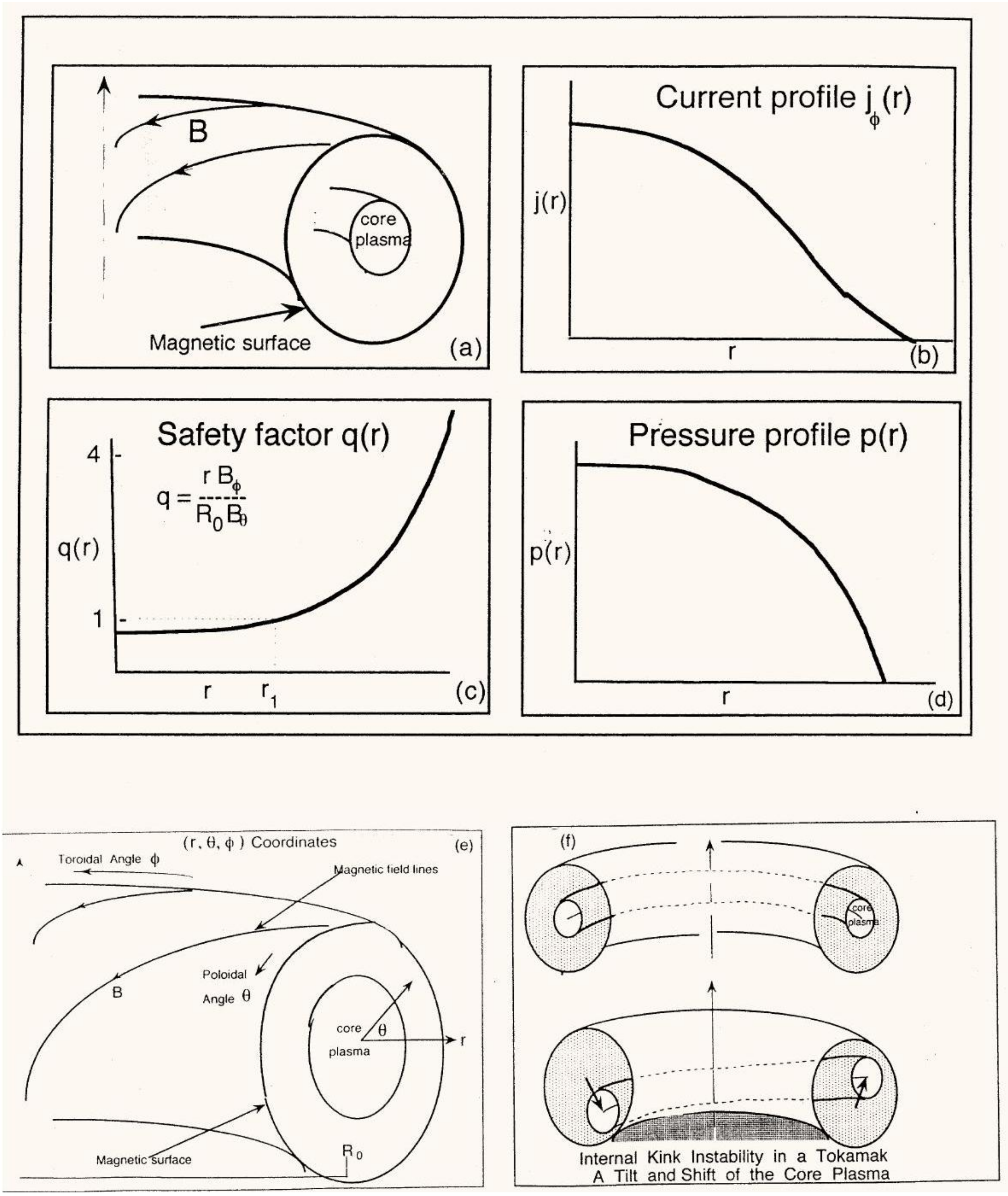

Figure 1: *(a) Geometry of a Tokamak. (b), (c), (d), typical profiles for the toroidal plasma current $j_\phi(r)$, the field line winding number, or 'safety factor', $q(r)$ and the pressure $p(r)$. (e) The magnetic coordinates r, θ, ϕ. (f) Geometry of the internal kink instability in a torus.*

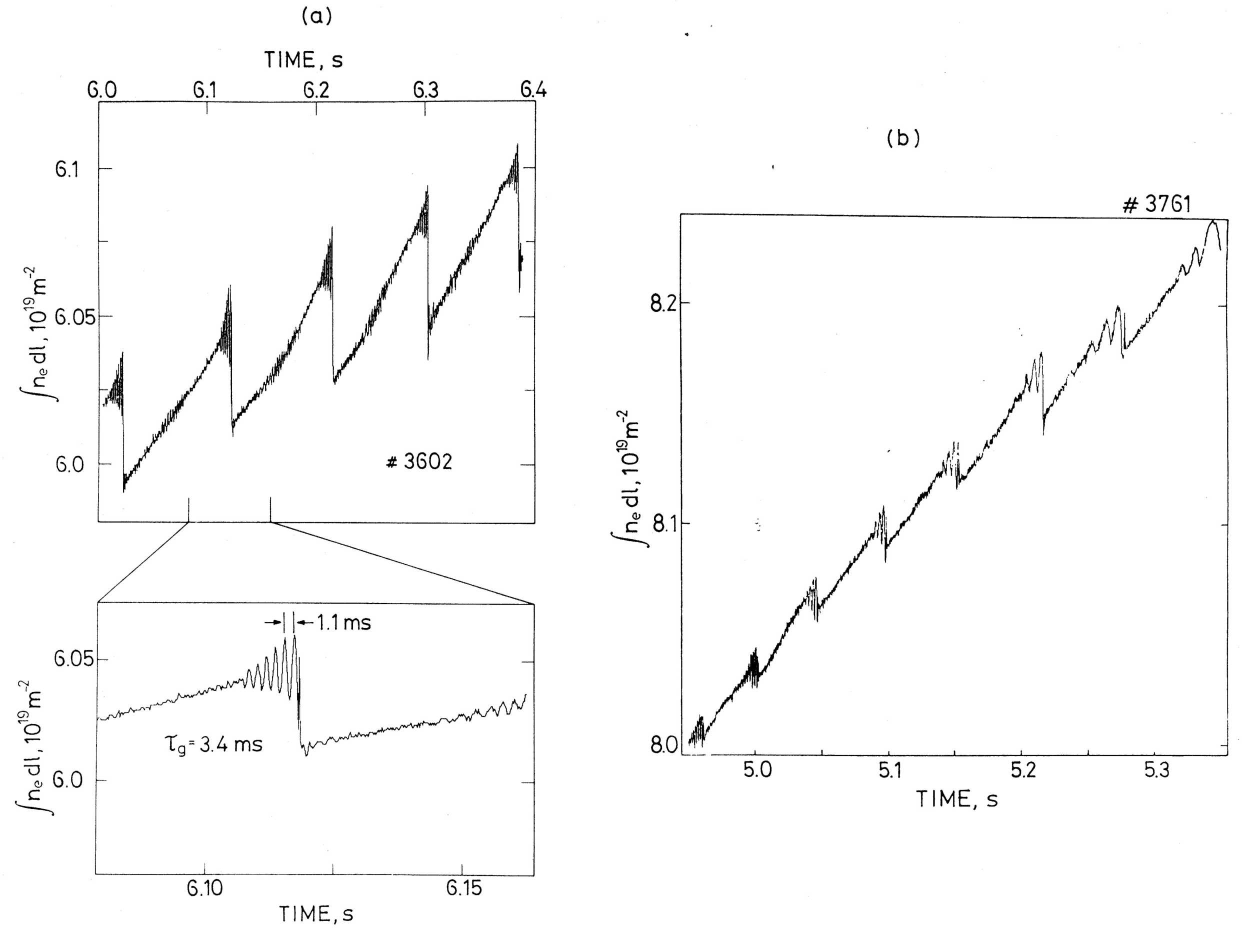

Figure 2: *Typical electron temperatures $T_e(r)$, before and after the collapse phase of the Sawtooth instability. The mixing radius r_m defines the radial limit of the sudden change in $T_e(r)$, while the inversion radius r_I is defined as the point at which* $\delta T = (T_{final} - T_{initial}) \simeq 0$.

