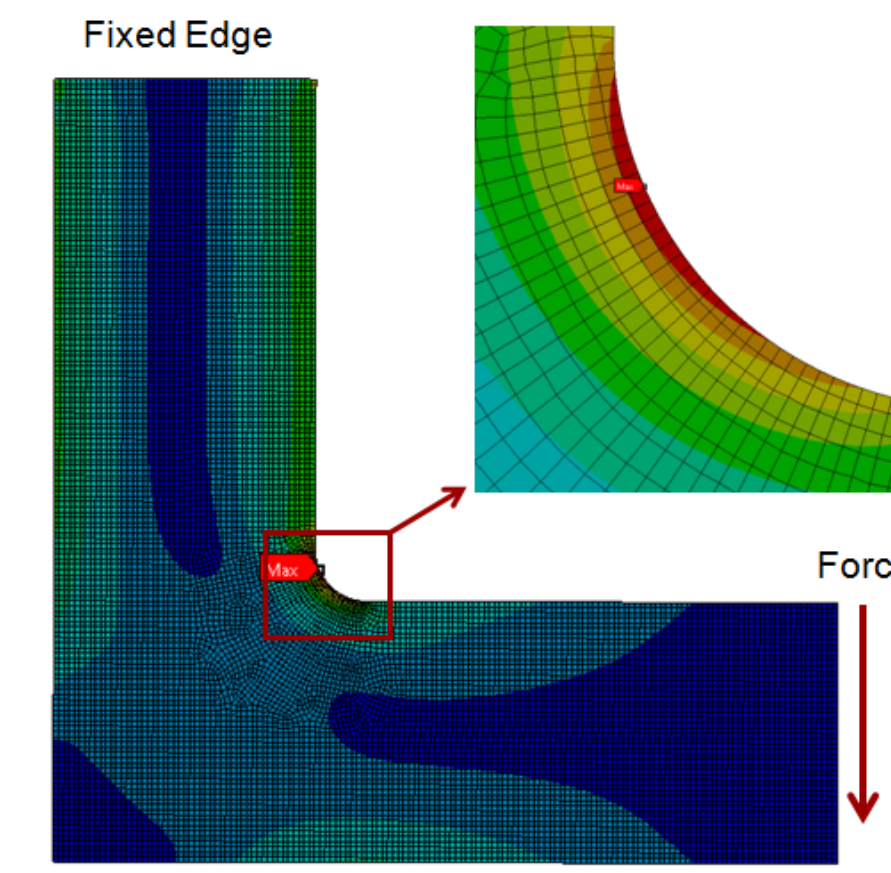


