Comparisons between a high resolution **discrete element model** and **analogue model**

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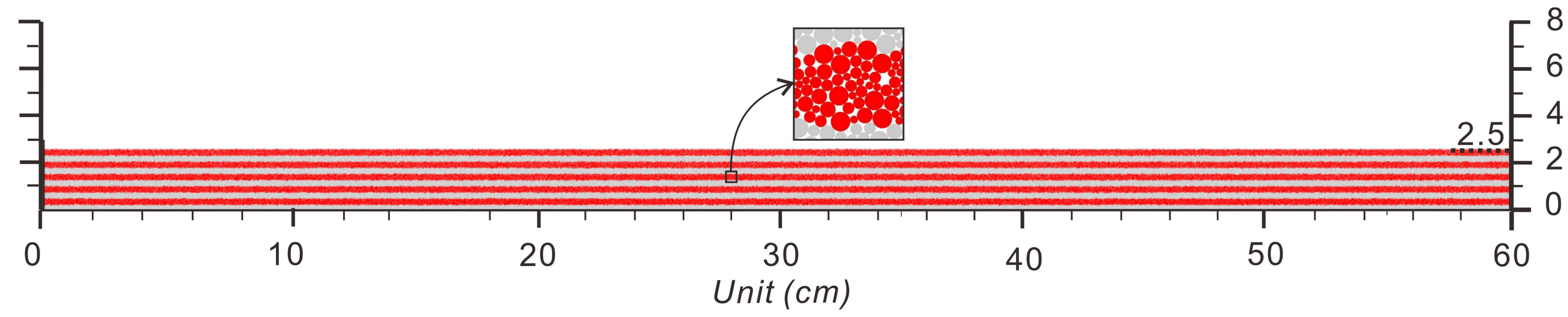
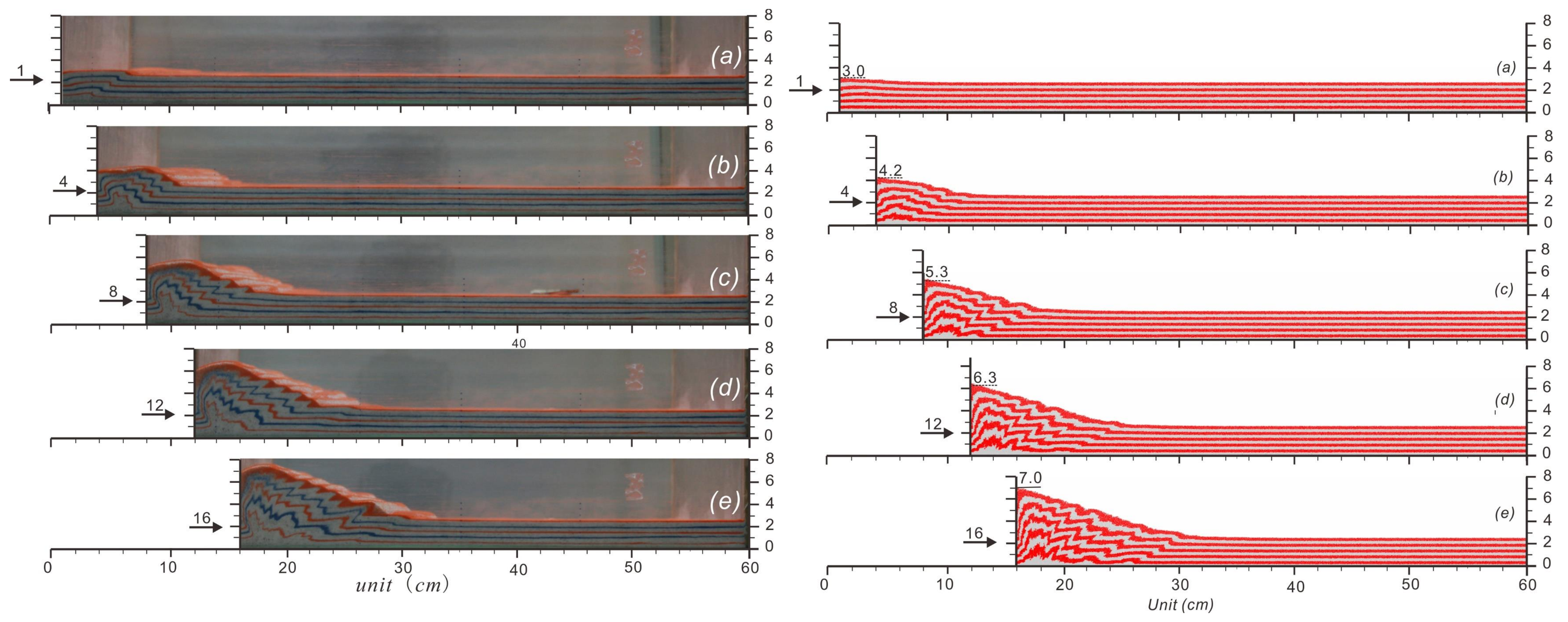
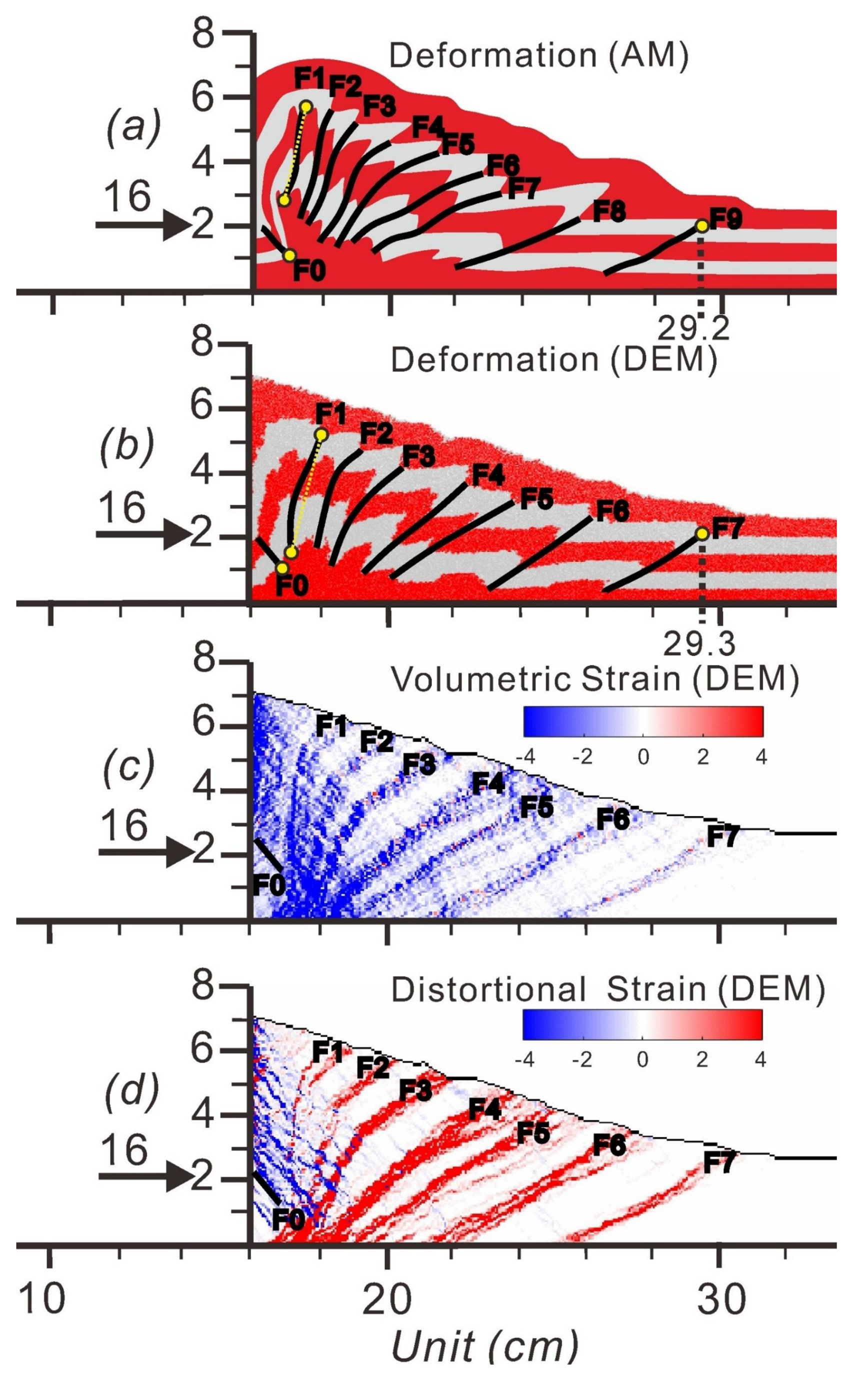
Numerical and analogue models represent two different modeling methods with which