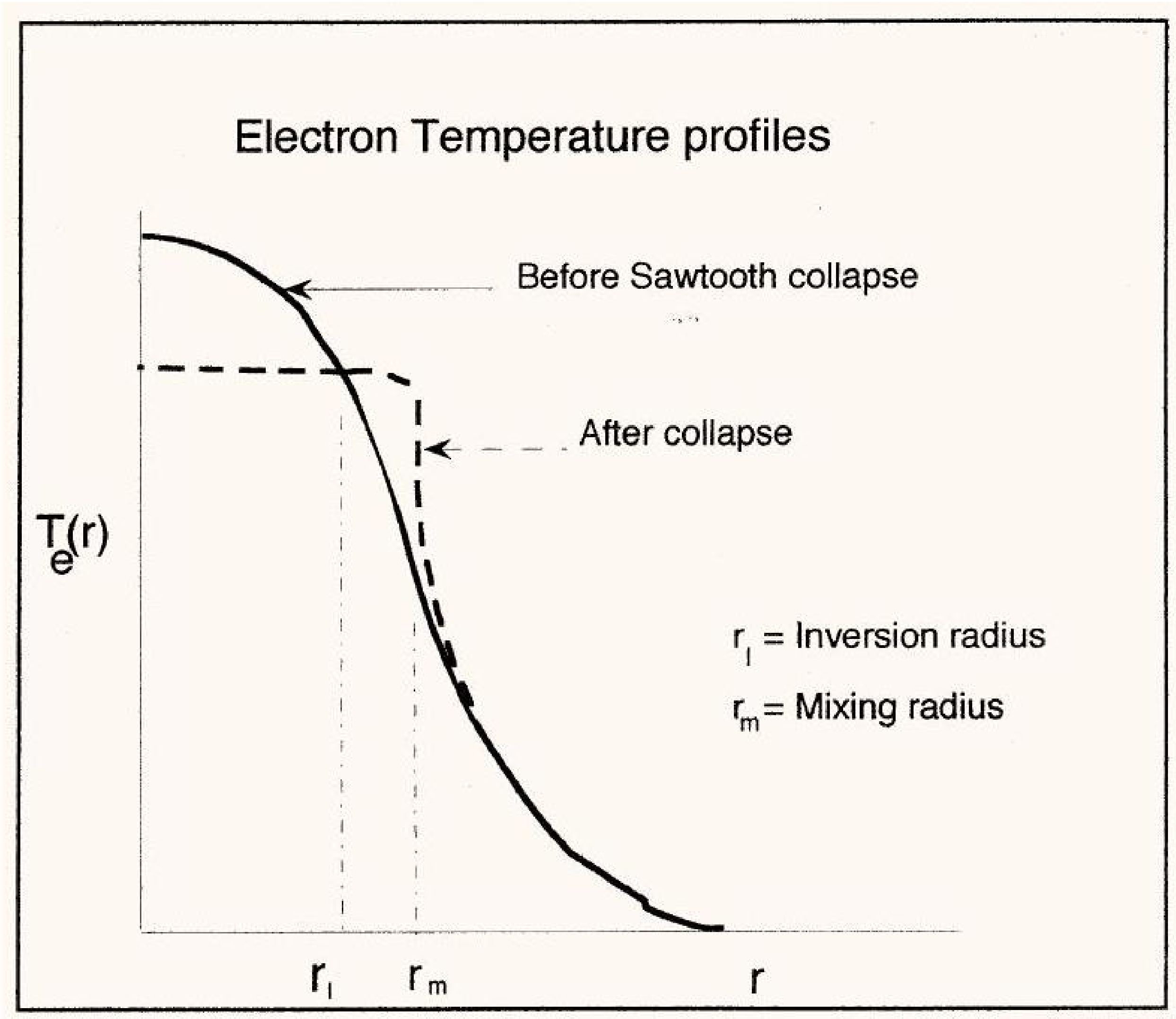

Figure 3: *Typical electron temperatures $T_e(r)$ before and after the collapse phase of the Sawtooth instability. The mixing radius r_m defines the radial limit of the sudden change in $T_e(r)$, while the inversion radius r_I is defined as the point at which $\delta T = T_{final} - T_{initial} \approx 0$.*

