



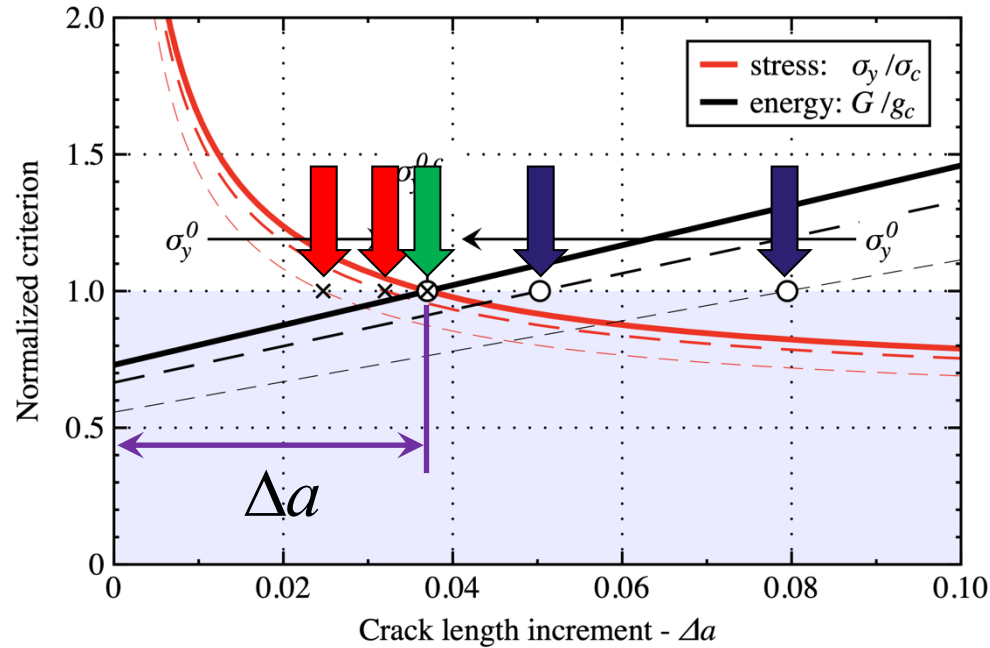
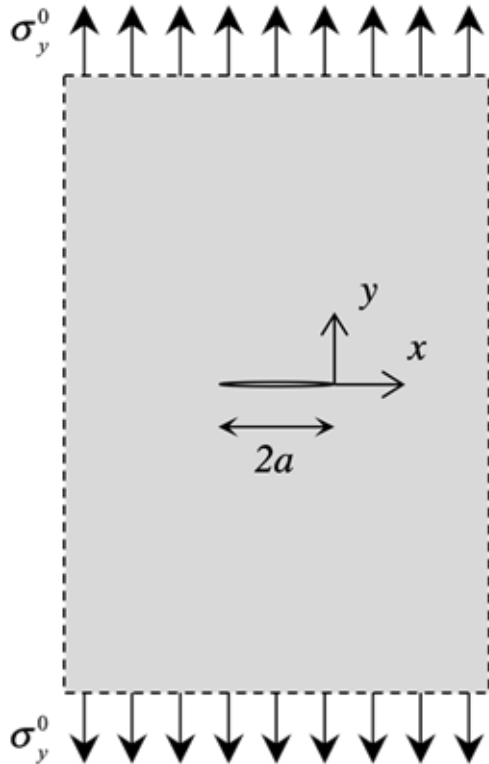
Coupled criterion in ABAQUS

Gergely Molnár



Coupled criterion (CC)

Tension



Coupled *stress* and *energy* criteria



Leguillon (2002)

