Geophysical Research Abstracts
Vol. 12, EGU2010-2149, 2010
EGU General Assembly 2010

Contraction star-shaped cracks: From 90 degrees to 120 degrees crack intersections

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Giant's Causeway, Port Arthur tessellated pavement, Bimini Road, Mars polygons, fracture networks in permafrost, septarias are some more or less known examples of self-organized crack patterns that have intrigued people through out history. These pavements are formed by constrained shrinking of the media due, for instance, to cooling or drying leading to fracture. The crack networks form in some conditions star-shaped cracks with mostly 90 or 120 degrees angles. Here, we report experiments allowing to control the transition between 90 and 120 degrees. We show that the transition is governed by the linear elastic fracture mechanics energy minimization principle, hence by two parameters: the cell size and the Griffith's length (balance between the energy needed to create cracks and to deform the material elastically). The results are used to infer new informations on tessellated pavements formation.