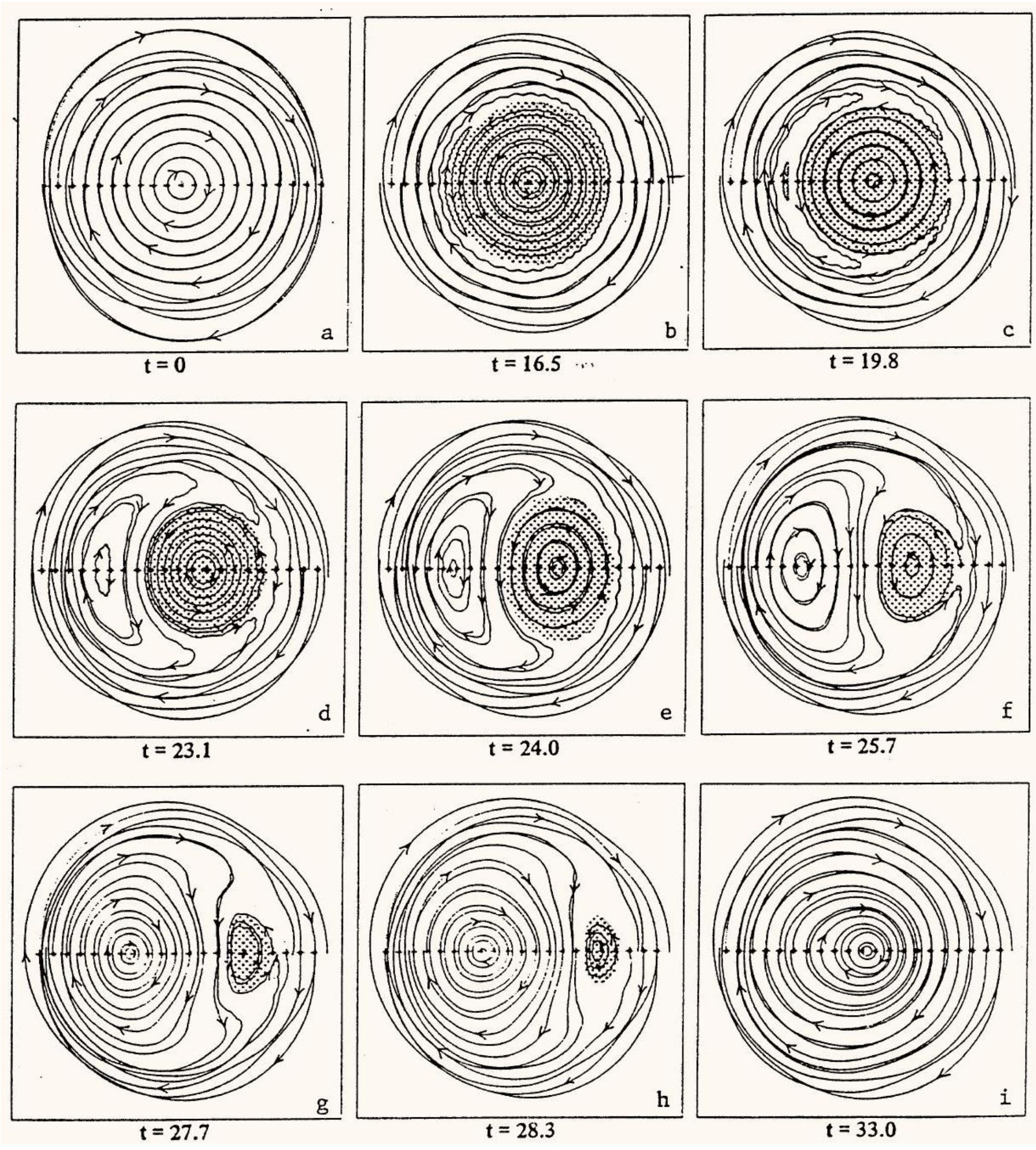

Figure 4: *Approximate structure of magnetic surfaces during the reconnection process, showing growth of the, crescent-shaped, magnetic island, shrinking of the hot core plasma, until the island takes its place and a new cylindrically symmetric equilibrium is established (from Reference 6).*

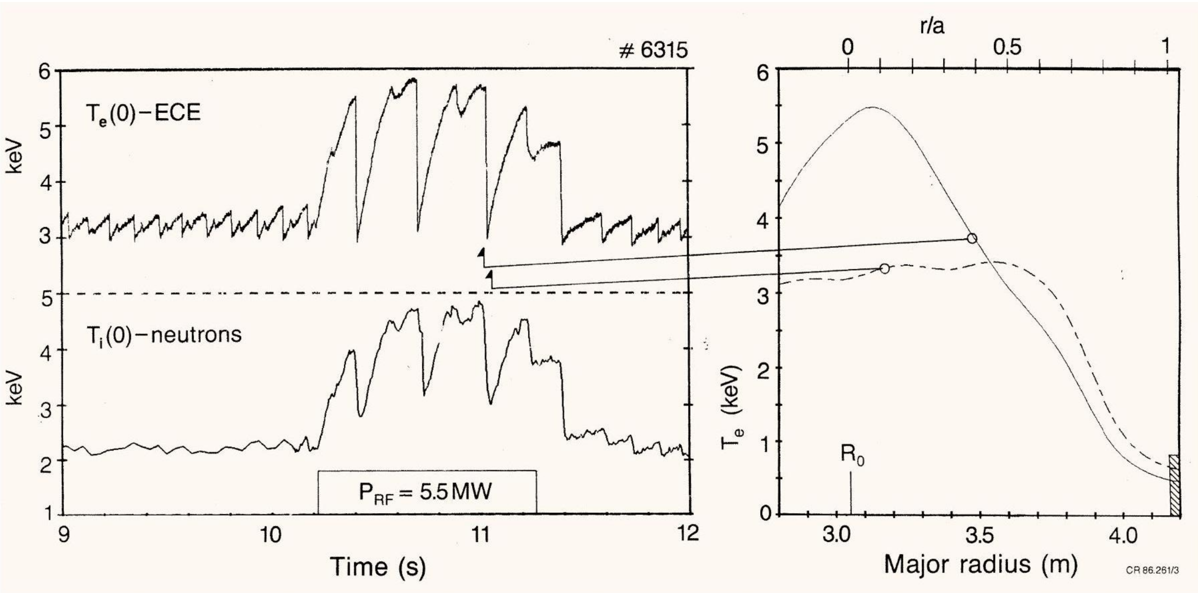

Figure 5: *Longer Sawtooth periods after auxiliary heating is switched on suggest that the kink mode is not driven unstable by plasma pressure. Also note the dramatic collapse (50%) of the central electron temperature T_e in this JET discharge with auxiliary heating (ICRH).*

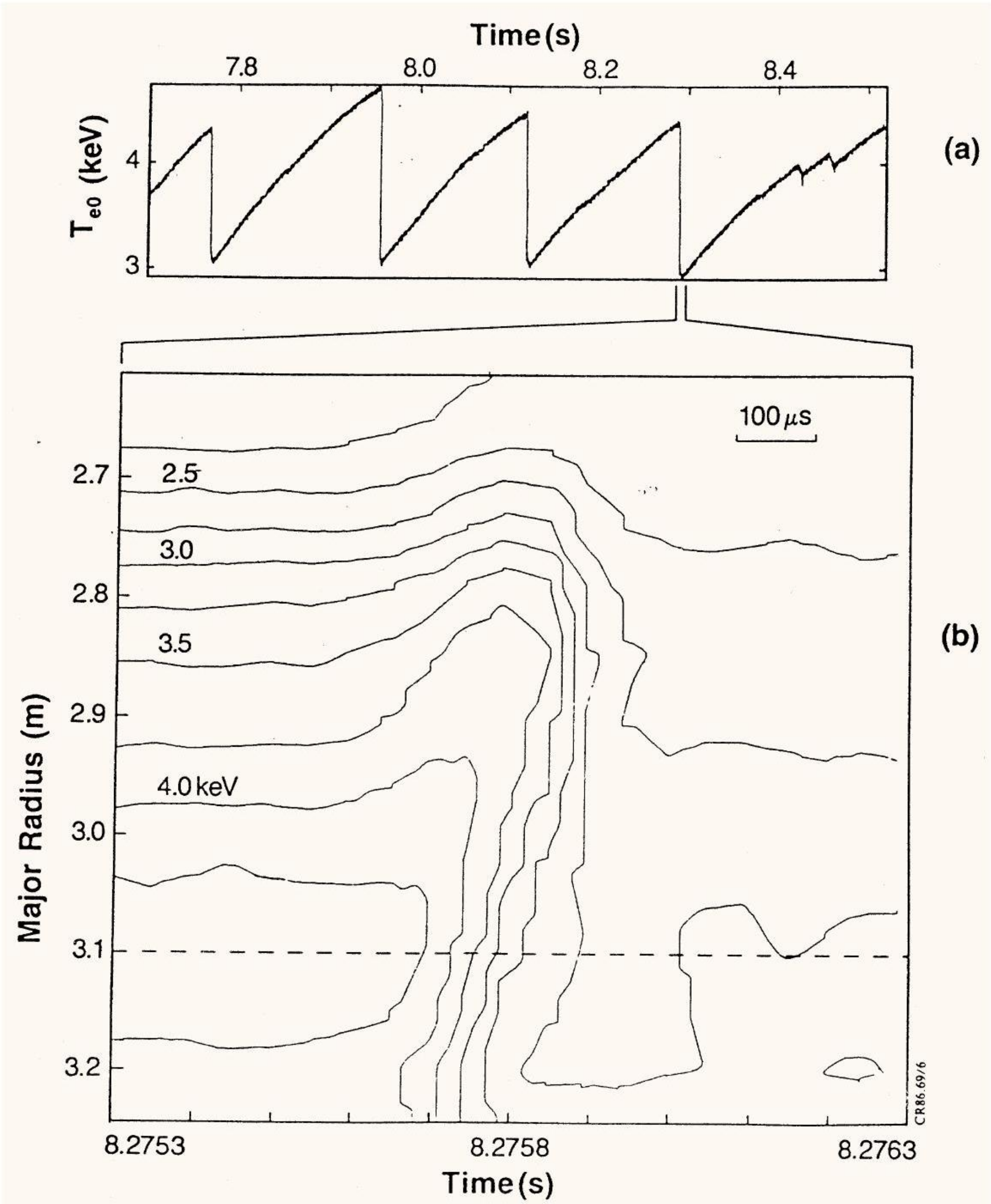

Figure 6: *Fast Sawtooth collapse events without a precursor oscillation. The kink displacement of the plasma core is still a feature (Figure 6b), but occurs on the same* 100μsec *timescale as the thermal collapse. Figure 6b shows the electron temperature as a function of major radius R, and time t.*

