GRAIN BOUNDARY PATTERNS: FRACTAL NATURE AND CRYSTALLOGRAPHIC CONTROL -- NEW ASPECTS OF ANALYZING METAMORPHIC ROCKS

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Grain boundaries are one of the most important textural features of crystalline material. 'Old-fashioned' instruments like the polarizing microscope and universal stage and, in addition, new electron microscopy and computer techniques provide a wealth of data which help to get deeper insight not only into the history of metamorphic rocks but also into general re-structuring mechanisms and equilibrium and non-equilibrium conditions of crystalline material. Specifically, the fractal geometry offers powerful methods to produce detailed information about tectonometamorphic processes. With foam textures and sutured grain boundaries from analogue as well as naturally annealed material it will be exemplified how diffusion-controled migration of boundaries results in different types of textures in relation to time, temperature and type of material. The strong anisotropy of crystalline material leads to very specific crystallographic orientations of grain boundaries. This forms the basis for detailed information about the history and physical state of crystalline material. In general, on the basis of the present study, grain boundary patterns appear to be self-similar and there are indications that they represent self-organized systems. This opens doors to simulations and other types of new investigations and views on the behaviour of crystalline material which will be discussed.