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On the Mechanics of a Thin Metal and Polymer Foil Laminate

Seminar at Tetra Pak, Modena, Orationem Meam.

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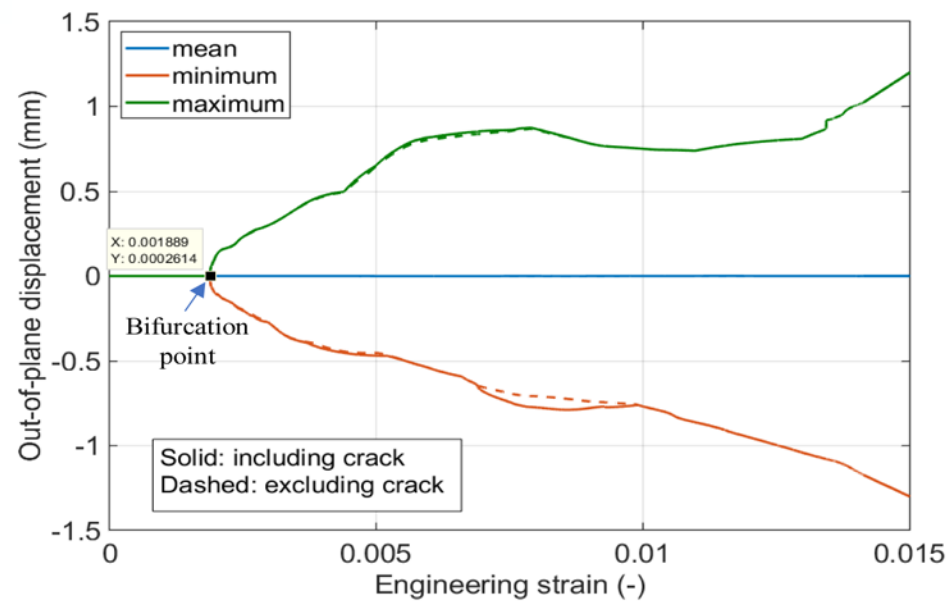
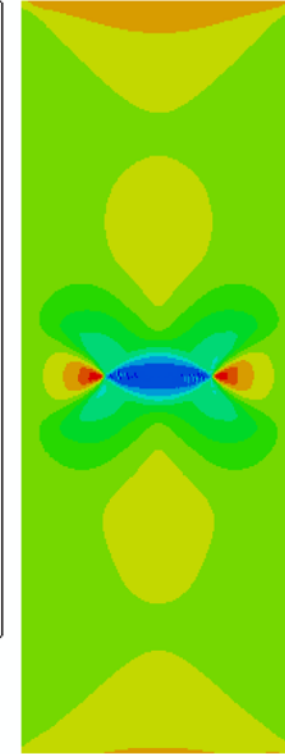
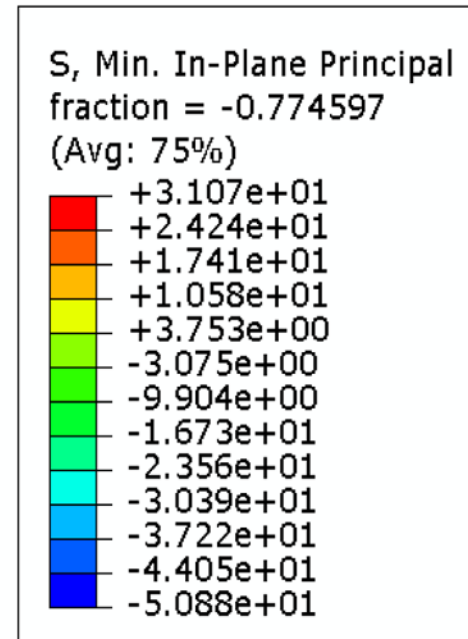
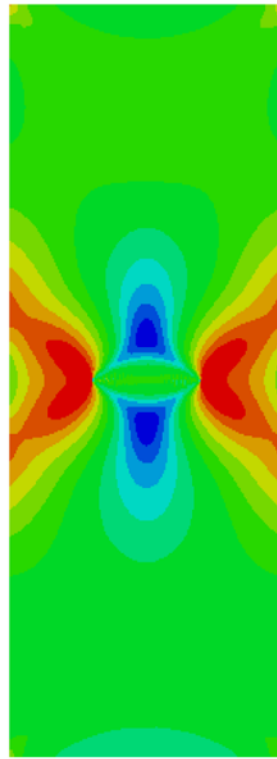
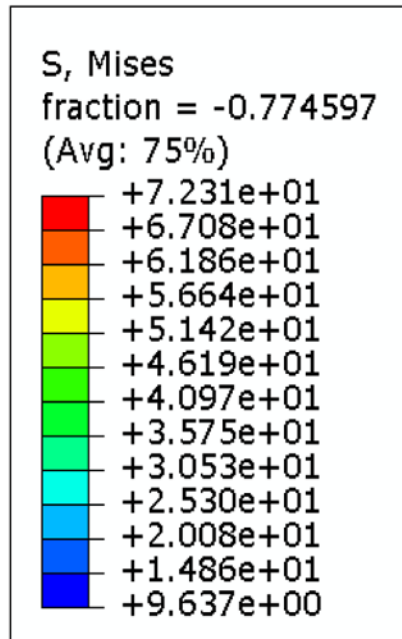
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Tetra Pak, Modena

