Vortex dynamics in columnar-defected YBCO-films

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By high-resolution SQUID-magnetometry, we study the influence of columnar defects of field-equivalent density B_ϕ = 1 T on the flux creep in thin $YBa_2Cu_3O_{7-\delta}$ films. At temperatures $T^*(B, B_\phi)$, the relaxation rates reveal a sharp crossover from a glassy dynamics to a faster algebraic flux creep which disappears at the transition lines $T_c(B)$ to equilibrium superconductivity. As key results we report the effect of defect filling $f = B/B_\phi$ on the exponent μ of the glassy vortex dynamics at $T < T^*$. For vanishing f we find μ = 1/3 indicating a Mott-like variable range hopping of free vortices while $\mu(f = 0.1) = 0.7$ agrees with a result by recent numerical work for interacting flux lines in the Bose glass (BG) model. For larger filling, however, we observe $\mu(f \to 1) \to 1$, which is inconsistent with these BG simulations.