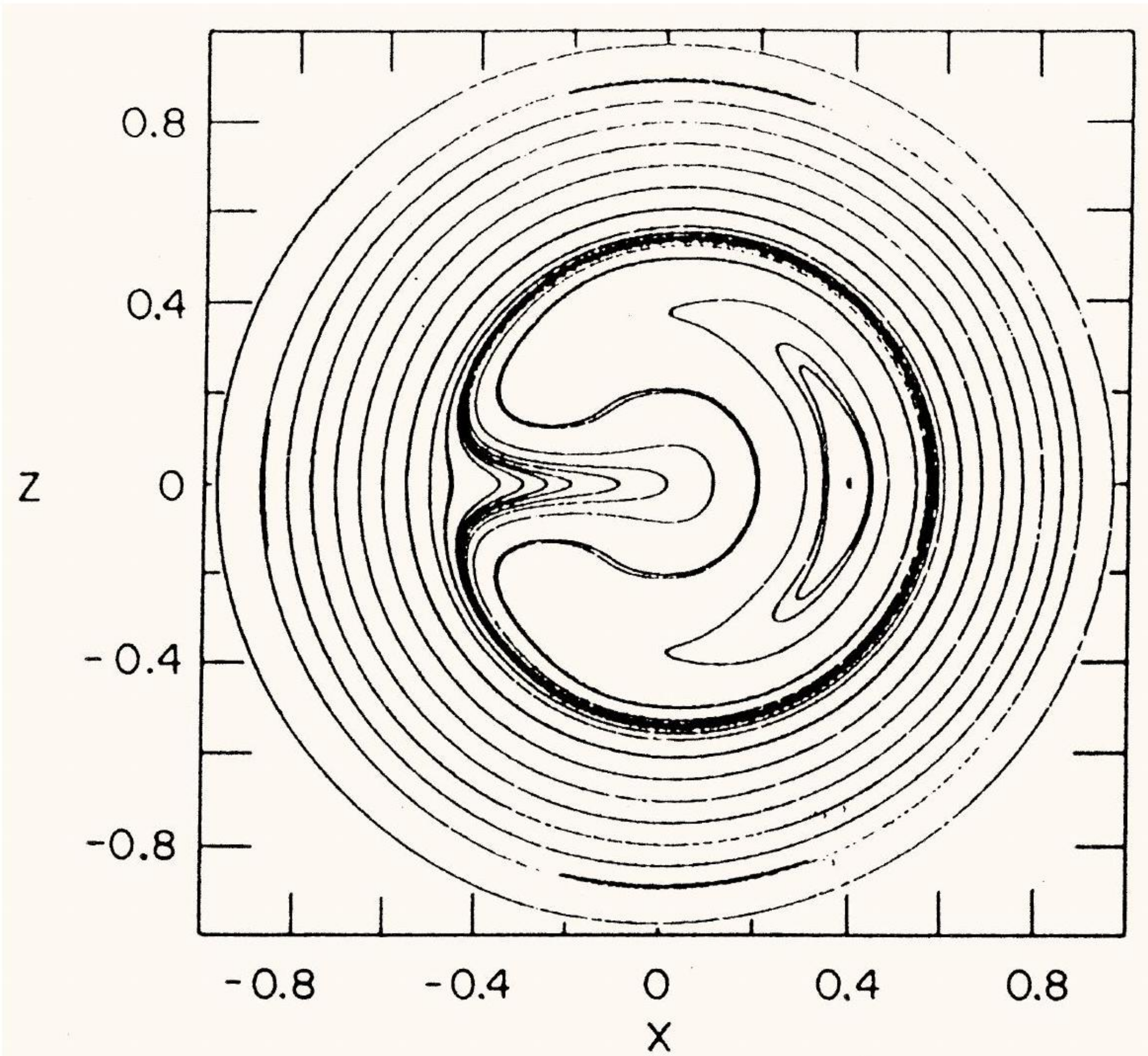

Figure 7: *Magnetic surface shapes in the non-linear phase of the $m = n = 1$, Ideal MHD kink instability, when $q \sim 1$ in the plasma core. There is no reconnection. The hot core plasma distorts to a crescent shape and is pushed aside; a bubble of cooler plasma is drawn into the concave side of the crescent, in a 'quasi-interchange' motion.*

