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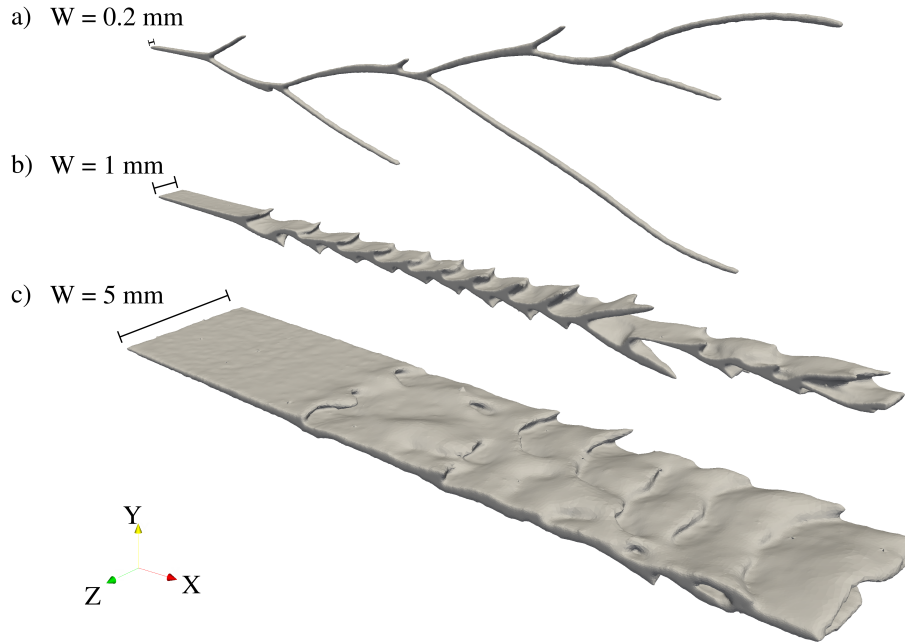
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Microbranching instability using a variational phase-field model

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Many aspects of the microbranching instability [1] are not fully understood such as the difference of crack patterns observed in PMMA on one hand and glass or brittle gels on the other hand [2]. In this work, we simulate the microbranching instability of fast propagating cracks using a variational phase-field approach and show that three-dimensional effects are fundamental for understanding the origin of this instability.

In particular, following on a previous work regarding the branching mechanism in 2D phase-field simulations [3], we show that microbranching does not occur in 2D simulations or for very thin 3D samples and that different microbranching regimes are obtained when increasing the sample thickness, ranging from translationally invariant across the thickness and quasi-periodic patterns to localized microbranching events driven by complex 3D dynamics (cf. Figure). We further show that the transition between these different

regimes is controlled by the value of the regularization length scale inherent to the phase-field modelling of brittle fracture.

References

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