$$G_{inc}(a + \Delta a) \geq g_c$$

Griffith

Stress

$$\sigma_1(a + \Delta a) \geq \sigma_c$$

FE Model

Geometry

$$\Delta a = 1 \text{ mm} \quad s = 40 \text{ mm}$$

$$b = 5 \text{ mm}$$

$$a = 1 \text{ mm}$$

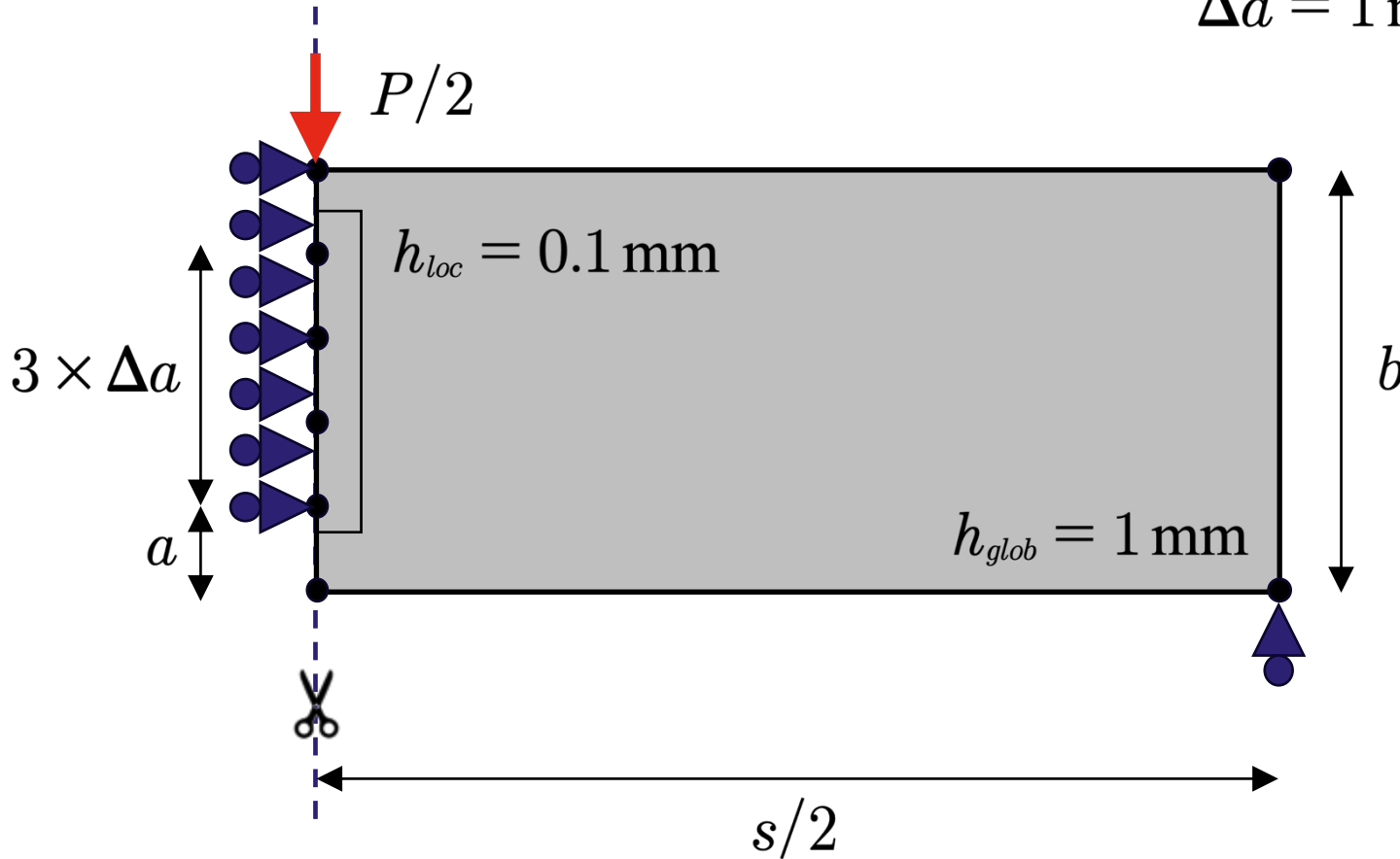
Load

$$P = 1 \text{ N}$$

Material

$$E = 3 \text{ GPa}$$

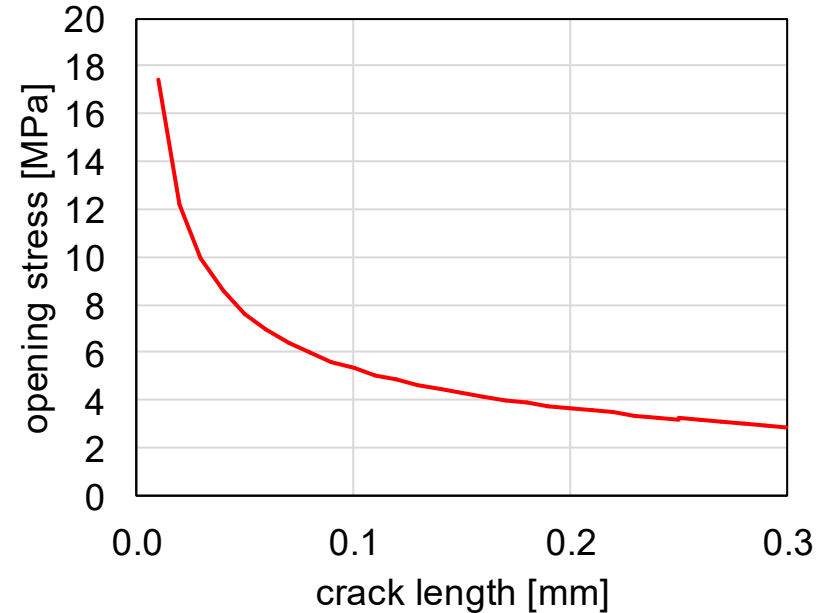
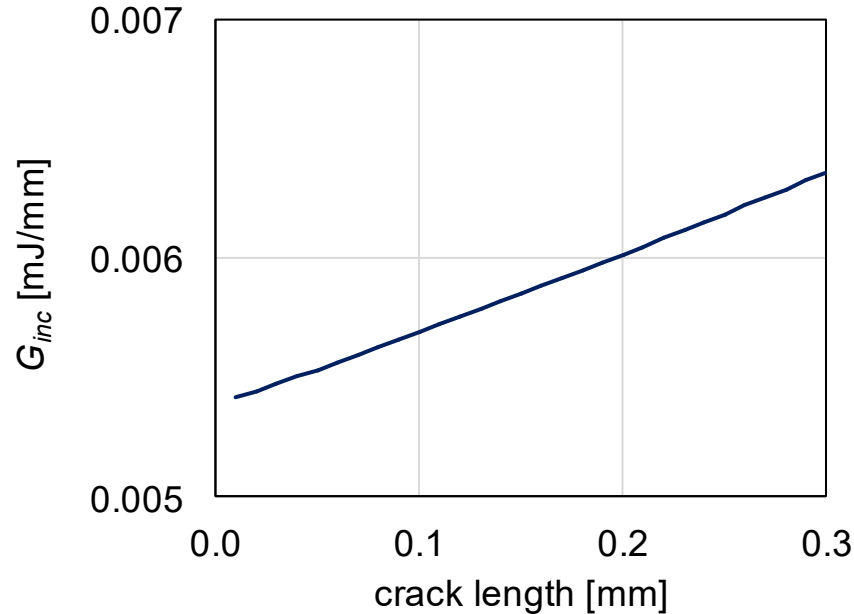
$$\nu = 0.37$$



