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# A STUDY OF DYNAMIC YIELDING UNDER SHOCK LOADING USING DYNAMIC DISCRETE DISLOCATION PLASTICITY SIMULATIONS

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Under weak shock loading, the shock wave front typically splits into an elastic precursor wave followed by a slower plastic wave front [**?**]. The dynamic yield point is therefore the boundary between the elastic precursor and the plastic wave, typically characterised as an attenuating peak value down to the Hugoniot Elastic Limit. Proper understanding of the many features displayed by the precursor peak is lacking. It is usually assumed that there are two distinct albeit interrelated mechanisms at play [**?**]: crystalline lattice relaxations arising from the compression imposed by the shock front and dislocation activity.

In this talk, Dynamic Discrete Dislocation Plasticity (D3P) is used to study the role of dislocation activity in dynamic yielding under shock loading. D3P is a method of dislocation dynamics first proposed by Gurrutxaga-Lerma et al. (2013) [**?**] as a variant of Discrete Dislocation Plasticity [**?**] (DDP). Unlike most discrete dislocation dynamics methods, D3P is able to cope with dynamic effects in dislocation theory by considering time as an explicit field variable. By solving the Navier-Lamé equation of elastodynamics, D3P uses the time-dependent fields of non-uniformly moving injected edge dislocations. This makes dislocation interactions with one another and with the material background heavily dependant on the past history of each dislocation, and on a retardation principle.

This talk will focus on the role of dislocation activity behind shock fronts. Several constitutive rules of D3P needed to properly described the underlying physics will be outlined, exploring the role of dislocation mobility and generation rules among others, and some results shedding light on dynamic yielding will be presented.

## REFERENCES

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