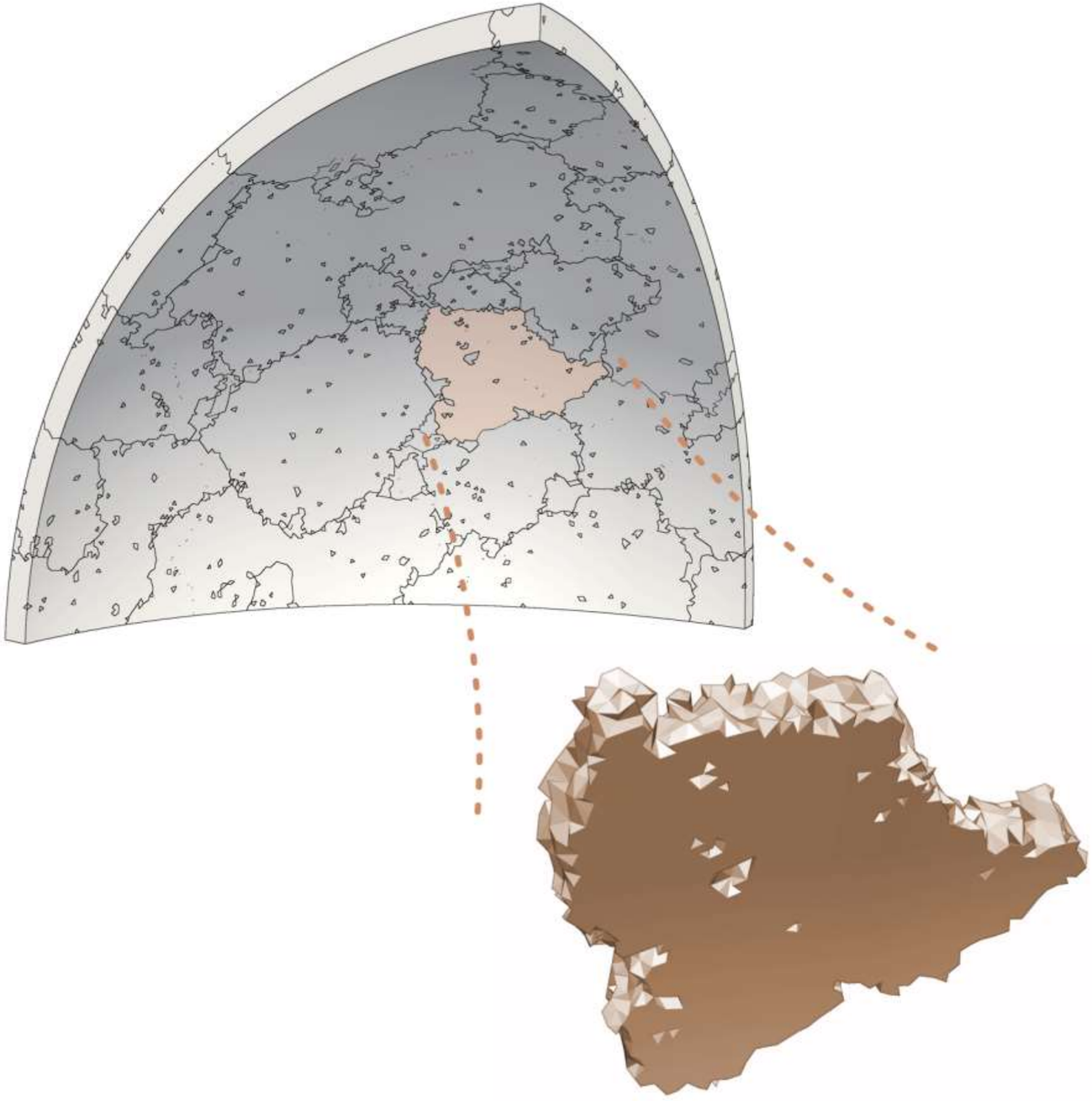

# Dynamic fragmentation of a brittle shell

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Dynamic fragmentation is a catastrophic failure of a material when it is subjected to blast loading (i.e. explosions and high velocity impacts). During such events multiple cracks originate at the material defects and they propagate. By branching and merging the cracks form complex patterns and in the final stage of this process they encapsulate fragments. The figure on the side shows the late stage of a simulated dynamic fragmentation of a brittle shell subjected to blast tensile loading. The calculations are based on the finite-element method with dynamic insertion of cohesive elements and were realized with the C++ open-source library Akantu [1]. The model consists of more than 1.4 millions of degrees of freedom that were handled thanks to state-of-the-art parallel algorithms. In fact the results that are shown were computed on 96 cores of the cluster Deneb [2] at EPFL. A single fragment is highlighted in colour and magnified in the lower part of the figure. The surfaces are rough because the model is discretized with tetrahedral elements. Thanks to this kind of simulations, it is possible to easily compute statistics of the size and the shape of the fragments for many combinations of loading conditions and geometries.

[1] http://lsms.epfl.ch/akantu
[2] http://scitas.epfl.ch/hardware/deneb