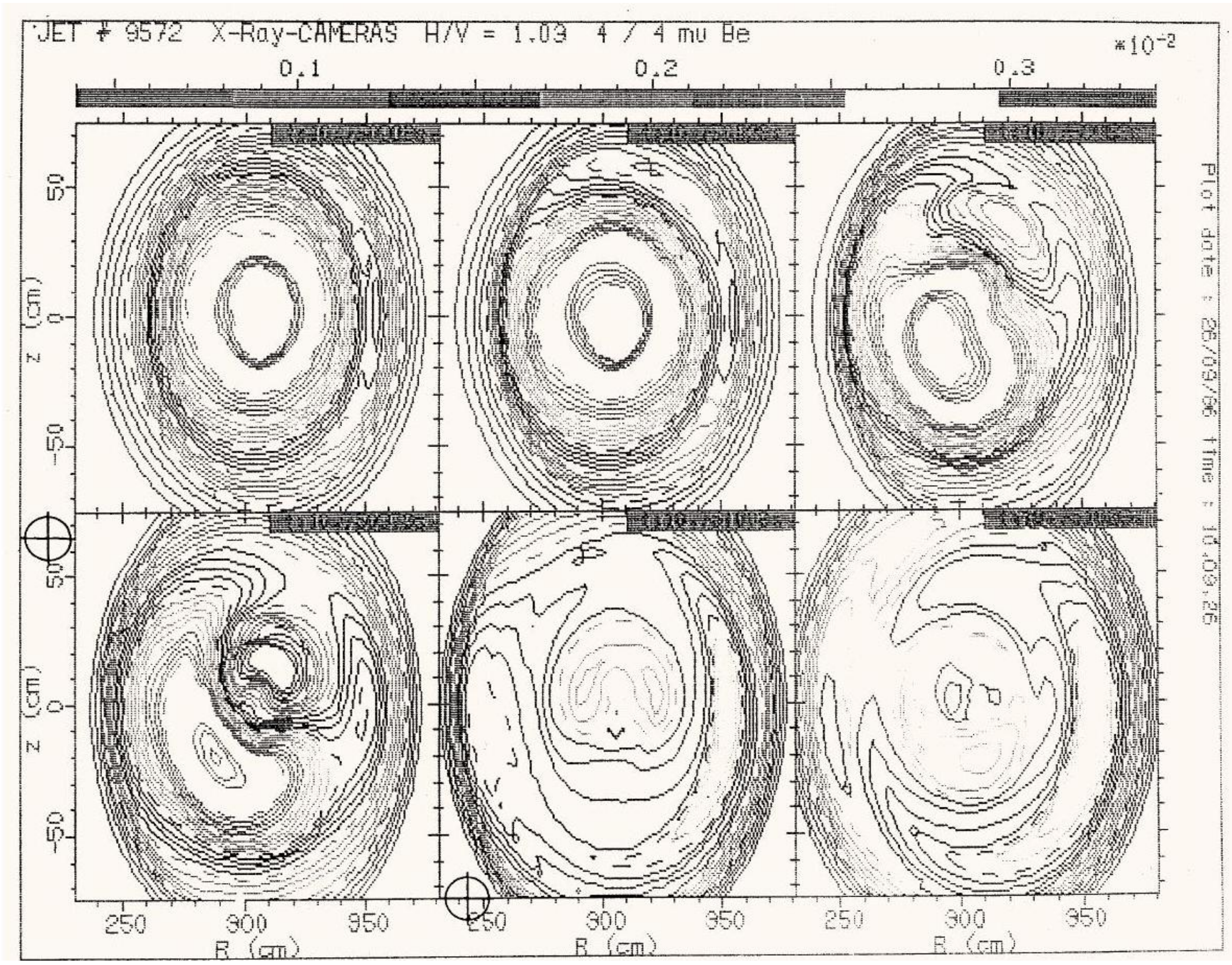

Figure 8: *Contours of constant SXR emission during a Sawtooth collapse in the JET Tokamak, displaying the 'hot-crescent, cold-bubble' or 'quasi-interchange' structure.*

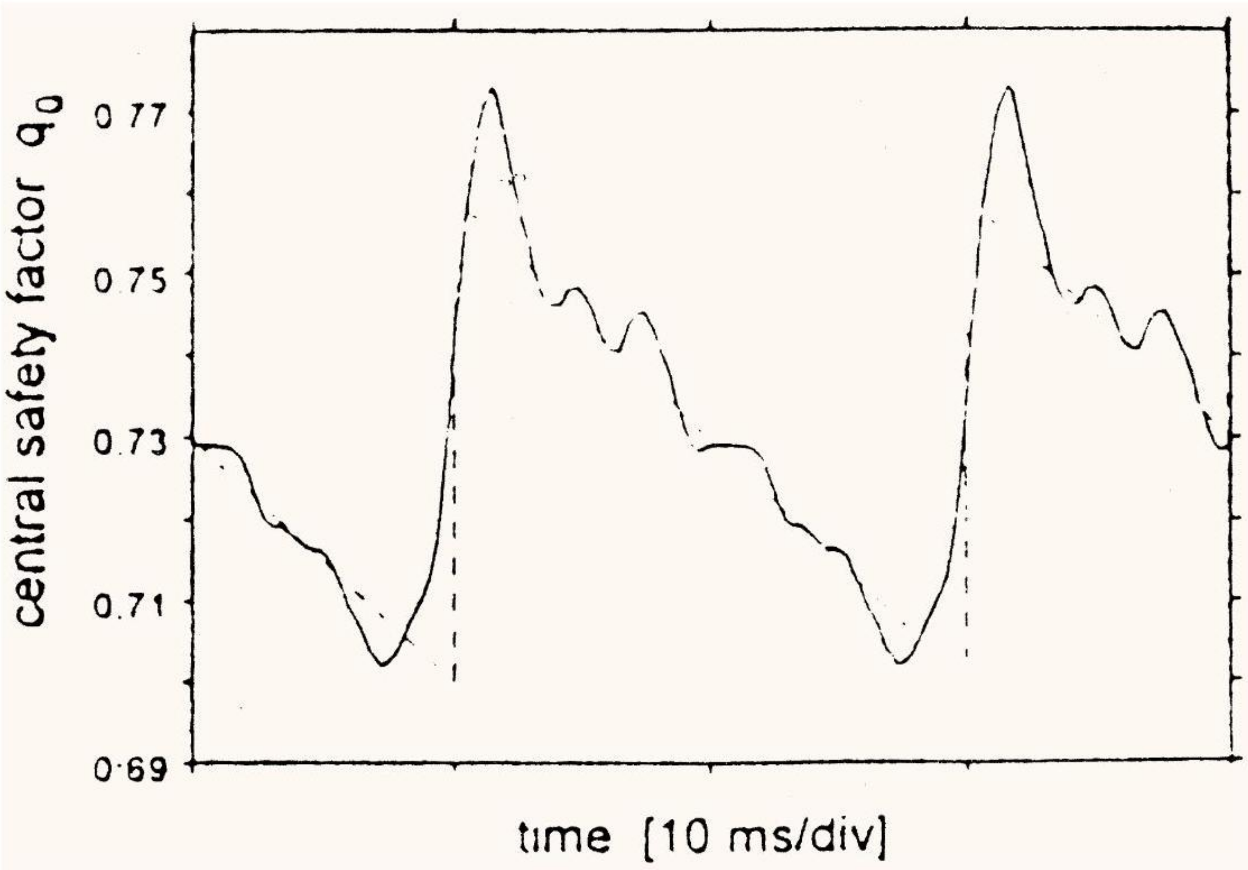

Figure 9: *Behaviour of $q(0)$, during a Sawtooth on TEXTOR. The axial value of q never rises above 0.8. Box-car averaging techniques were used to sum the signals from many similar Sawteeth, and enable the $\sim 5\%$ sudden changes in q_0 to be monitored.*

