

Fracture of thin metal sheets : panoply of challenges for computational modelling

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Abstract. The ductile failure process on thin metal sheets is a complex fully 3D problem involving very large strains, crack tip necking, a transition from flat to slant fracture, crack tip tunneling and several length scales from the microvoid size up to the macro scale. In addition, as for any damage dominated problem, local models suffer from unescapable loss of ellipticity of the equations and mesh sensitivity. Finally, the fracture toughness is not well defined in the near plane stress regime with significant variations with the thickness. The fracture toughness is thus not really a property anymore. These variations are still not well understood, nor quantitatively predicted and thus not used to design better structures. The talk will present the experimental evidences and underlying physics while setting then the computational challenges that must be overcome. A recent version of the Gurson damage model implemented in a non local setting will be presented, showing potential to tackle these complex issues