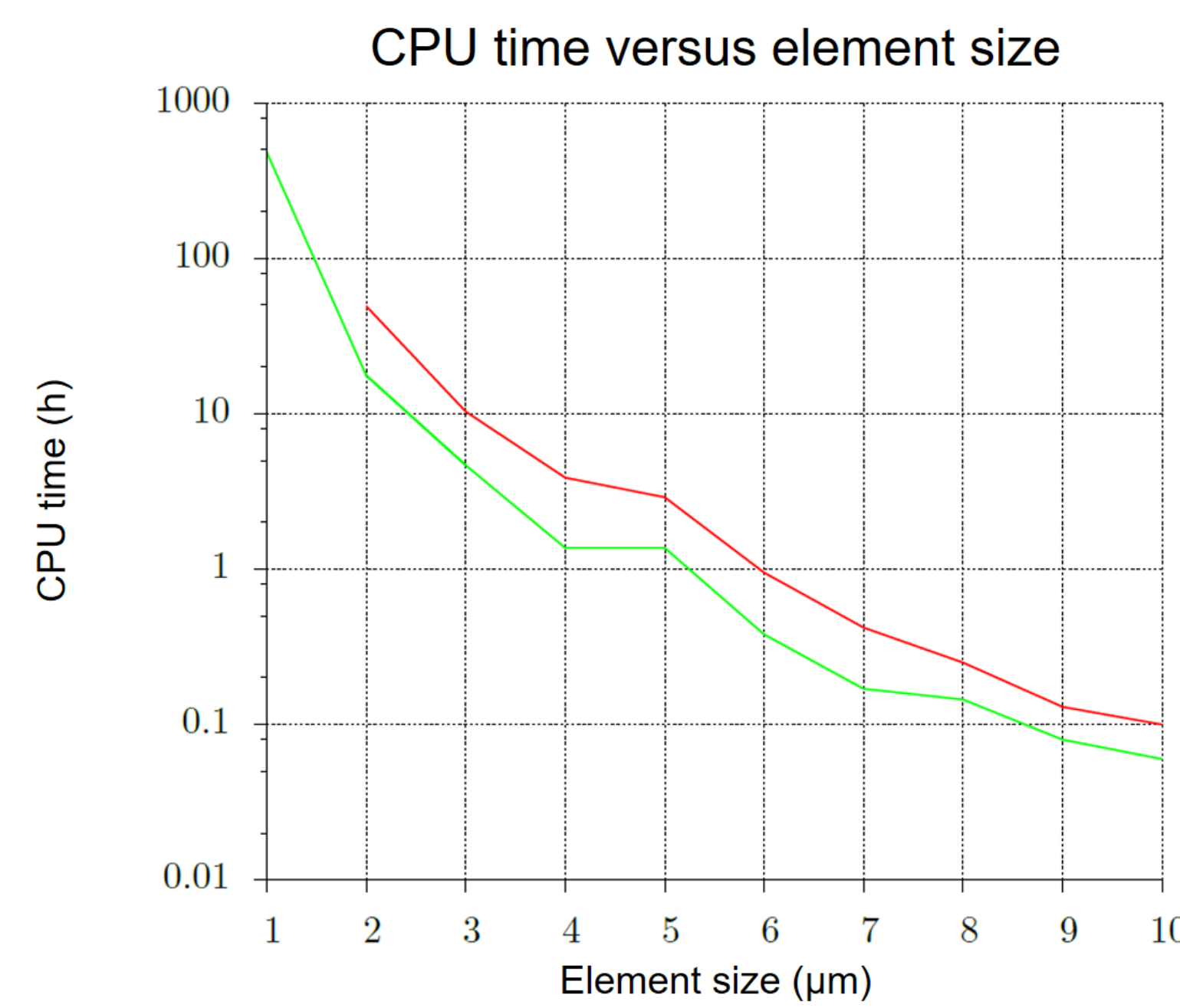