January 25th 2019

1. buckling and reduction of energy release rate
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Mises stress and Min. principle stress at bifurcation point:



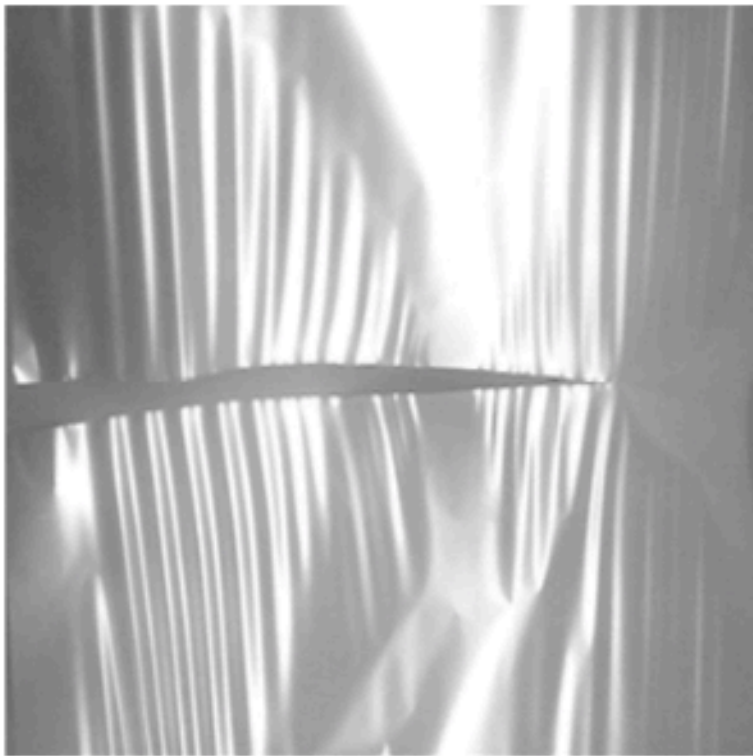


FIGURE 3. Buckling pattern

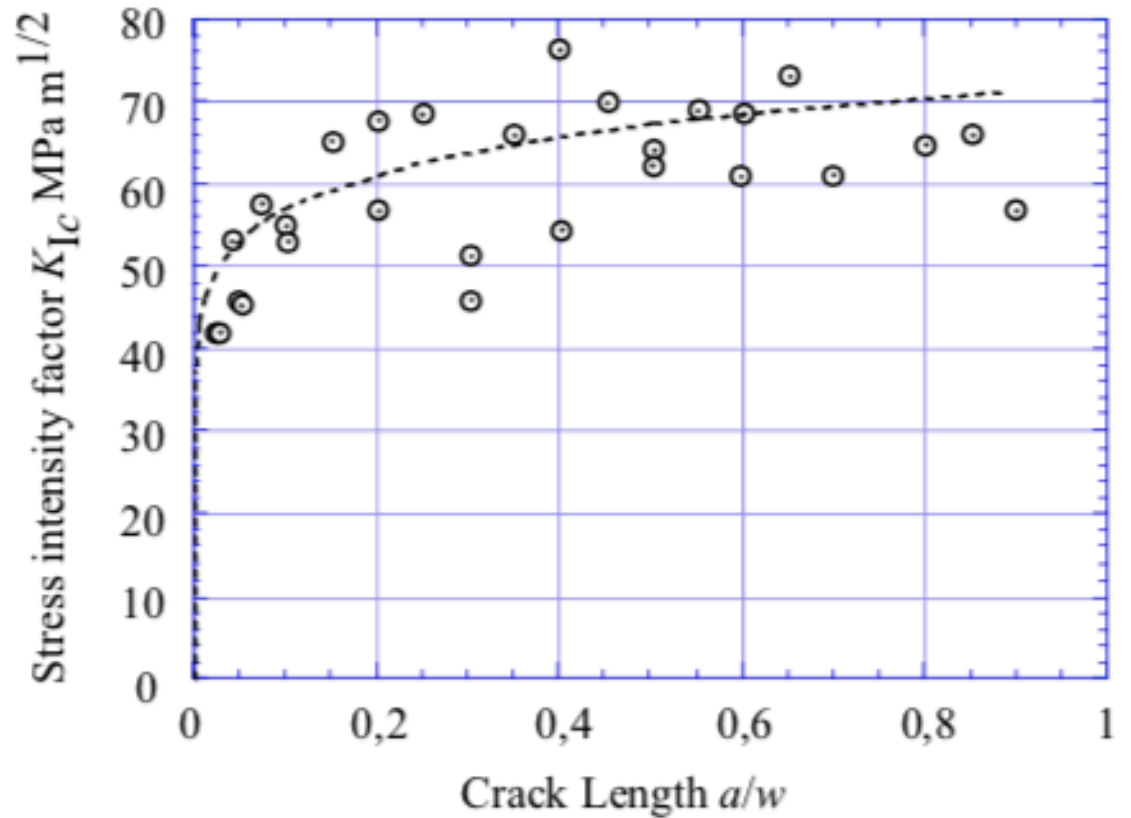
