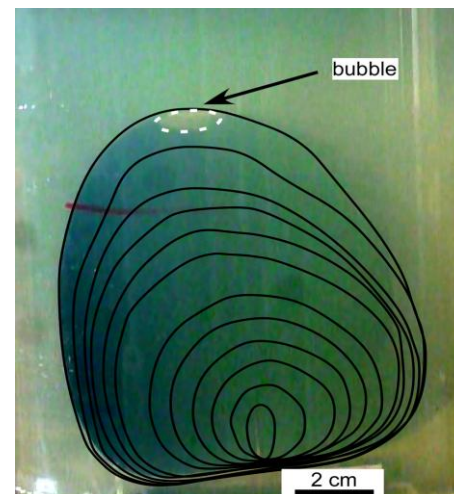
Experimental setup



Analogue dykes after propagation



Injection of a Non-Newtonian (shear thinning) fluid. Square box container.



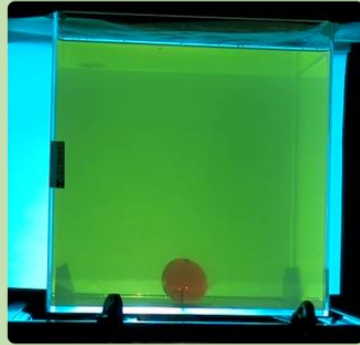
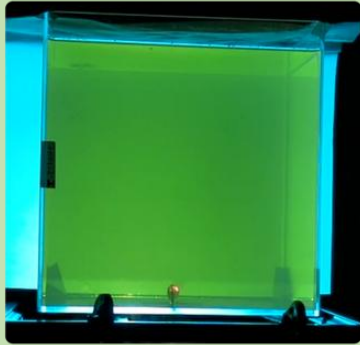
Injection of a Newtonian fluid. Cylindrical container.

## Remarks

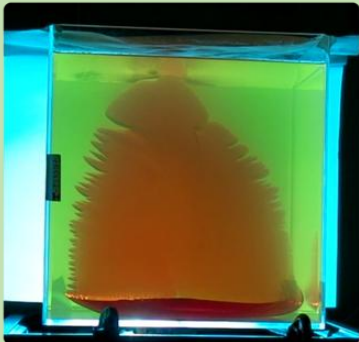
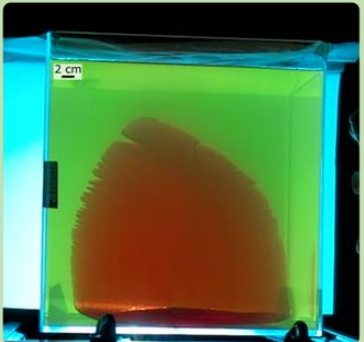
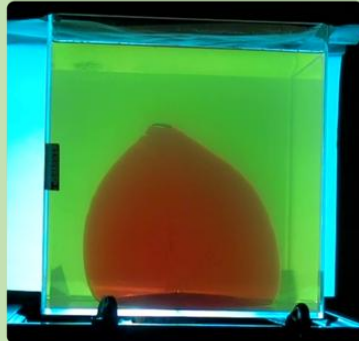
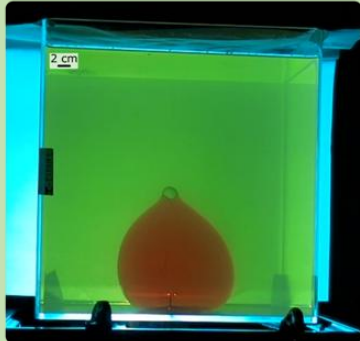
a) no-Newtonian dykes development phases:

Inception

Development of a semi-stable coin-shape structure



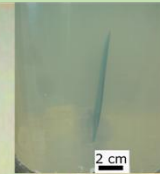
Growth in the vertical direction and associated deflection of the dike trajectory



b) The shape of the non-Newtonian dykes during the *development phase* is significantly smaller than the Newtonian dykes at the same injected volume.

Newtonian fluid

$V=8.08 \text{ cm}^3$



profile view

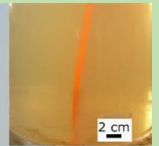
frontal tip

lateral tip

2 cm

no-Newtonian fluid

$V=25.84 \text{ cm}^3$



profile view

frontal tip

lateral tip

2 cm

### BIBLIOGRAPHY

**Chavez-Alvarez, M.J.**, Cerca, M. and Bustos-Cervantes, N. 2020. Contrasting emplacement modes of Newtonian and shear thinning fluids in gelatin fractures and their implications for igneous sheet intrusions. Submitted.

**Magee, C**, Muirhead, J, Schofield, N, Walker, R J, Galland, O, Holford, S, Spacapan, J, Jackson, C A-L & McCarthy, 2019, Journal of Structural Geology, vol. 125, pp. 148-154.

**Pollard, D.D.**, Segall, P., Delaney, P.T., 1982. Geol. Soc. Am. Bull. 93, 1291–1303.

**Pollard, D.D.**, Segall, P., 1987. In: Atkinson, B.K. (Ed.), Fracture Mechanics of Rock. Academic Press, London, pp. 277-349.

**Schofield, N.**, Stevenson, C., Reston, T., 2010. Geology 38, 63–66.

### SUPPLEMENTARY MATERIAL

**Chavez-Alvarez, M.J.**, Cerca, M., (2020), “Dyke segmentation: an experimental approach.”, Mendeley Data, V1, doi: 10.17632/h758kwj57x.1