the evolution of geological structures, such as fold-and-thrust belts and sedimentary basins, can be investigated visually. They share the advantages and disadvantages of trying to capture aspects of a geological process. Some studies have combined the two modelling techniques in their investigation of tectonic process. DEM (Discrete Element Model) can be constructed before AM (Analogue Model) in order to help us to adjust the initial AM settings. The experimental set-up, the model construction technique, the material and the base and wall properties were prescribed. The aims of our study were **to test the similarity of DEM and AM**, in order to help adjust the initial AM settings and establish robust features of tectonic models on the scale of the upper crust.



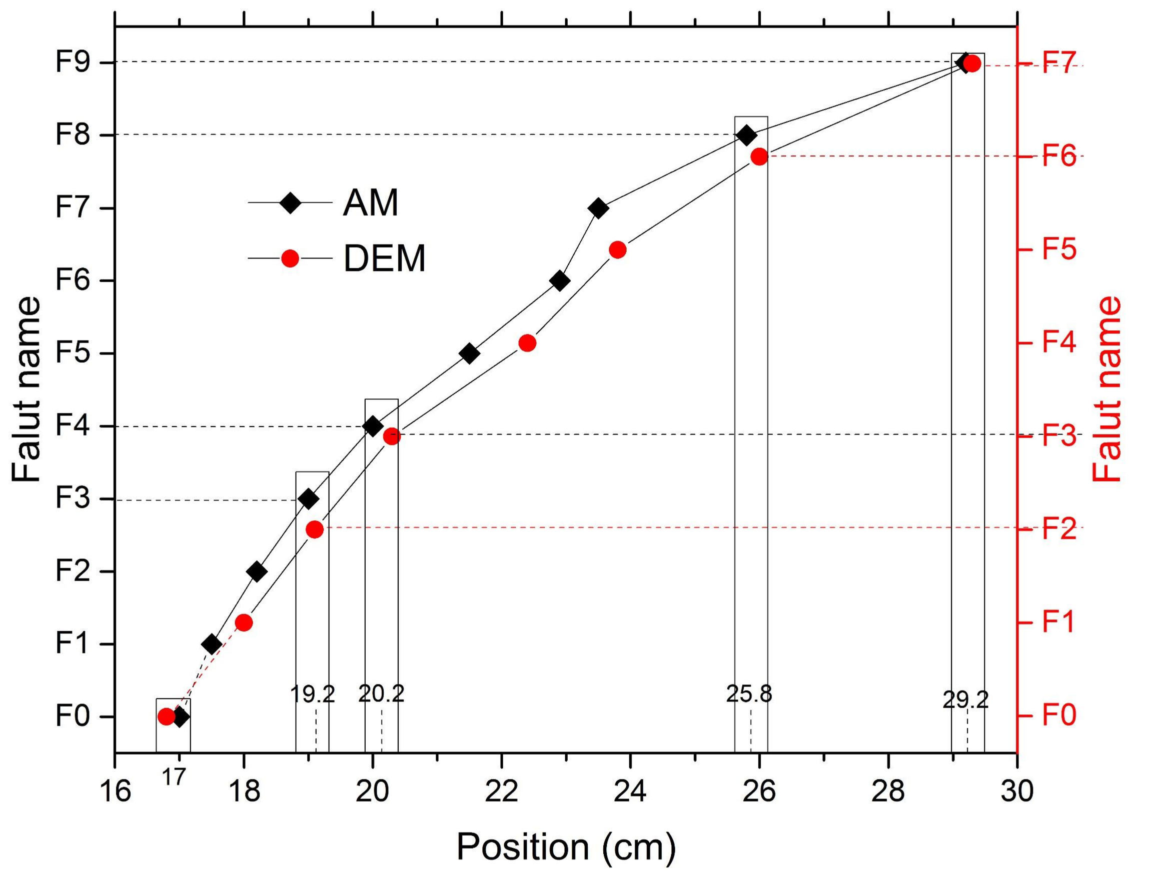
- 120,000 particles
- Randomly generate particles within a 60 cm length × 5.0 cm tall domain
- Settle under gravity



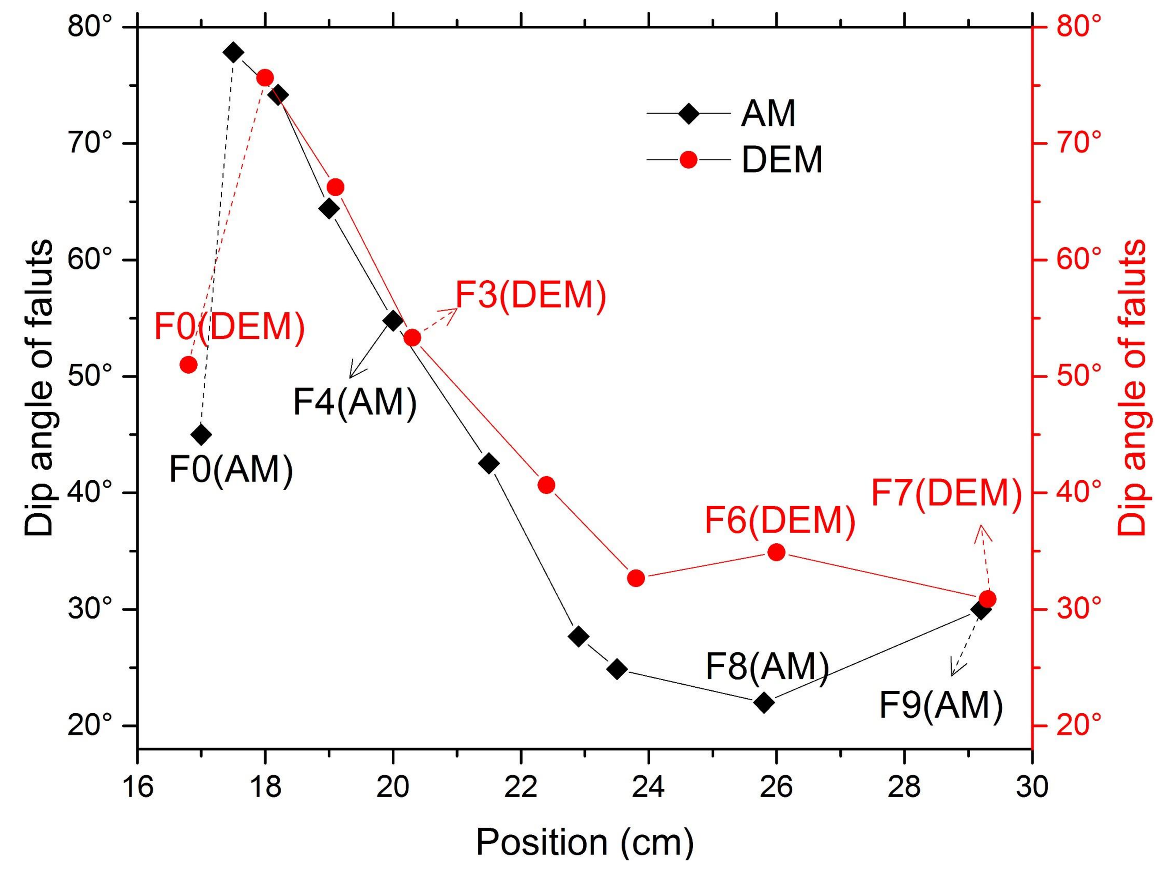
- The overall evolution of DEM and AM is broadly similar.