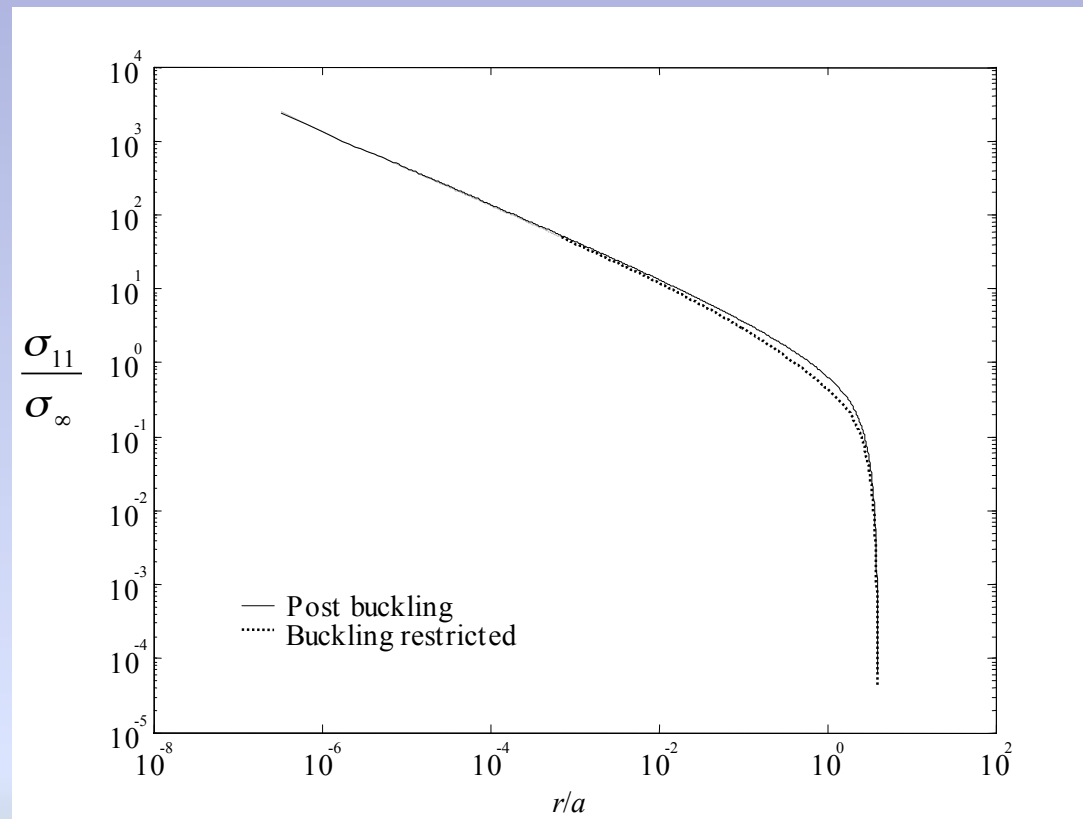
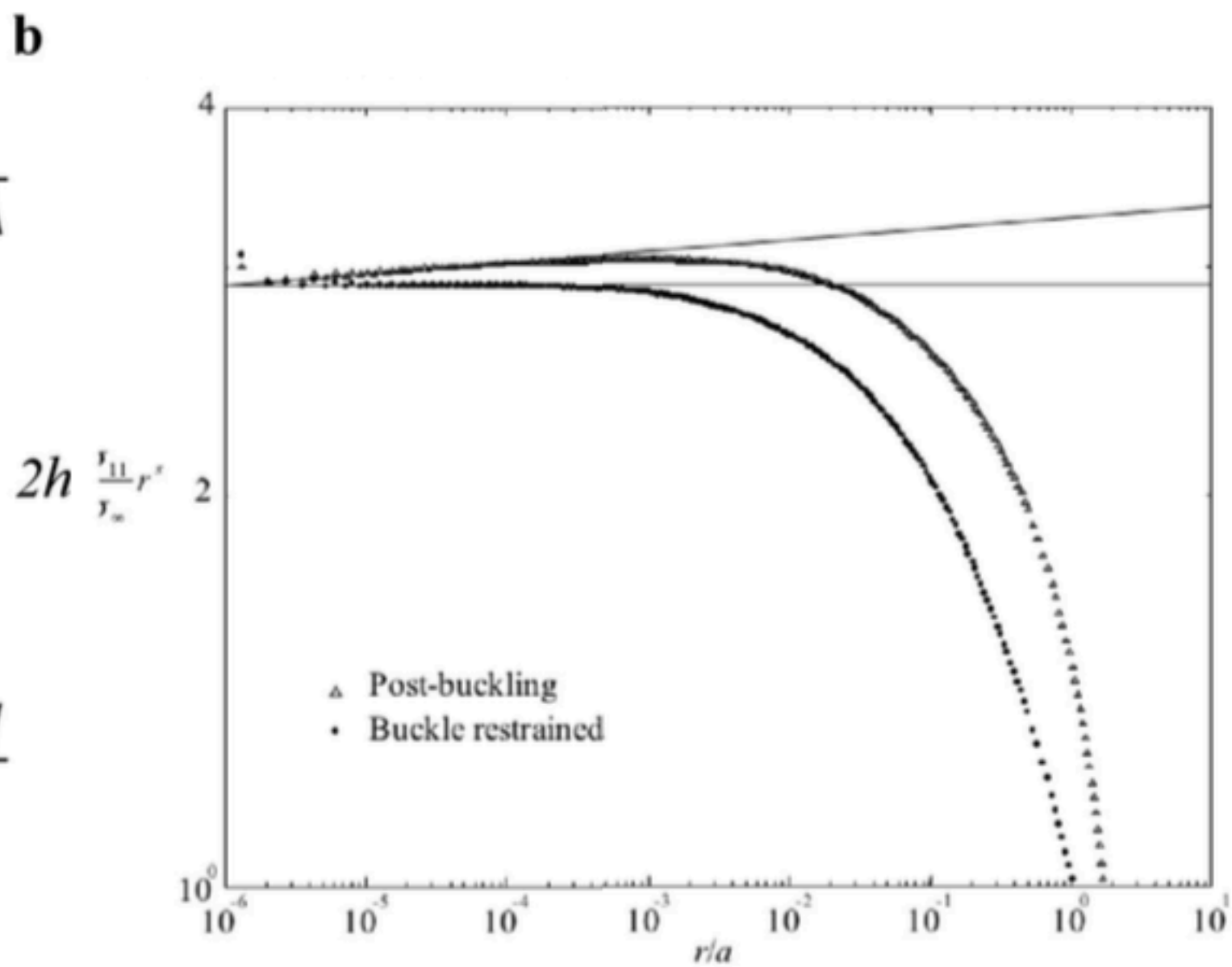
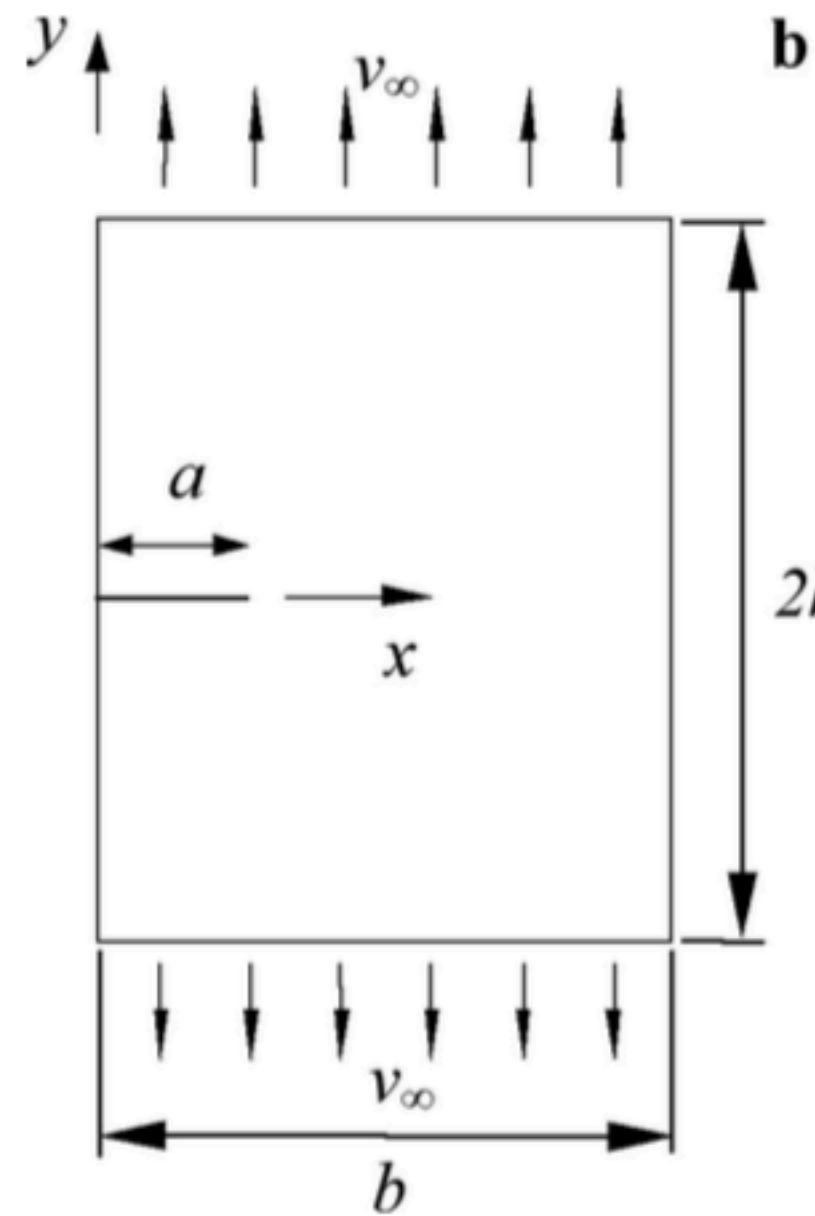


