The spreading of droplets of surfactant solutions on underlying gel layers is observed to be accompanied by the shaping of “starburst”-resembling cracking patterns on the gel surface. Marangoni stresses induced by surface tension gradients between the spreading surfactant and the underlying gel layer are identified to be the driving force behind these phenomena. A parametric study that involves the spreading of droplets of different surfactants on different gels aims to investigate the ways that system parameters such as the surfactant chemistry and concentration and the gel type and strength can affect the morphology and the dynamics of the cracking patterns. The surfactants used in this study include the well-known SDS (Sodium Dodecyl Sulphate) and “the super-spreader” Silwet L-77 (a Trisiloxane ethoxylate), and the different gel substrates are made of agar and gelatine. The instability associated with the cracking on the surface of the gels can be characterised in terms of the number of “arms” that forms and of their mean length as a function of time.

Figure 1: Fully-developed cracking patterns formed after the spreading of SDS droplets of different concentrations on 5 mm thick agar gel layers of different concentrations.