Geophysical Research Abstracts, Vol. 8, 04961, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04961

Growth of complex carbonate surfaces

B. Jamtveit, Ø. Hammer, E. Jettestuen, Y. Y. Podladchikov
Physics of Geological Processes, University of Oslo, Norway

Carbonate aggregates precipitated at the Earth's surface or in subsurface fractures or pores, often show complex growth morphologies on a variety of scales and carbonate deposits represent one of the most striking examples of geological pattern formation on the Earth's surface. Common examples include stromatolites, travertine terraces, and a variety of spherulitic or botryoidal growth forms. We show how morphologically complex carbonate surfaces may be very accurately described by a simple surface-normal growth model that both reproduce the correct surface topography and the most pertinent characteristics of the growth controlled microstructures

The surface normal growth model can be extended to describe many pertinent features of travertine terrace formation based on shallow-water flow and an empirical positive correlation between the flow velocity and precipitation rate. The resulting self-organizing pattern formation process displays rich and unusual dynamics, consistent with field observations. Terraces coarsen with time, fold into lobes and migrate downstream with differential rates, resulting in striking patterns. This model, in which topography grows rather than erodes in response to rapid flow, produces patterns that are completely different from those generated by flow driven erosion.