Results (with fine mesh)

Incremental energy release rate

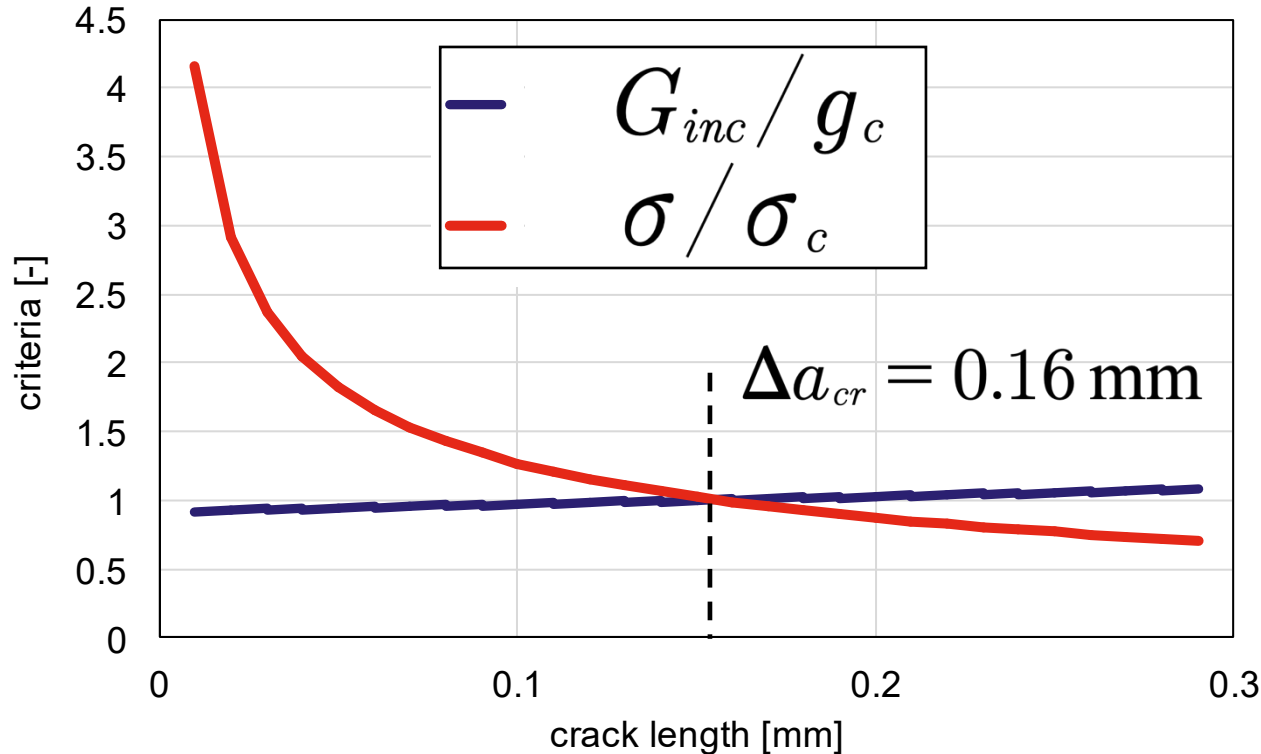
Opening stress



$$-\frac{\Pi(a_0 + \Delta a) - \Pi(a_0) - \Delta W_{ext}}{\Delta a} = G_{inc}(a_0 + \Delta a)$$

Results (with fine mesh)

Solution of the coupled criterion



$$g_c = 300 \text{ J/m}^2$$

$$\sigma_c = 30 \text{ MPa}$$

$$P_{cr} = 7.15 \text{ N}$$

Summary

1. ABAQUS GUI
2. Automatic Python script
3. Solution of CC