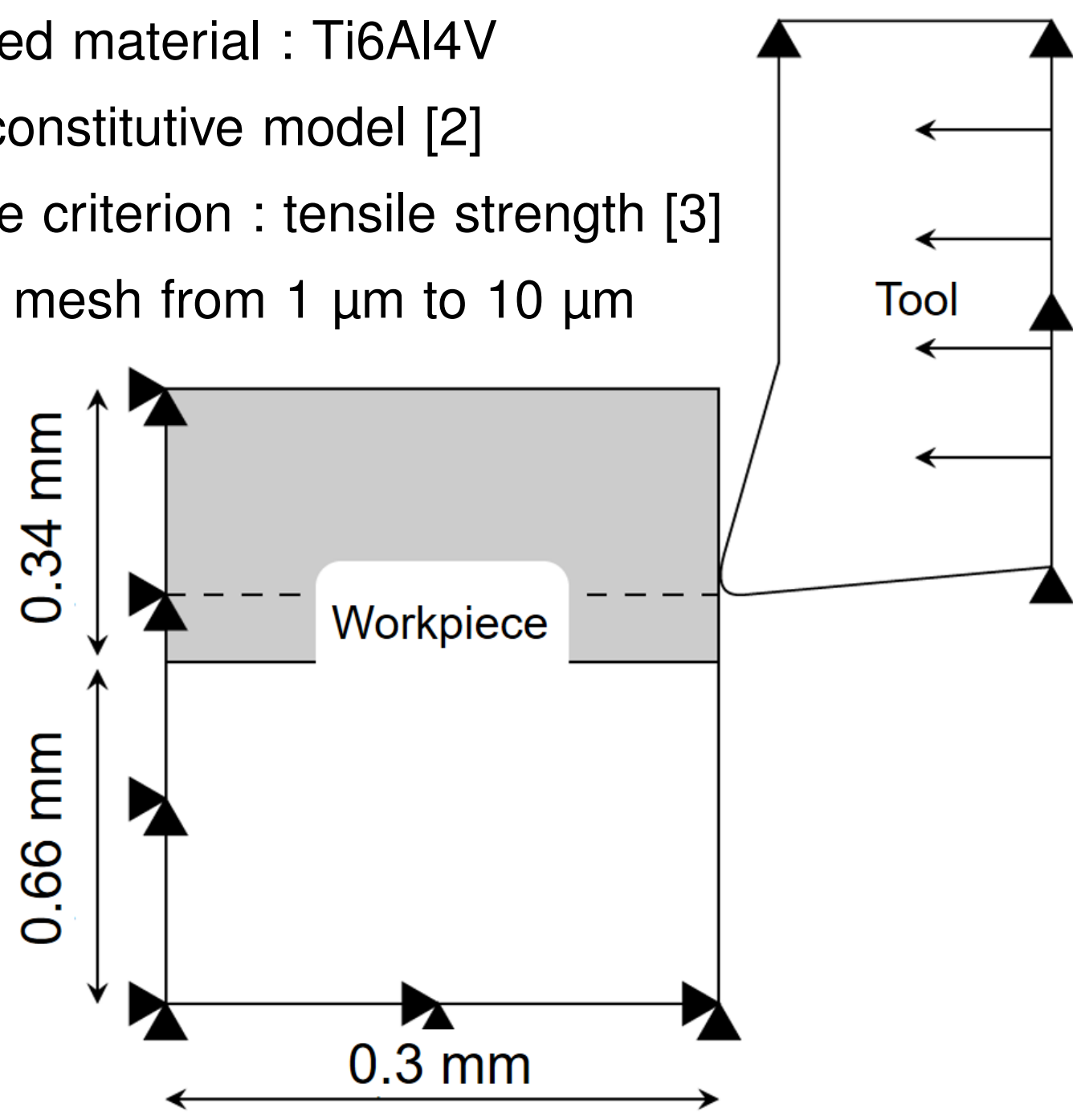
Context

