Mesh dependence of the results of a finite element model is a well-known problem in many fields (Figure from [1]). This problem is not much studied in the literature for machining modeling. 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

Results of the initial model

- Chip morphology
- Shear band width
- Cutting forces

**Model with 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.

**References**

[1] https://caeaai.com/sites/default/files/mesh%204.png