Rheological hysteresis in soft glassy materials THIBAUT DIVOUX, VINCENT GRENAUD, SEBASTIEN MANNEVILLE, Ecole Normale Superieure de Lyon — The nonlinear rheology of a soft glassy material is captured by its constitutive relation, shear stress vs shear rate, which is most generally obtained by sweeping up or down the shear rate over a finite temporal window. For a huge amount of complex fluids, the up and down sweeps do not superimpose and define a rheological hysteresis loop. By means of extensive rheometry coupled to time-resolved velocimetry, we unravel the local scenario involved in rheological hysteresis for various types of well-studied soft materials. Building upon a systematic experimental protocol, we introduce two observables that quantify the hysteresis in macroscopic rheology and local velocimetry respectively, as a function of the sweep rate \( \delta t^{-1} \). Strikingly, both observables present a robust maximum with \( \delta t \), which defines a single material-dependent timescale that grows continuously from vanishingly small values in simple yield stress fluids to large values for strongly time-dependent materials. In line with recent theoretical arguments, these experimental results hint at a universal timescale-based framework for soft glassy materials, where inhomogeneous flows characterized by shear bands and/or wall slip play a central role.