- Mesh dependence of the results of a finite element model = well known problem in many fields (Figure from [1])
- This problem is not much studied in the literature for machining modelling
- However, quality of the results and predictive aspect of the model heavily rely on it



Initial model

- Machined material : Ti6Al4V
- TANH constitutive model [2]
- Damage criterion : tensile strength [3]
- Square mesh from 1 μm to 10 μm



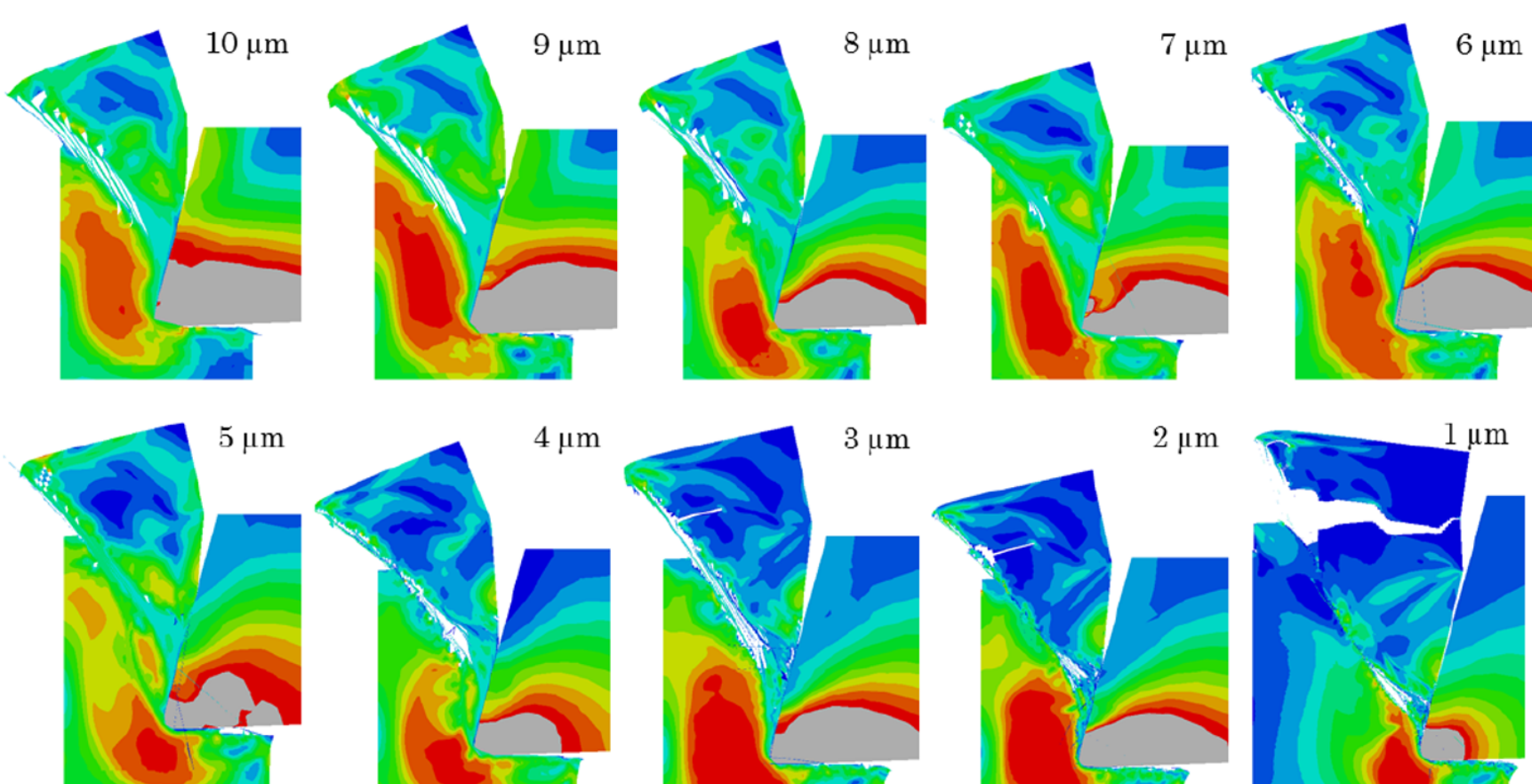
Experimental reference [4]