FIGURE 4. K_{Ic} results for the different tests. Dashed curve shows the theoretical result for $s = 0.4$.

- Central crack Denser case, $a/b = 0.1$



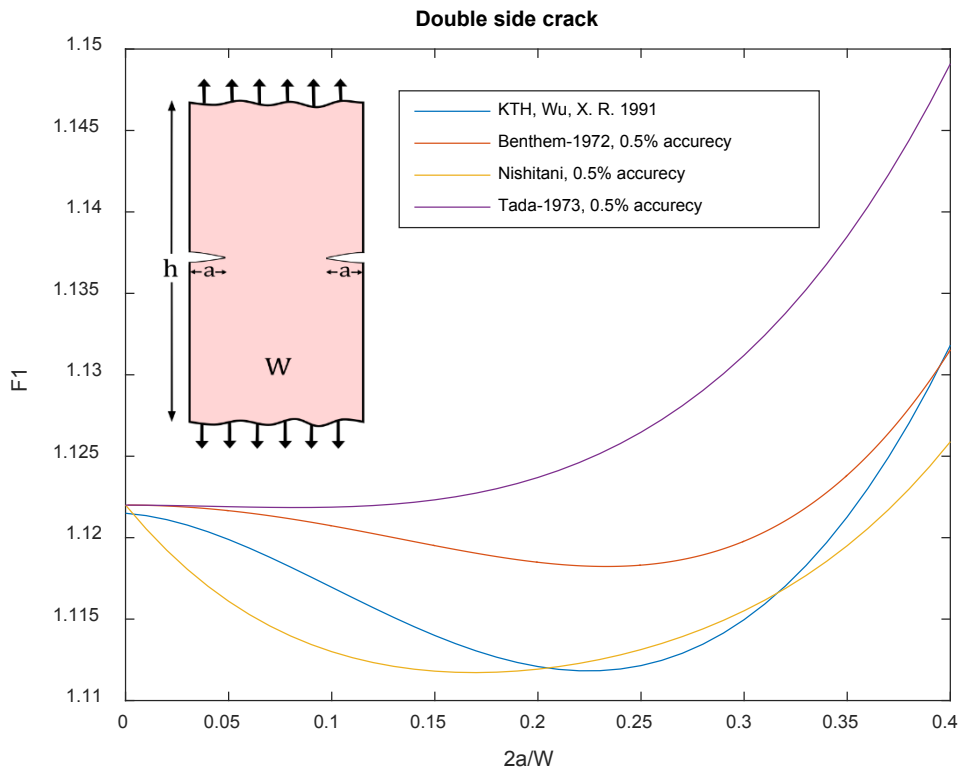
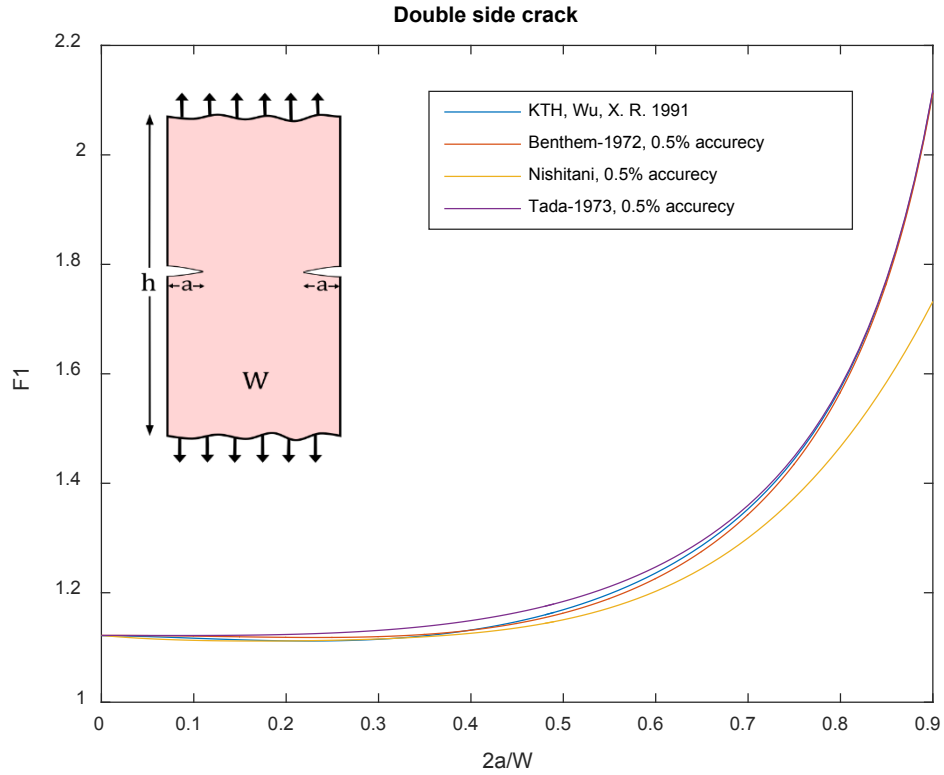