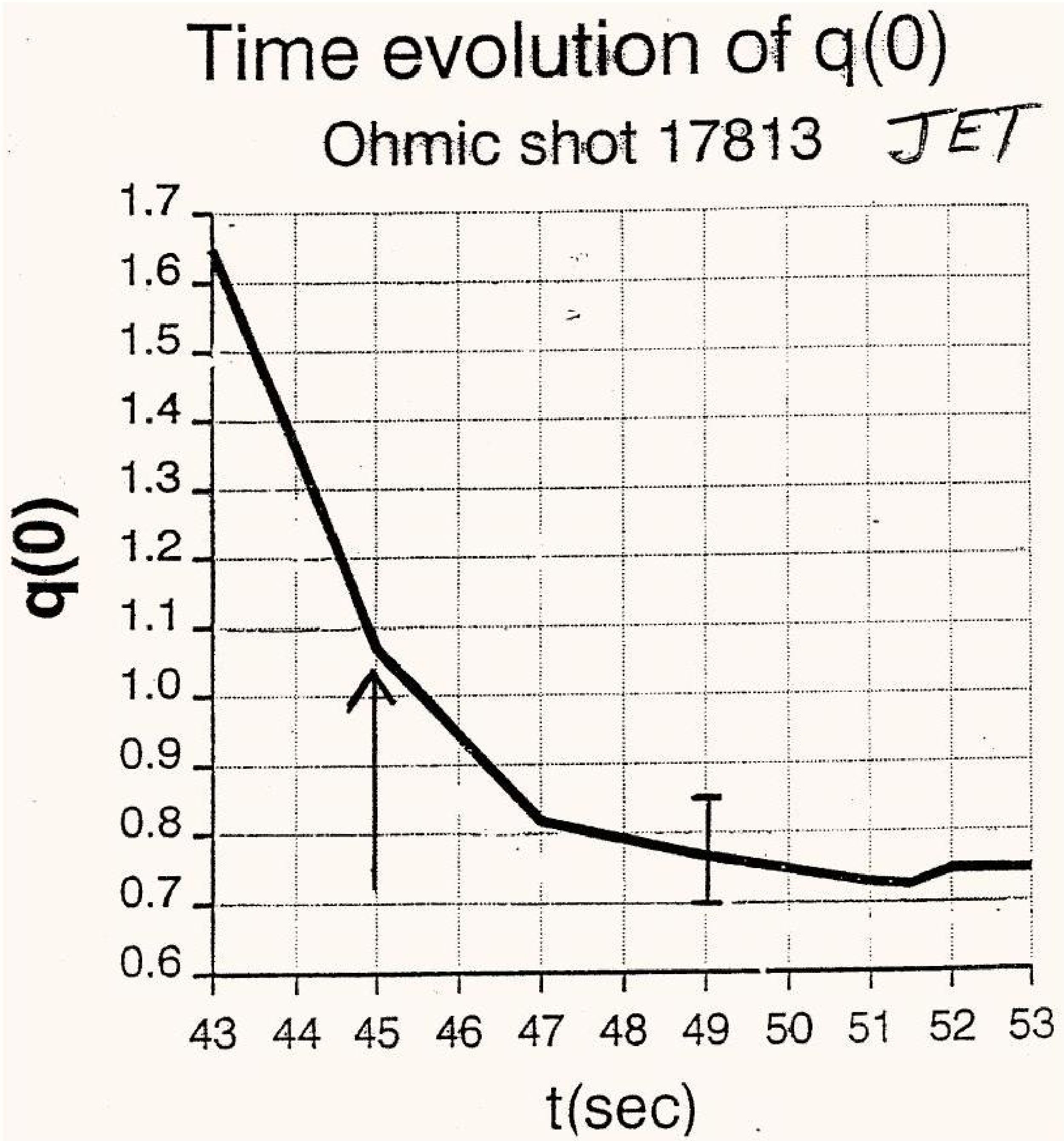

Figure 10: *Evaluation of $q(0)$ in a JET ohmic discharge. $q(0)$ continues to decrease after Sawtoothing commences at $t = 45$. Averaging smoothes out the small modulations which occur at each Sawtooth event, which are consequently not visible (from Reference 28).*

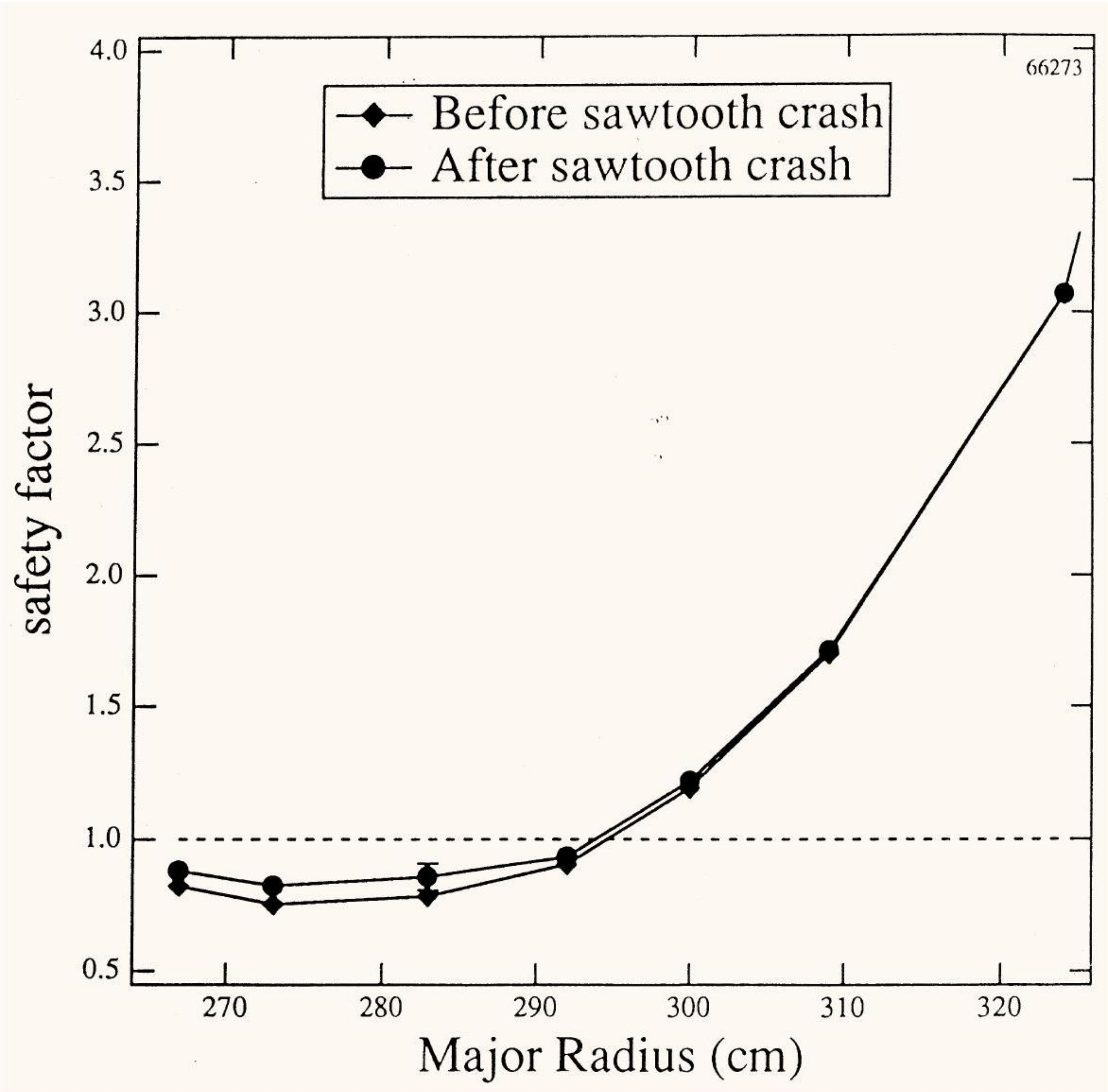

Figure 11: *$q(r)$ profiles just before, and just after, a Sawtooth collapse on the TFTR Tokamak, measured using the Motional Stark Effect (from Reference 32).*

