Supplementary material

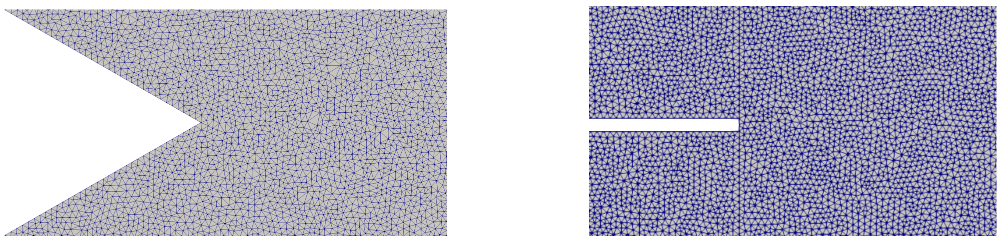


Figure S1: Typical spatial discretizations used in the problems of crack nucleation (left: mesh size $\delta = 0.005$, number of elements = 119778, number of nodes = 60028) and propagation (right: mesh size $\delta = 0.1$, number of elements = 2940678, number of nodes = 1473158). Figures show only a zoom of the mesh around the notch angle (left) and the pre-crack (right). Triangular elements are randomly and uniformly distributed.

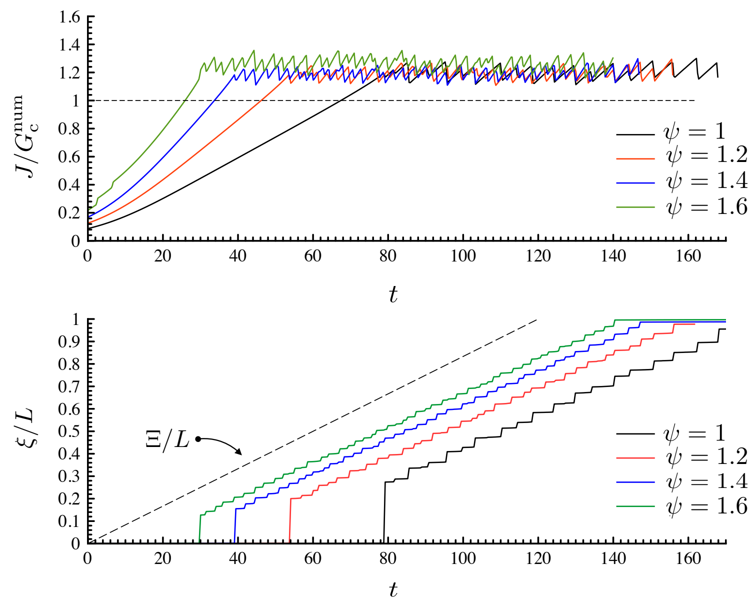
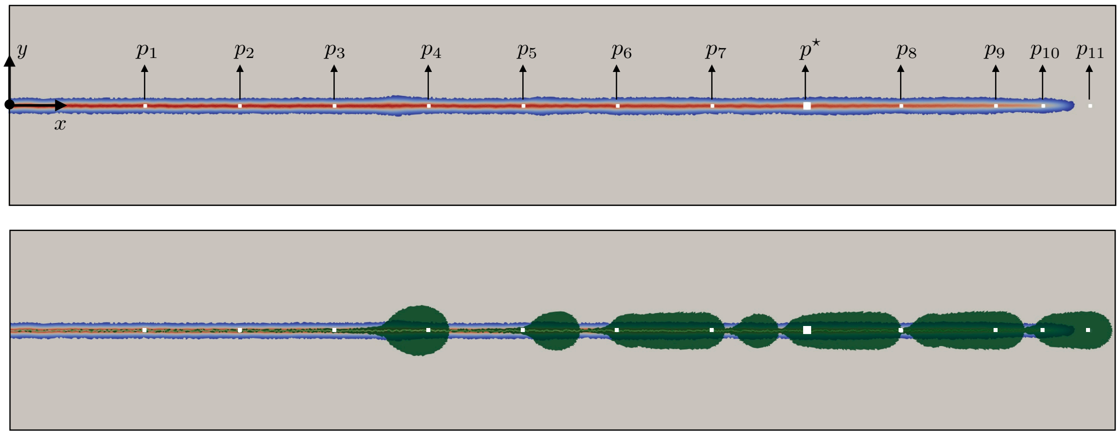