Influences on fracture criteria prediction

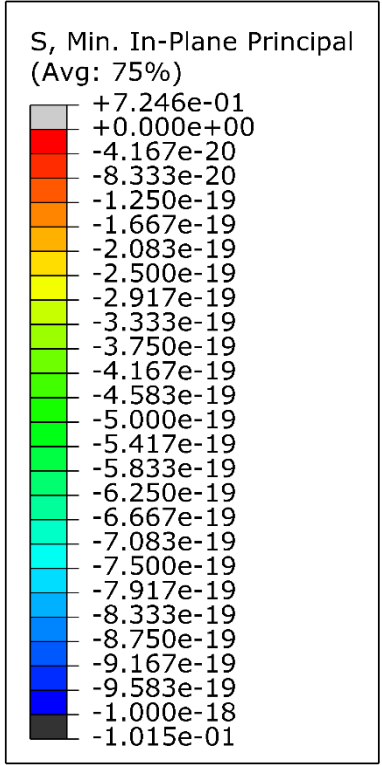
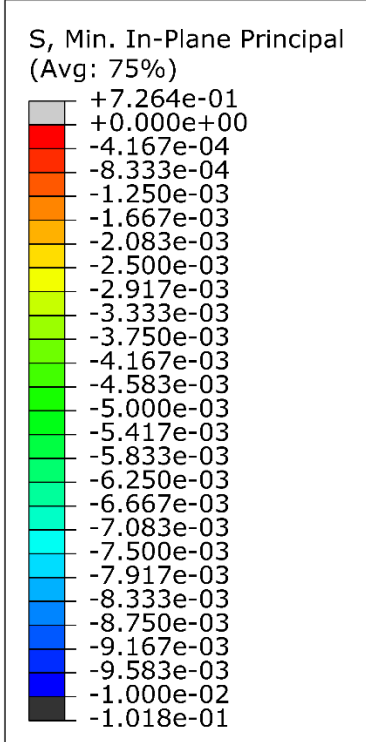
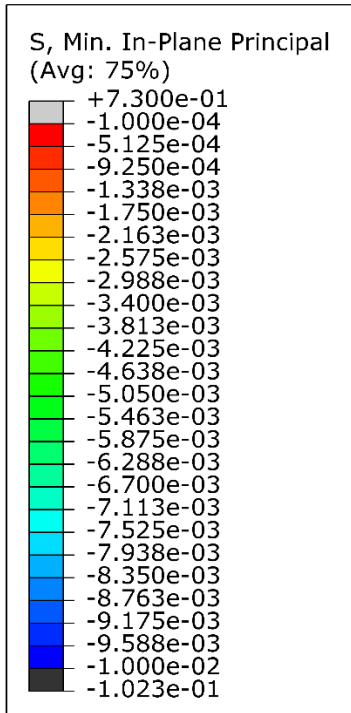
- The load capacity can be determined as:

$$\sigma_c = \frac{k_c \sigma_o (2\pi a / r_o)^s}{f(a/b, h/b)}$$

- The micro structural distance : $r_o = K_{Ic}^2 / \sigma_o^2$
- At a critical load the load parameter $k = k_c = K_I / K_{Ic}$



Formula and accuracy source: KTH [1,2,3], Benthem [4], Koiter [4], Tada [4], Murakami [5] and Nishitani and others [See Mahdih's reference]



Same condition as earlier studies (Except deformation is not exactly scaled).

L =length, W =width, $r = \frac{L}{W}$.

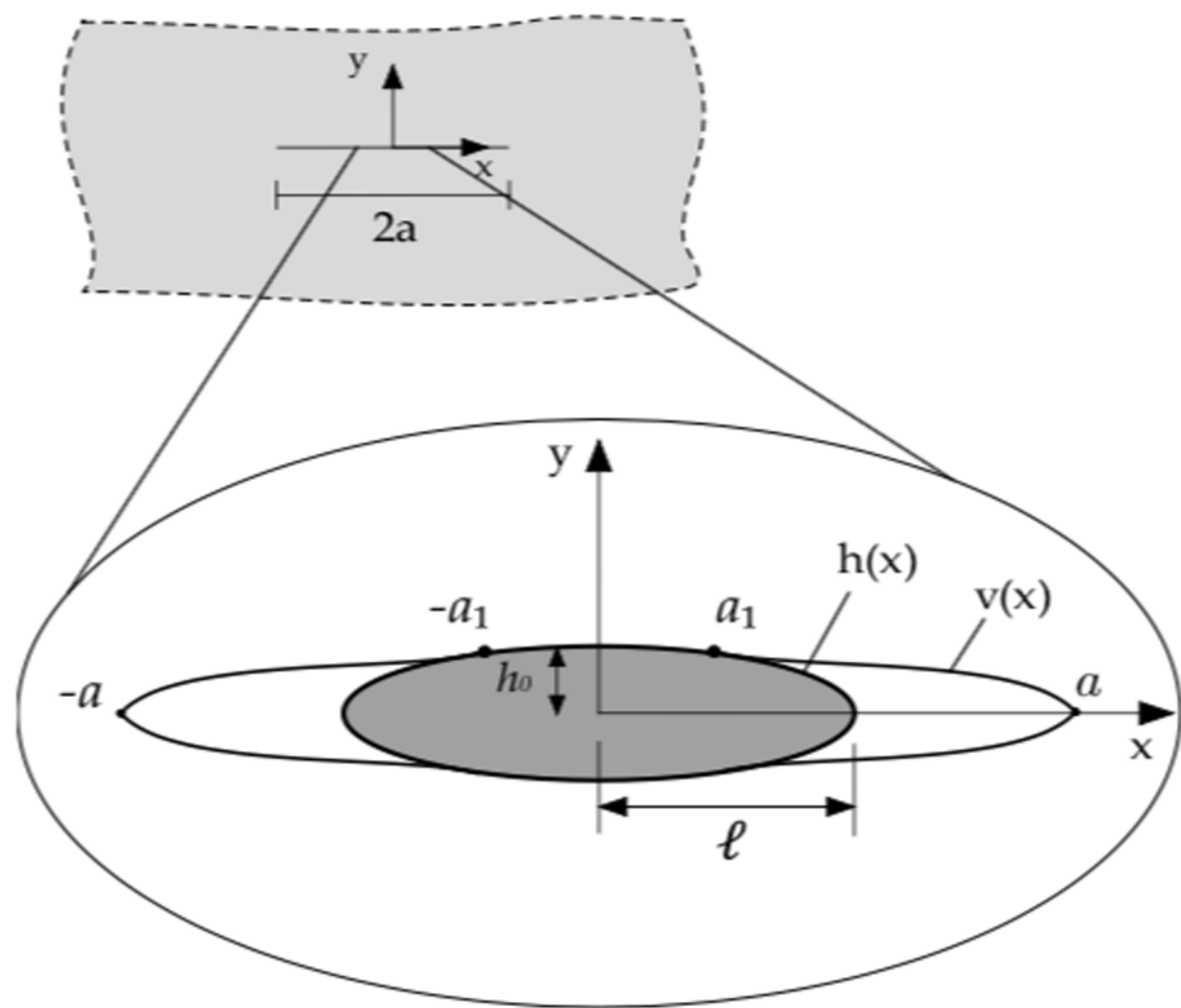
For $r=2.5$ compressive stress order $1e-3$. For $r=5$ no compressive stress. For $r=10$ compressive stress is back and is in the order $1e-19$.