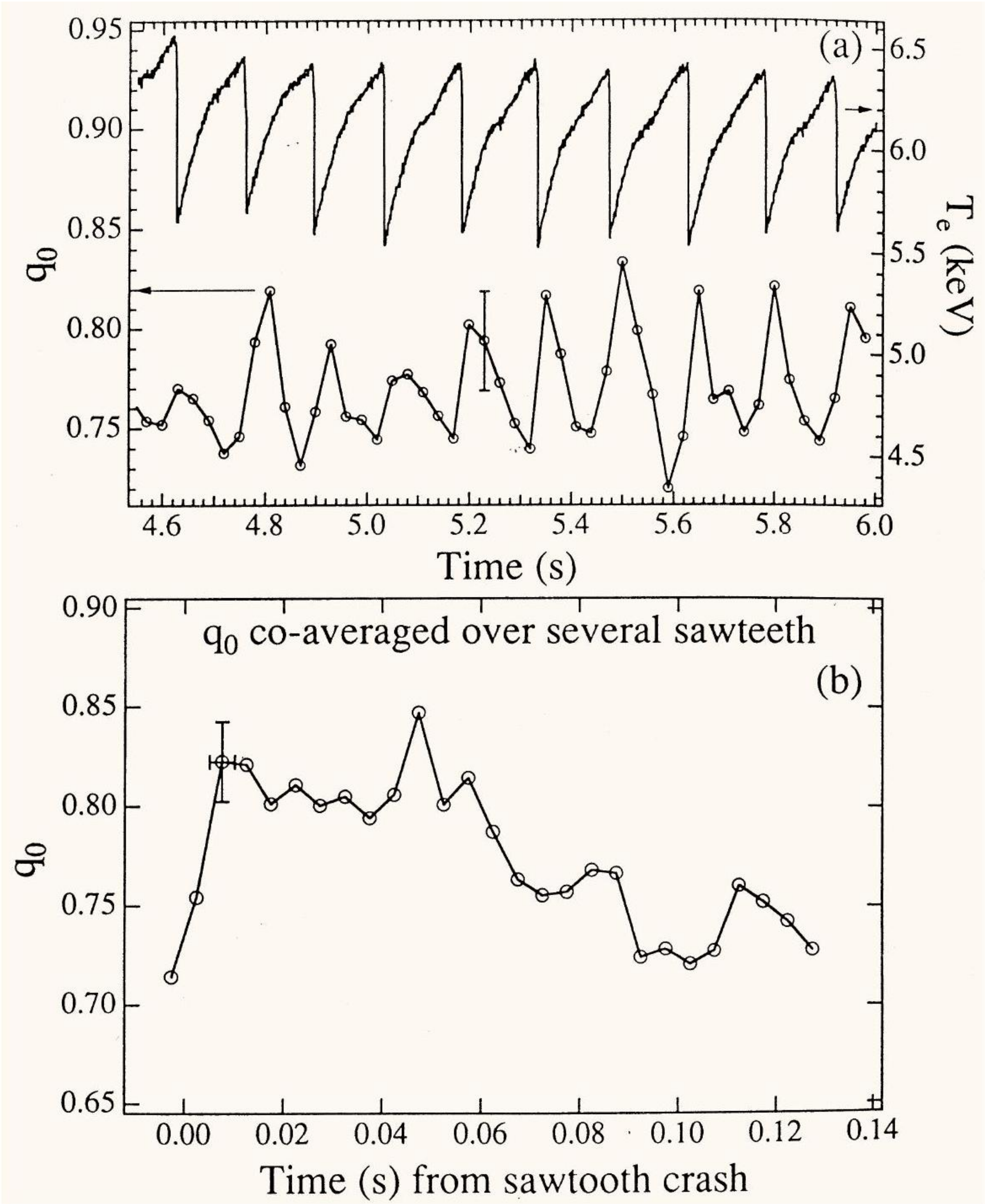

Figure 12: *(a) q_0 measurements using MSE during Sawtoothing on the TFTR Tokamak. (b) q_0 evolution during a Sawtooth period, obtained by averaging 9 consecutive Sawtooth events (from Reference 32).*

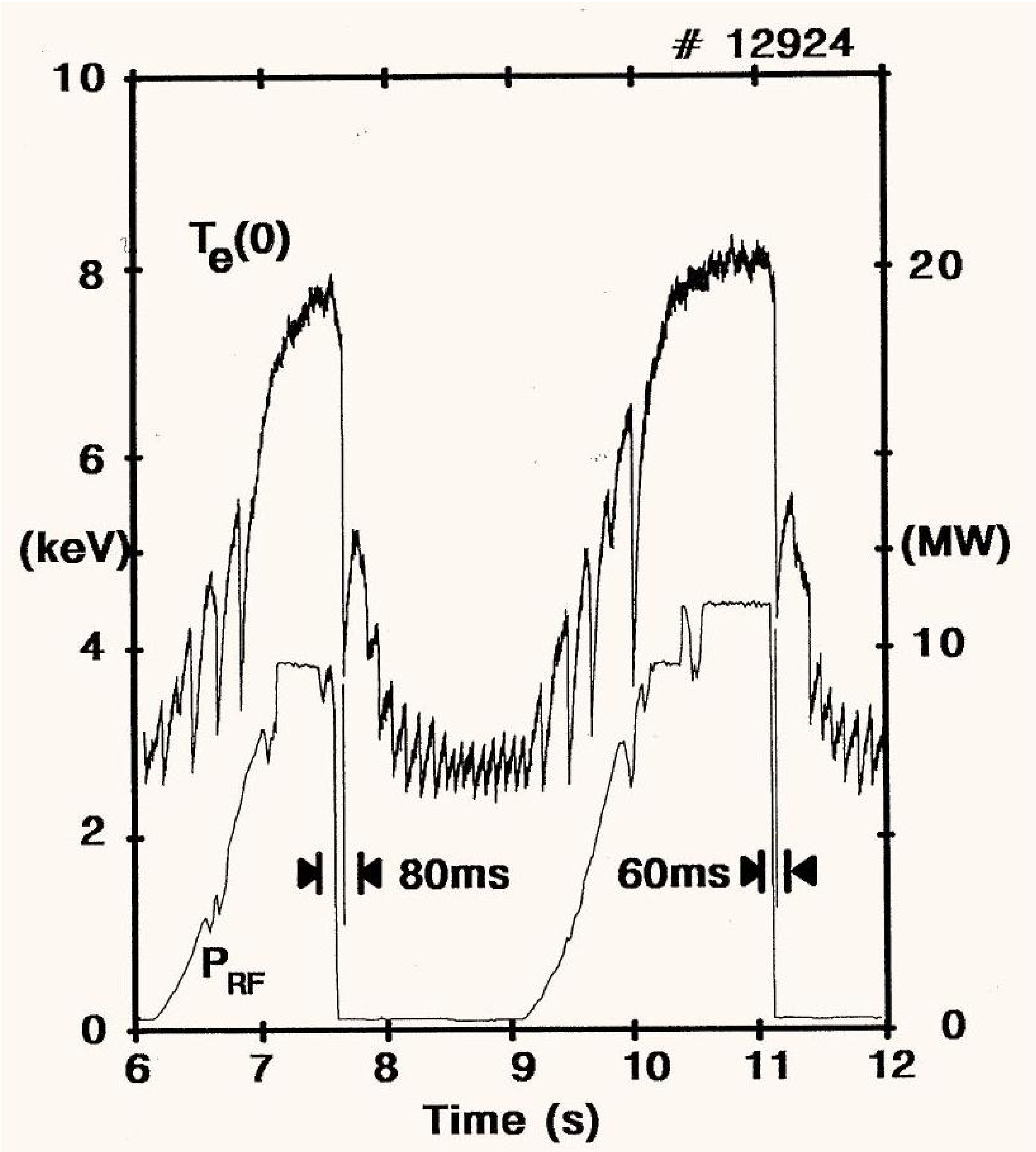

Figure 13: *Stabilising effect of energetic ions demonstrated by switch-off of ICRH. This triggered a Sawtooth collapse in 60 - 80 msec, a delay comparable to the slowing down time of the trapped energetic ions generated by the ICRH.*

