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Alan Newell, Toby Shearman and Shankar C Venkataramani*

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Energy driven pattern formation is ubiquitous, and manifests itself in a variety of systems including convection patterns, crumpled paper, the complex morphology of leaves and, as we will argue, in the large scale structure of the Universe. A key idea in understanding these phenomena is through “rough solutions” in geometry, i.e. through the study of geometric objects that are “piecewise smooth” but that also contain lower dimensional defects.

We will present some recent work, aiming to show that the nature of such defects in piecewise smooth surfaces (2 dimensional objects) is constrained, and thus there are only a few possible types of defects in a wide variety of systems. Further, an analysis of one system then gives insights into the analysis of other systems in the same “universality” class, i.e. that have the same types of defects. We will illustrate this approach with concrete examples. (Received September 13, 2016)