$V_c = 75 \text{ m/min}$, $h = 0.28 \text{ mm}$

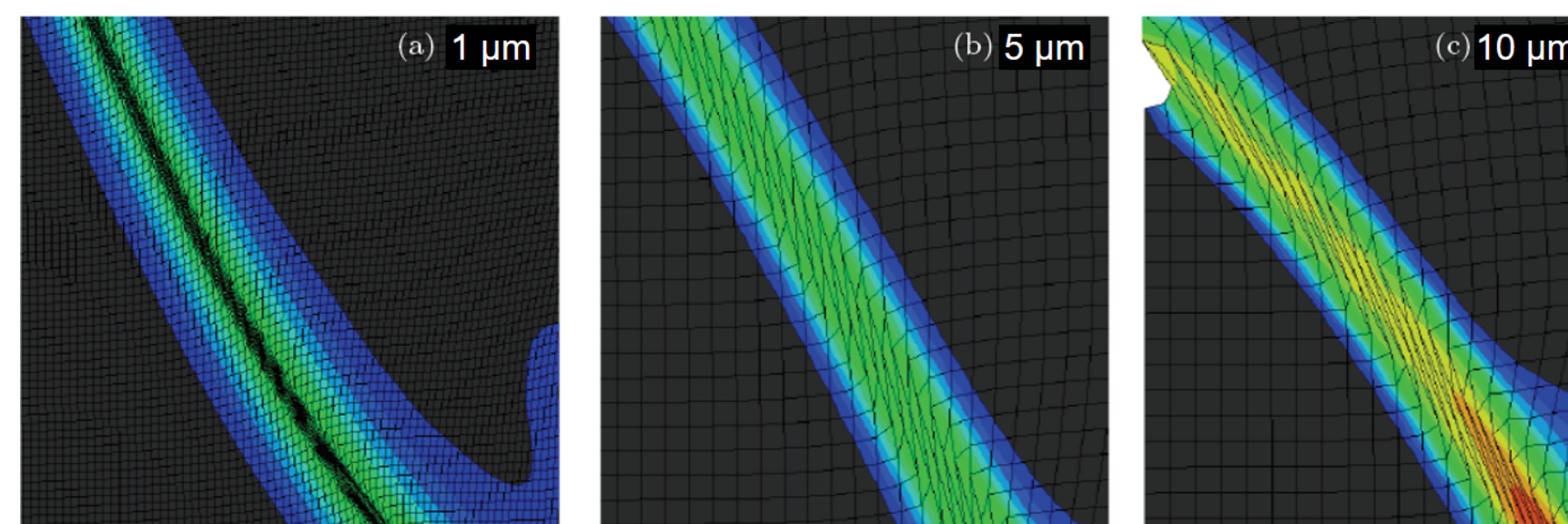


Results of the initial model

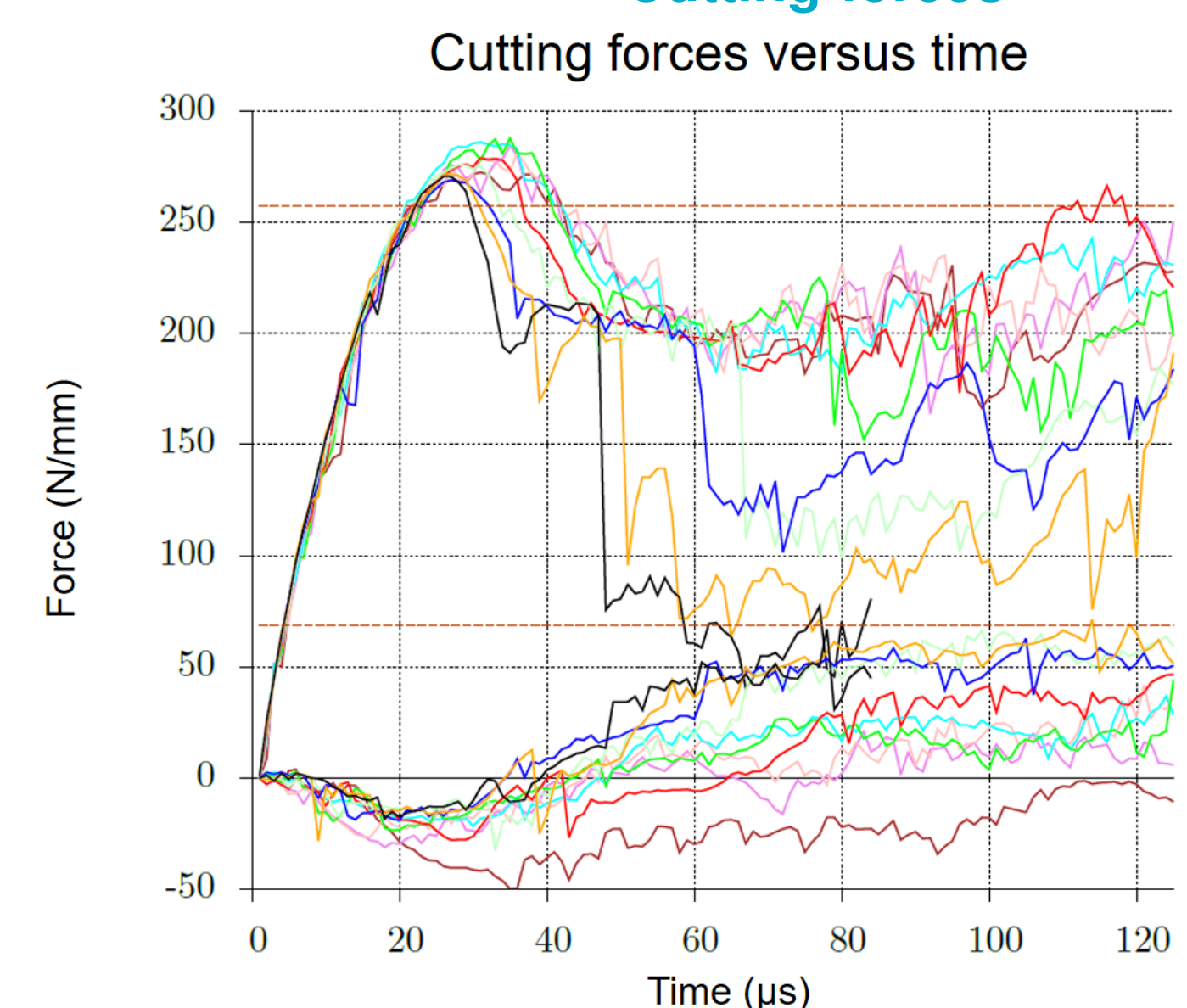
Chip morphology