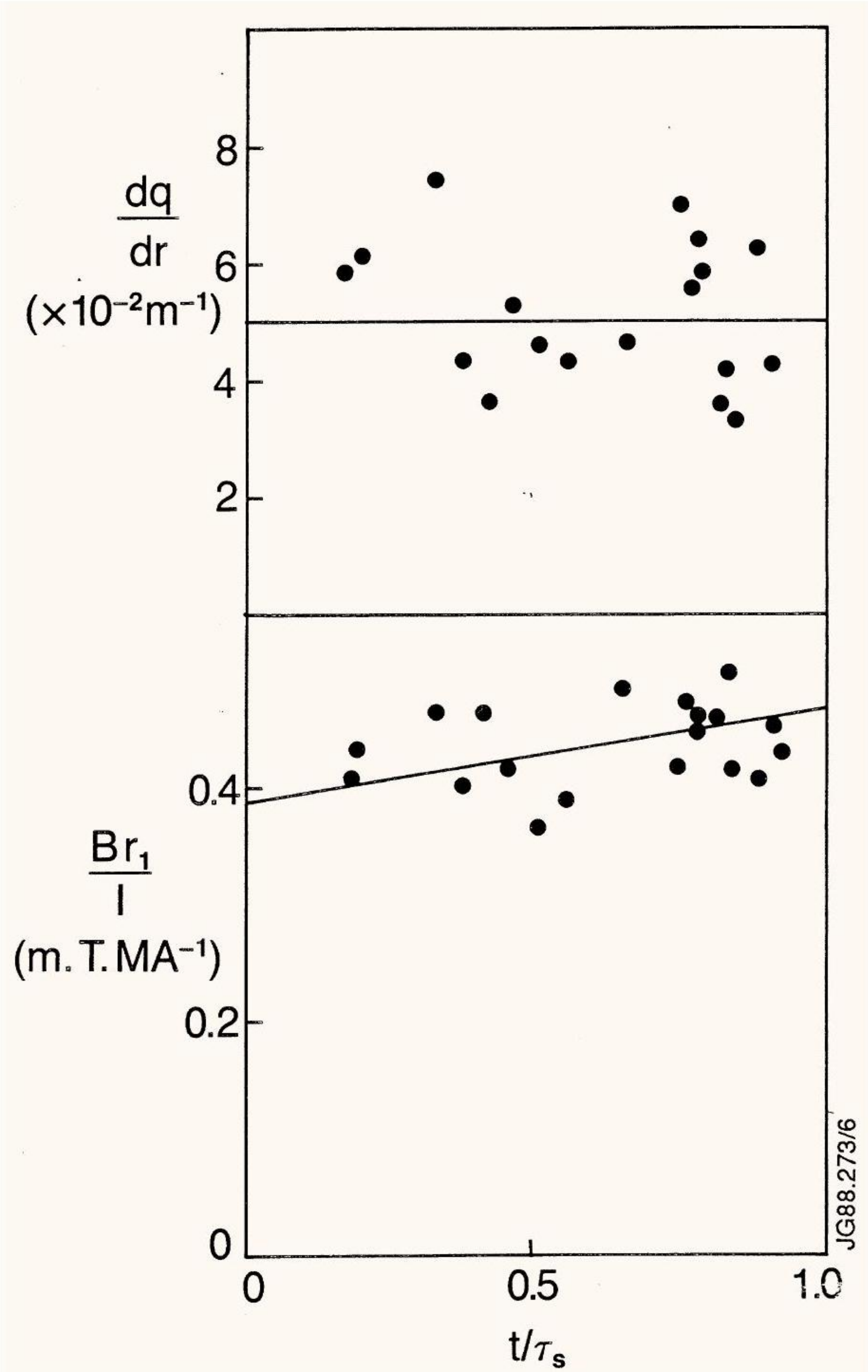

Figure 14: *Magnetic shear, $s_1 = r_1 \frac{dq}{dr}(r_1)$ at the $q = 1$ surface as inferred from light emitted as a pellet passes through $q = 1$. Note the lack of correlation between values of $q'(r_1)$ and the time elapsed since the last Sawtooth collapse (from Reference 51).*

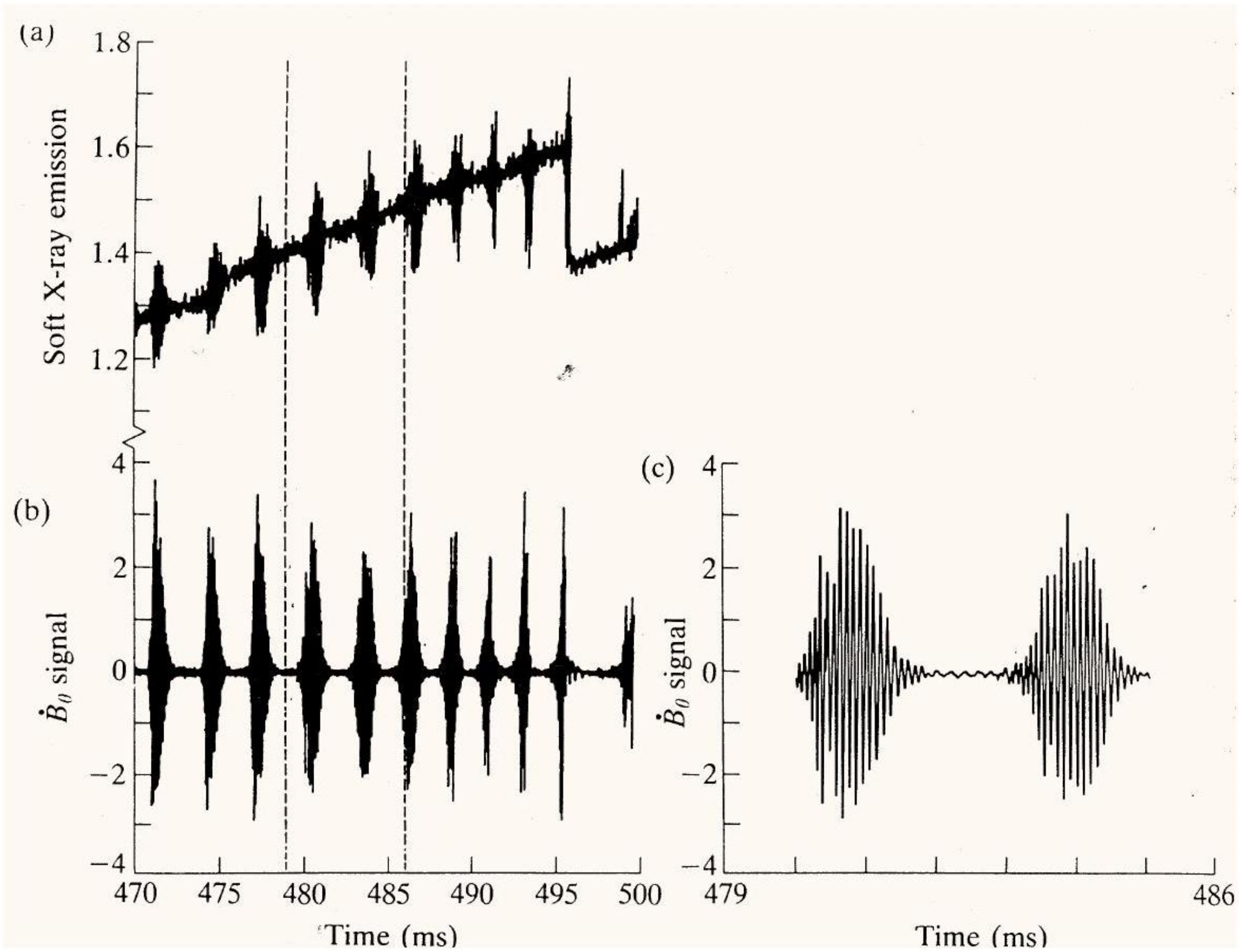

Figure 15: *(a,b) Regular bursts of fishbone activity on PDX as seen on soft X-ray emission and magnetic fluctuations. (c) Characteristic signature of the magnetic fluctuation signal for the Fishbone instability on the PDX Tokamak (from Reference 60).*