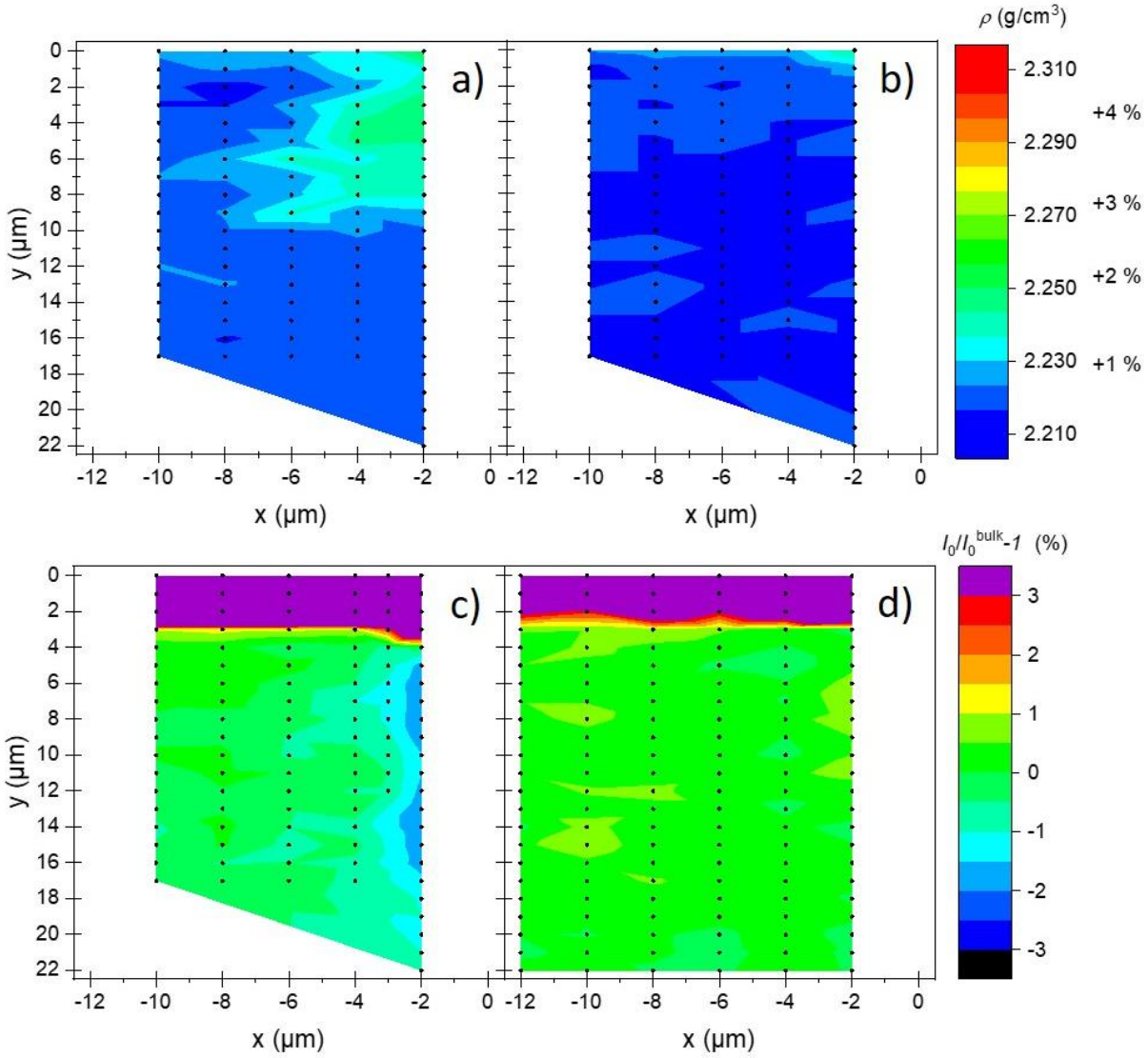

Supplementary Figure 2. Density maps (a, b) as derived from the maximum position of the FSDP[1] and normalized relative difference of the scattering intensity at $q = 0$ nm^{-1} (c, d), representing the variation of the AEDF. Both shown for indent 2: *in-situ* under load (a, c); after unloading (b, d). The data shows different dimensions and shapes of the areas, which are affected by the indenter tip (center is located at $(x,y) = (0,0)$) for short-range order (density or FSDP, Fig. a) and topological heterogeneity (AEDF, Fig. c), respectively, while the quantity of the effect with ~1.5 % is very similar. Upon stress release with unloading, both contributions seem to fully relax. However, a permanent densification of a small volume in the vicinity of the indenter tip (-4 µm < x < 0 µm, 0 µm < y < 1 µm) cannot be excluded from these SAXS measurements.

[1] C. Z. Tan and J. Arndt, *X-ray diffraction of densified silica glass.* Journal of Non-Crystalline Solids, **249**(1), 47-50 (1999) (https://doi.org/10.1016/S0022-3093(99)00245-8)