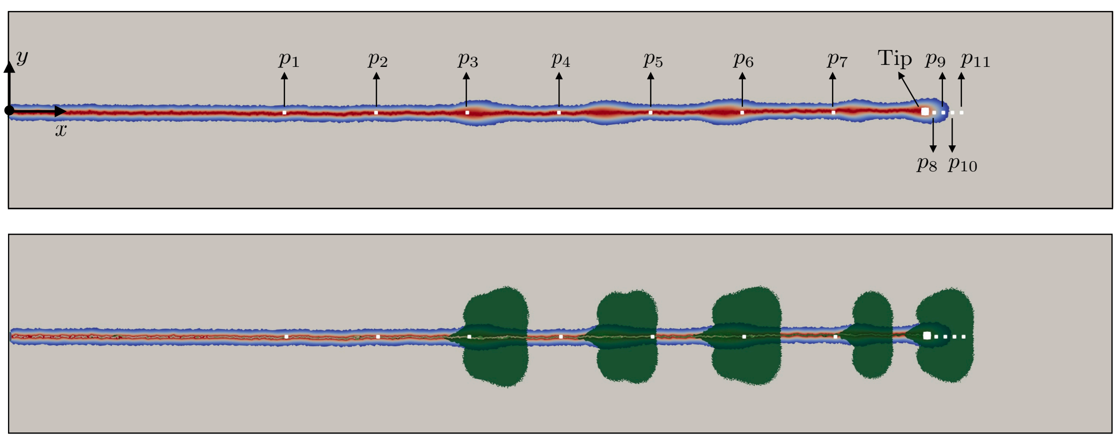
Figure S2: Crack propagation in plane strain conditions. J-integral and crack length ξ as a function of the time parameter t. Influence of the magnitude ψ of the applied opening displacement in Eq. (15).



Points coordinates:

$p^\star = (x_{p^\star}, y_{p^\star}) \equiv (21.884, -0.008961)$	$p_3 = (0.5\,x_{p^\star}, 0)$	$p_6 = (0.8\,x_{p^\star}, 0)$	$p_9 = (1.2\,x_{p^\star}, 0)$
$p_1 = (0.3\,x_{p^\star}, 0)$	$p_4 = (0.6\,x_{p^\star}, 0)$	$p_7 = (0.9\,x_{p^\star}, 0)$	$p_{10} = (1.25\,x_{p^\star}, 0)$
$p_2 = (0.4\,x_{p^\star}, 0)$	$p_5 = (0.7\,x_{p^\star}, 0)$	$p_8 = (1.1\,x_{p^\star}, 0)$	$p_{11} = (1.3\,x_{p^\star}, 0)$

(a)



Points coordinates:

$\text{Tip} = (x_{\text{tip}}, y_{\text{tip}}) \equiv (21.2797, 0.0284)$	$p_3 = (0.5\,x_{\text{tip}}, 0)$	$p_6 = (0.8\,x_{\text{tip}}, 0)$	$p_9 = (1.02\,x_{\text{tip}}, 0)$
$p_1 = (0.3\,x_{\text{tip}}, 0)$	$p_4 = (0.6\,x_{\text{tip}}, 0)$	$p_7 = (0.9\,x_{\text{tip}}, 0)$	$p_{10} = (1.03\,x_{\text{tip}}, 0)$
$p_2 = (0.4\,x_{\text{tip}}, 0)$	$p_5 = (0.7\,x_{\text{tip}}, 0)$	$p_8 = (1.01\,x_{\text{tip}}, 0)$	$p_{11} = (1.04\,x_{\text{tip}}, 0)$

(b)

Figure S3: Crack propagation for $\ell = 0.1$ in (a) plane stress (i.e., $r_{\text{y}} = 3.95$) and (b) plane strain (i.e., $r_{\text{y}} = 3.87$) conditions. Damage field and equivalent plastic strain. In both cases the time-step is set equal to 50. Material points (x, y) such that $x > x_{p^\star}$ exhibit values of damage lower than 0.9.