- Shortening is accommodated by in-sequence forward propagation of thrusts.
- With shortening, both models had not the obvious volume loss. Instead, the volume basic remained unchanged in the whole extrusion processes.



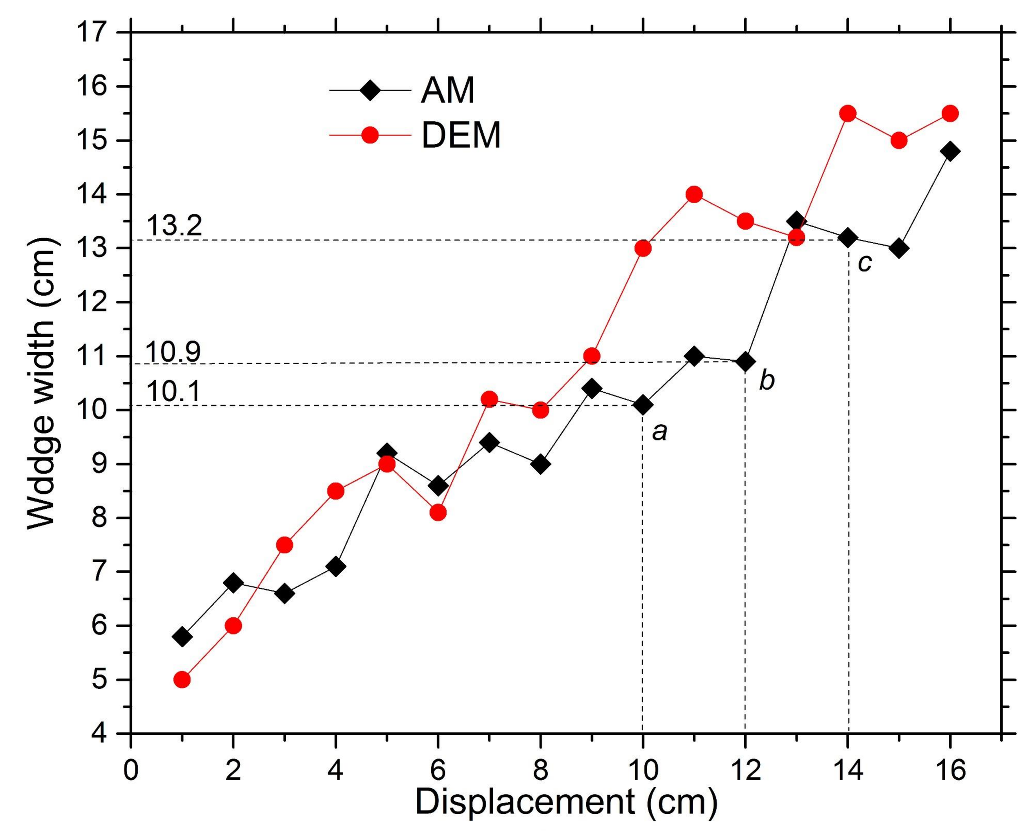
- Fault interpretation after 16 cm of shortening.
- Almost all high strain values are within fold-and-thrust belts in DEM, which allows a direct comparison between the fault zone identified on the DEM deformation field and that in the strain field.
