Do advanced material models contribute to accuracy in industrial sheet forming simulations?

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Abstract. The accuracy of material models can have a large impact on the overall accuracy of material forming simulations in general and sheet forming simulations in particular. For large strain plastic deformations, the material model usually consists of a yield function and a hardening relation, optionally including the influence of temperature and strain rate. In large-scale simulations it is favourable to keep the model as simple as possible. The 'allowable' error in a material model should be in balance with other errors, like the discretisation error and errors in contact and friction modelling.

The required accuracy depends on the application and the goal of the analysis. In many occasions, strain rate and temperature dependency can be ignored, but for warm forming this is clearly not the case. Furthermore, numerical simulation of the onset of necking requires a much better material model than needed for the calculation of the global deformation field before necking.