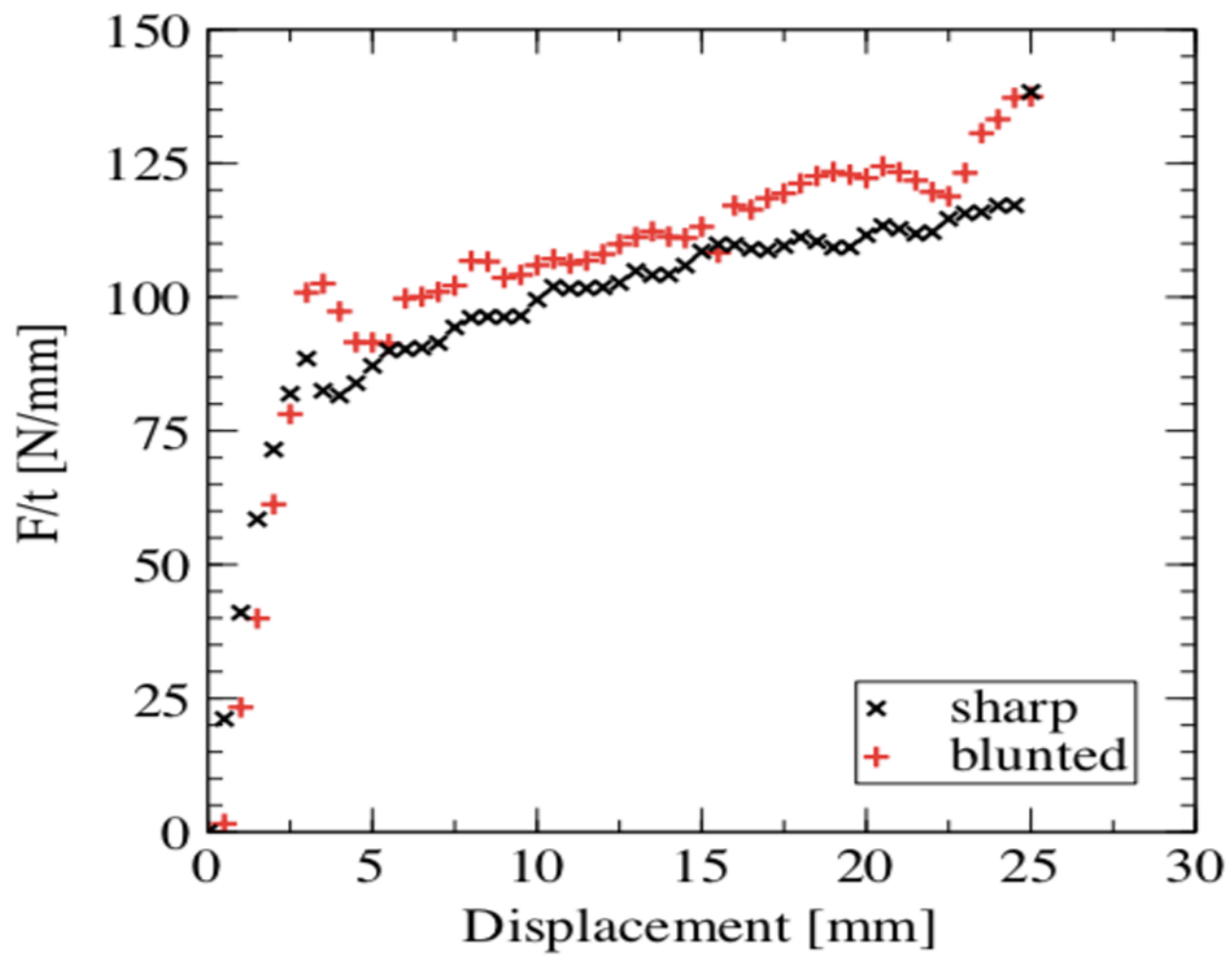
Conclusion: Probable 'r' value to neglect clamp effect at the centre region, $2.5 < r < 5$