Shear band width



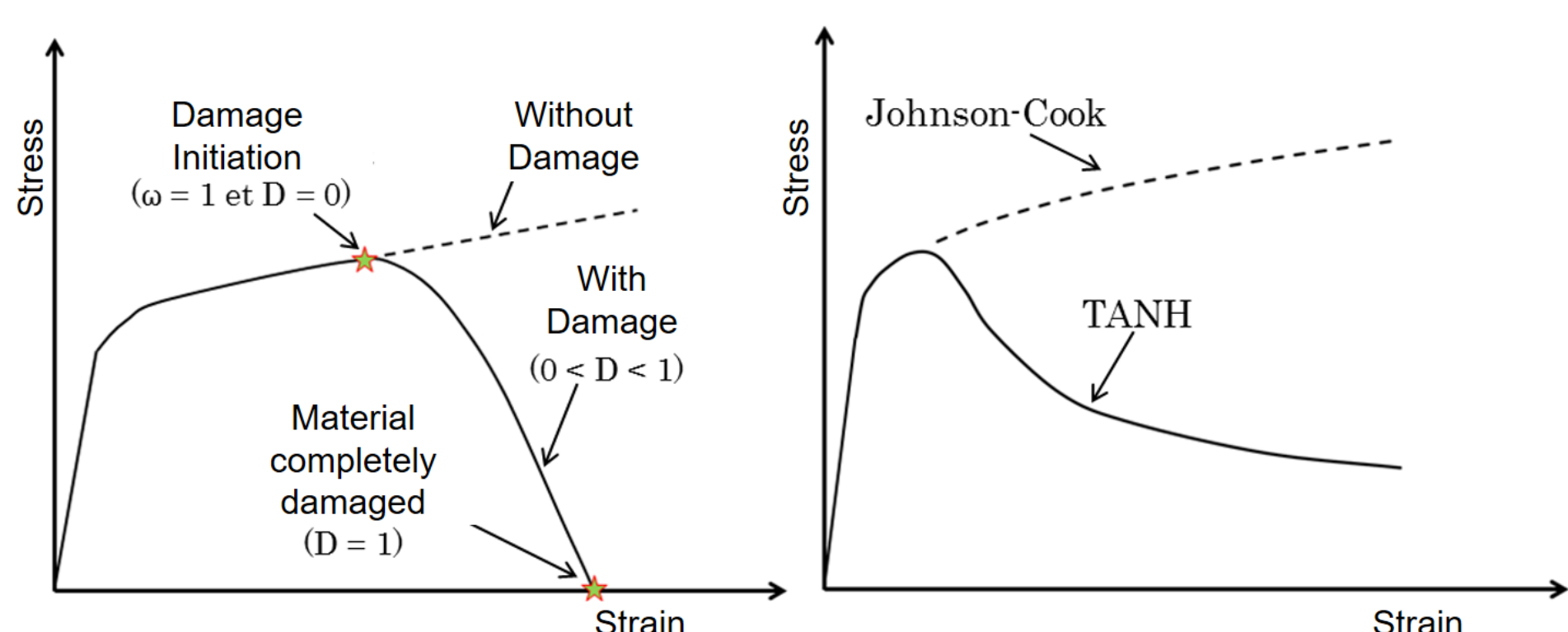
Cutting forces



Model with non-local damage criterion

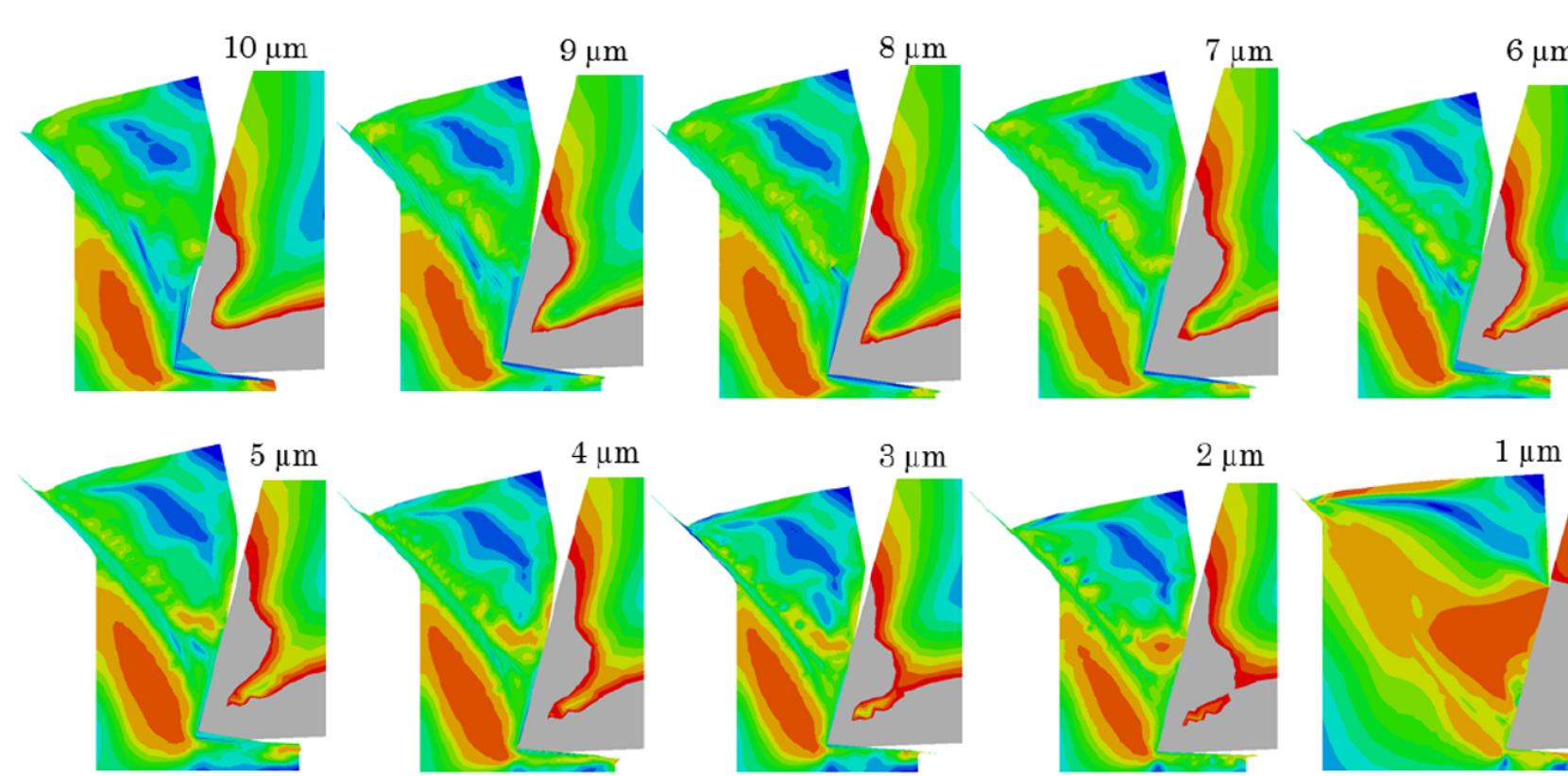
Constitutive model and non-local damage criterion

- Johnson-Cook constitutive model [5]
- Damage criterion : Johnson-Cook damage model [6]
- Initiation and propagation steps of damage

