Supplementary Figure 1. Diagram describing the post-processing of the UV marker displacements used to produce silicon flow velocity maps. Punctual UV markers (1 mm radius) are disseminated in three distinct layers: at the base of the silicon cap (60 green markers), at mid-thickness (60 blue markers) and at the surface (60 pink markers). As shown by comparing the white light and the black light photographs, the UV markers are transparent in the visible wavelength. The post-processing consists in (i) extracting the position of every marker through time on the black light photographs and (ii) interpolating silicon flow velocity maps for every layer. The velocity of every marker is calculated by dividing the distance with the interval between two photographs (10 s).

Supplementary Figure 2. Silicon flow velocity map at the initial state. This map represents the silicon flow pattern when the silicon cap is only subject to gravity and viscosity forces. The silicon flows under its own weight and creates a radial pattern of flow.

Supplementary Figure 3. Experimental fan morphology comparison. The black dashed lines correspond to the elevation of the surrounding substratum. The blue dashed lines correspond to the silicon layer shape at the margin. a, DEM (on the left) and longitudinal profile (on the right) of the substratum in the outer part of the silicon putty right directly following an outburst event. The longitudinal profile (A-B) cuts through a low-angle "outburst" fan. b, DEM (on the left) and longitudinal profile (on the right) of the substratum in the outer part of the silicon putty after tunnel valley development . The longitudinal profile (C-D) starts at the valley bottom and cuts through a high-angle marginal fan.