point, decreases as $t^{-\frac{1}{3}}$ until viscous effects become more important than inertial effects, causing the front speed to decrease more rapidly.

The shallower the upper layer is relative to the dense layer, the greater must be the speed of the return flow there. Theory indicates that this trend results in the formation of an interfacial hydraulic drop for $h_0/H > \frac{1}{2}$, but experiments give no indication of a hydraulic drop until $h_0/H > 0.7$. The values of the constant speed during the first stage for other values of h_0/H than 1 have been shown to decrease almost linearly from 0.7 when $h_0/H = 0$ to about 0.5, as already mentioned, for $h_0/H = 1$.

12.2.2 Second stage (self-similar flow)

During the stage when the front speed has begun to decrease, the gravity current is well described as collapsing through a series of equal-area rectangles, the so-called box model, in which the current depth is roughly uniform along the length of the current, but steadily decreases with time.

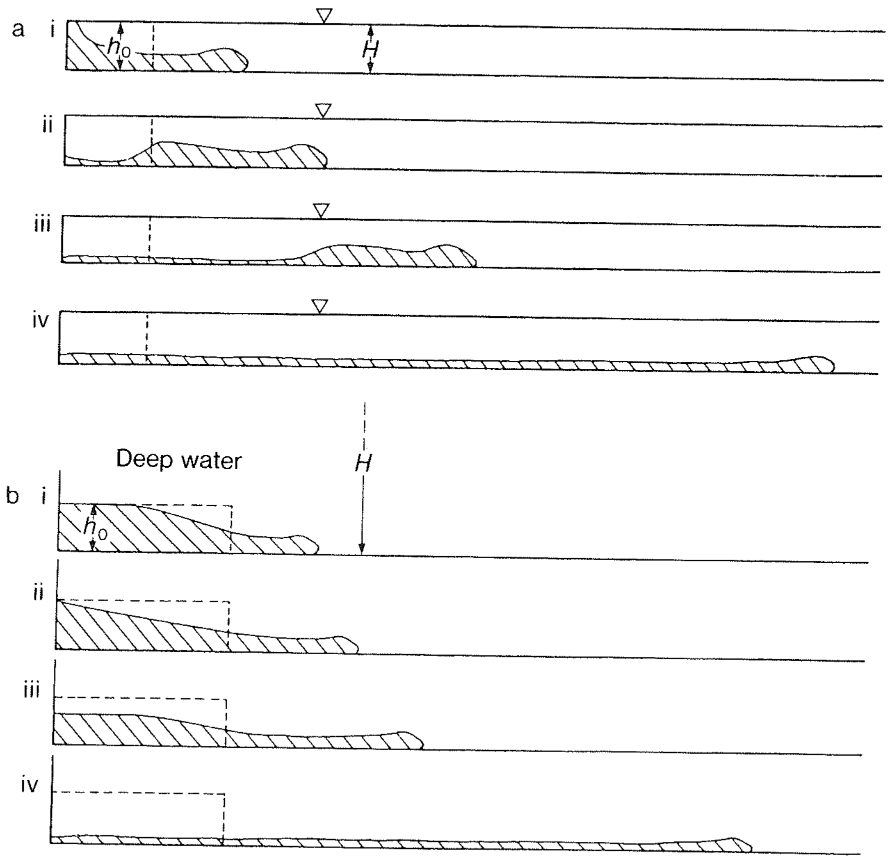

Figure 12.5 The collapse of a volume of dense fluid at four stages after release. The dense fluid is the same depth as the fresh water in (a) and is much less deep than the water in the channel in (b). The dashed lines indicate the boundary of the fluid before collapse.