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Applications of the Distinct Element Method in Structural Geology: A critical review of common practices in model presentation and suggestions for a more quantitative approach

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The Distinct Element Method (DEM) is a numerical tool in which rock is represented as an assemblage of cemented particles. Failure of the cement, i.e. bonds, corresponds to cracking of the model material. Due to the ease of simulating large-strain deformation, the DEM is becoming a popular tool for modelling a wide range of brittle structures, such as joints and faults. However, despite the fact that quantitative measures, such as stress and strain, can be readily extracted from DEM models, many researchers represent their models by simply plotting particles and sometimes the locations of broken bonds. In this presentation we show how more sophisticated approaches to the visualisation and analysis of DEM models can provide quantitative insights into a variety of process in Structural Geology. Examples considered here encompass various scales of observation, and include: (1) stresses associated with jointing, (2) the kinematic evolution of fault systems, (3) the strain distribution within a faulted layered sequence and (4) stress-paths during caldera collapse.