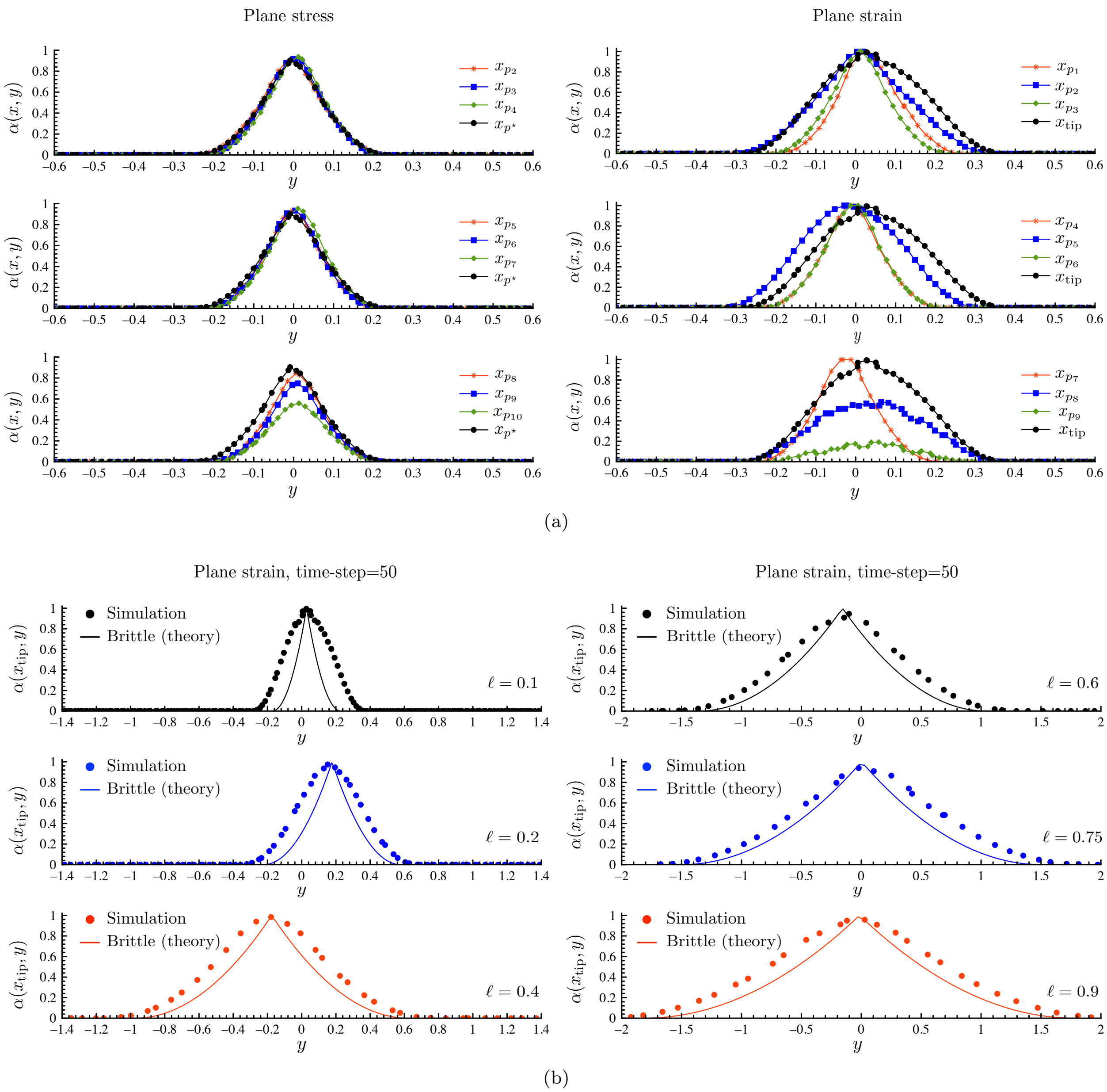


Figure S4: Fracture field (see Figs. S3 for notation): (a) profiles computed at different coordinates along the x-axis, for a time-step equal to 50; (b) comparison between theoretical (Ambrosio and Tortorelli, 1990) and numerical damage profiles, for different values of the regularization length ℓ.