- Details of thrust spacing, dip angle and number of thrusts vary between DEM and AM, but the characteristics of thrusts are similar on the whole.



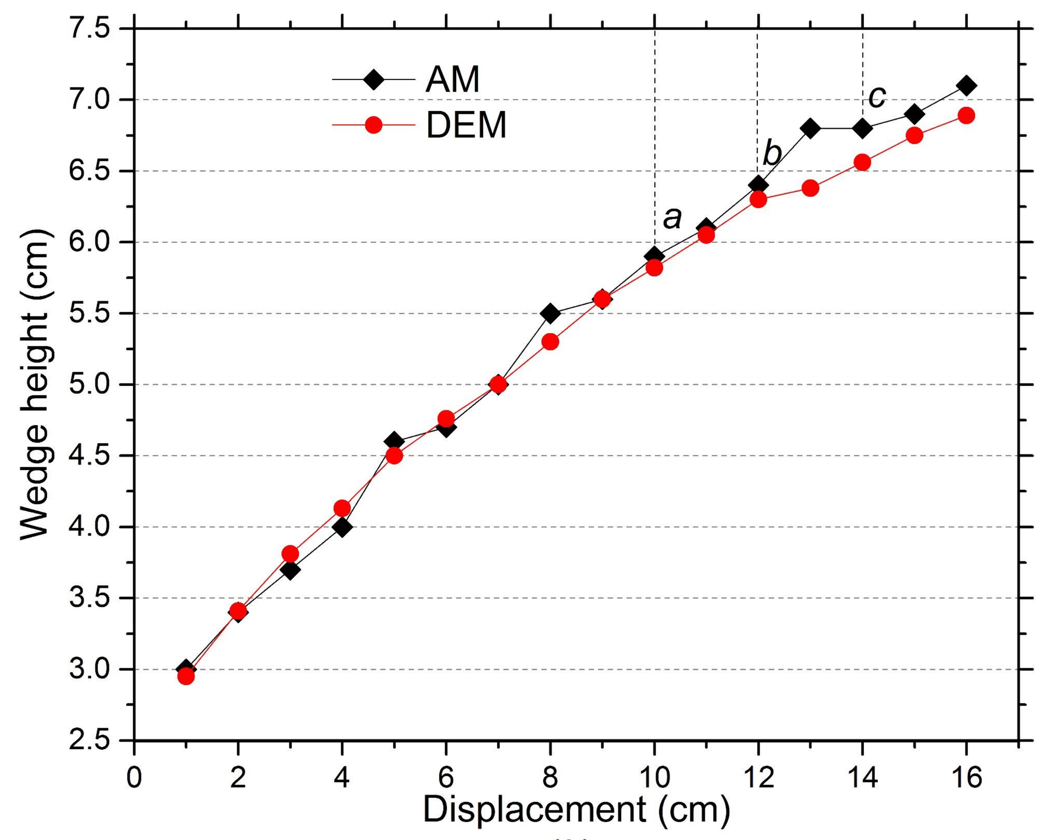
- The position of the faults.
- The position of a fault was defined as the intersection of this fault and the stratigraphic line between the above two stratums



- The dip angle of faults
- Dip angles of the forward thrusts increased from foreland (ca. 30°) to the mobile wall (ca. 80°)



- The width of wedge deformation zone versus the amount of displacement.
- The width of wedge deformation zones is taken as the distances between the moving backstop and the wedge toe.



- The maximum height of wedge versus the amount of displacement.
- The maximum wedge height of AM and DEM with a high consistent degree increased linearly with shortening, basically.

- With non-tensile particles for DEM, contraction is broadly distributed throughout the model and dilation is hardly any, which also leads to a higher efficient computation.
- High resolution DEM can to first order successfully reproduce structures observed in AM. The comparisons serve to highlight robust features in tectonic modelling of thrust wedges.

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