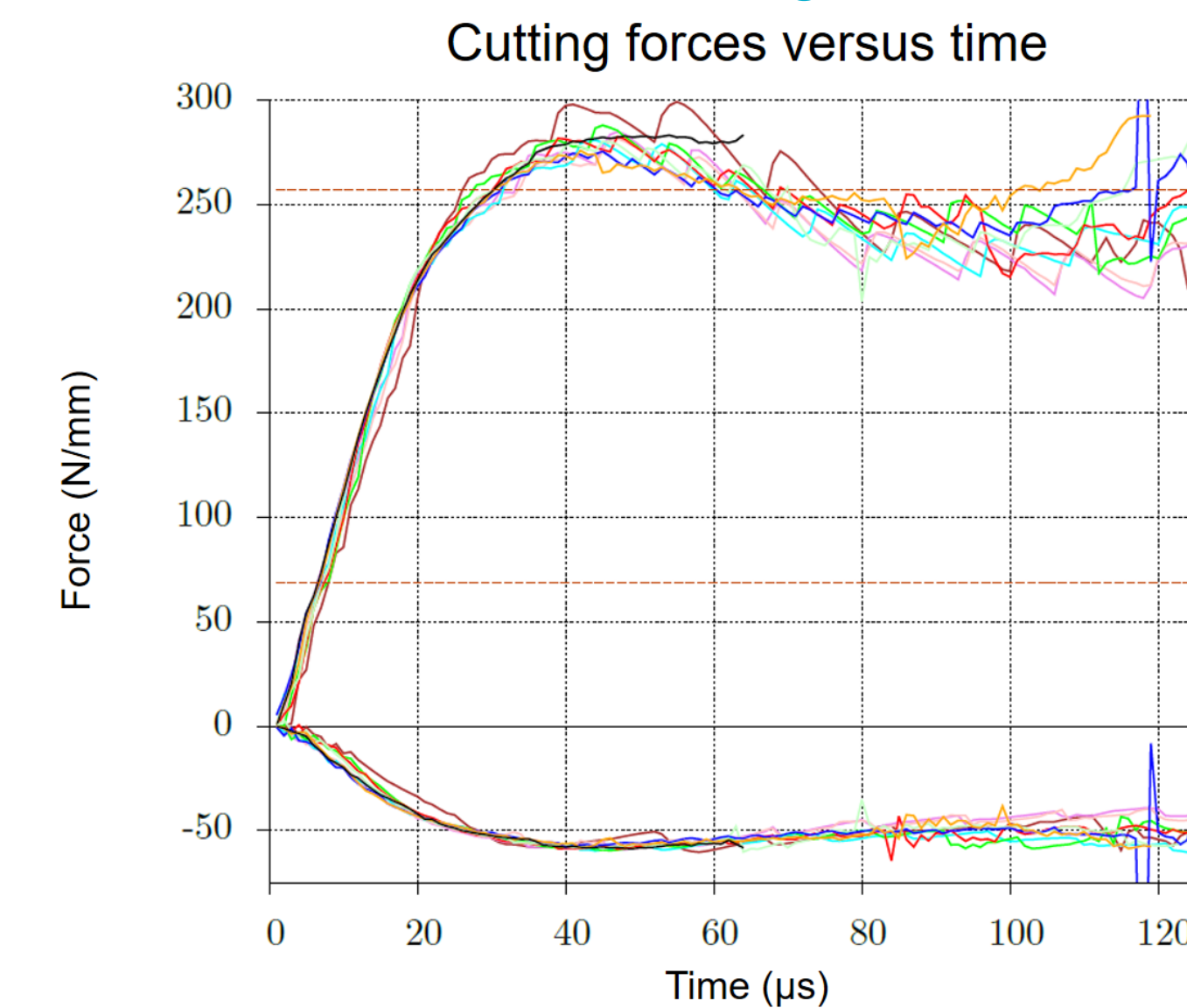


Results

Chip morphology



Cutting forces



Conclusions

- Dependence of the results to the size of the mesh is high with a Lagrangian formulation and a local damage criterion in machining
- The machined material and the cutting conditions increase that dependence
- The adopted non-local damage model reduces the mesh dependence
- Element size close to the grain size is recommended

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