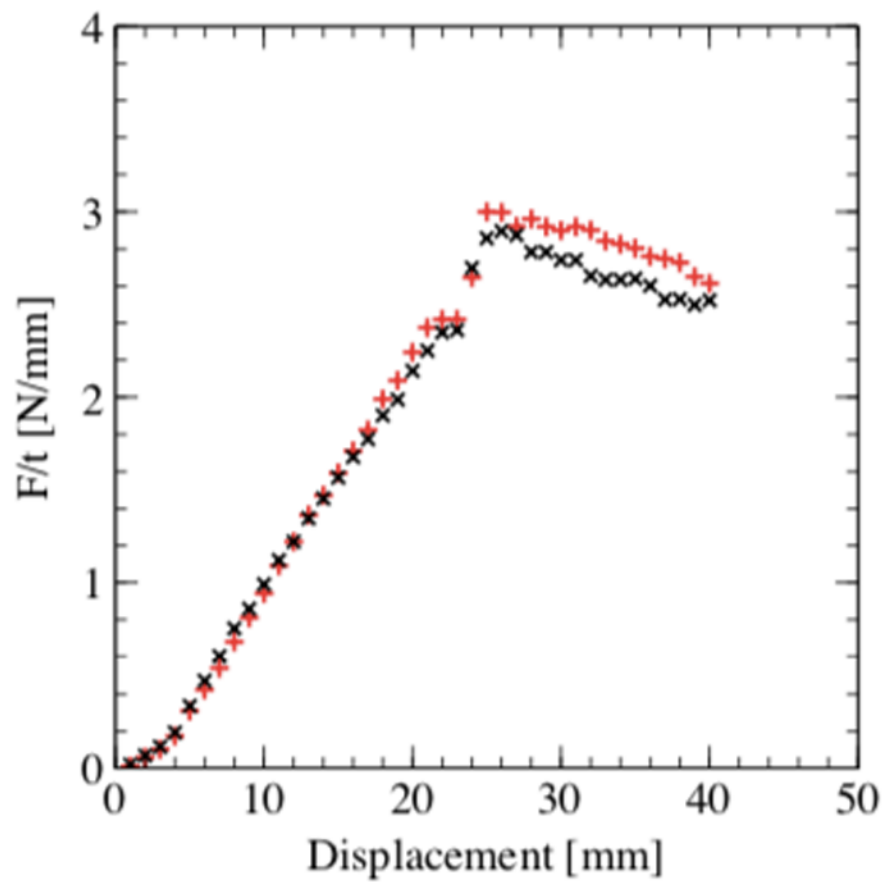
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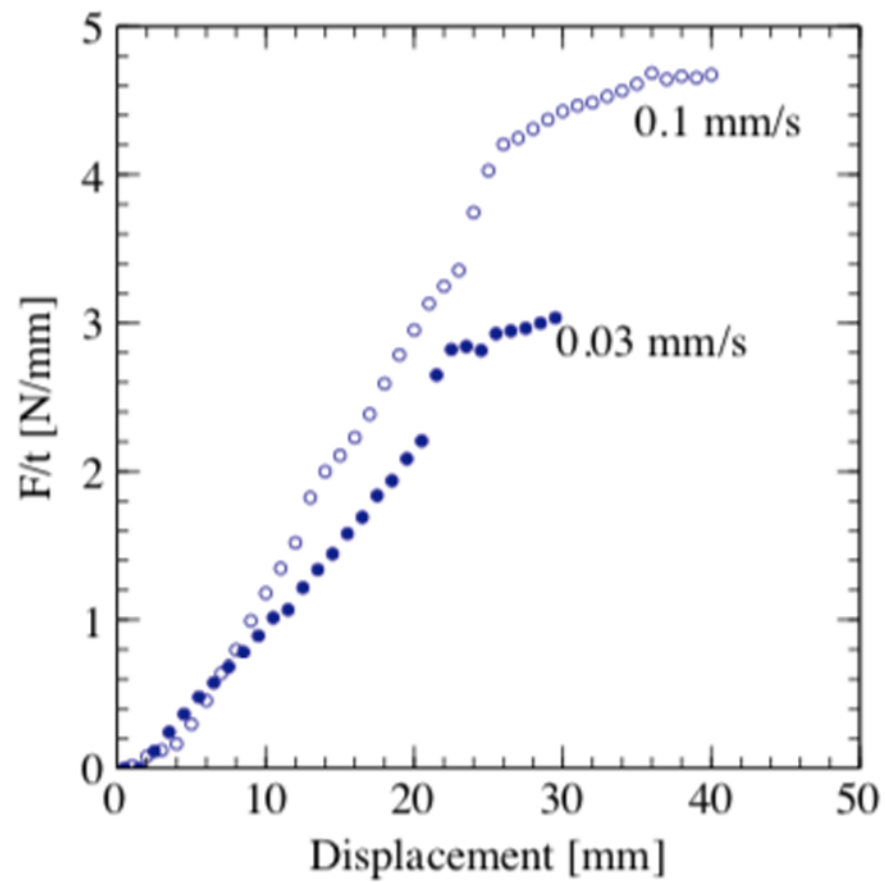
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(a)



(b)