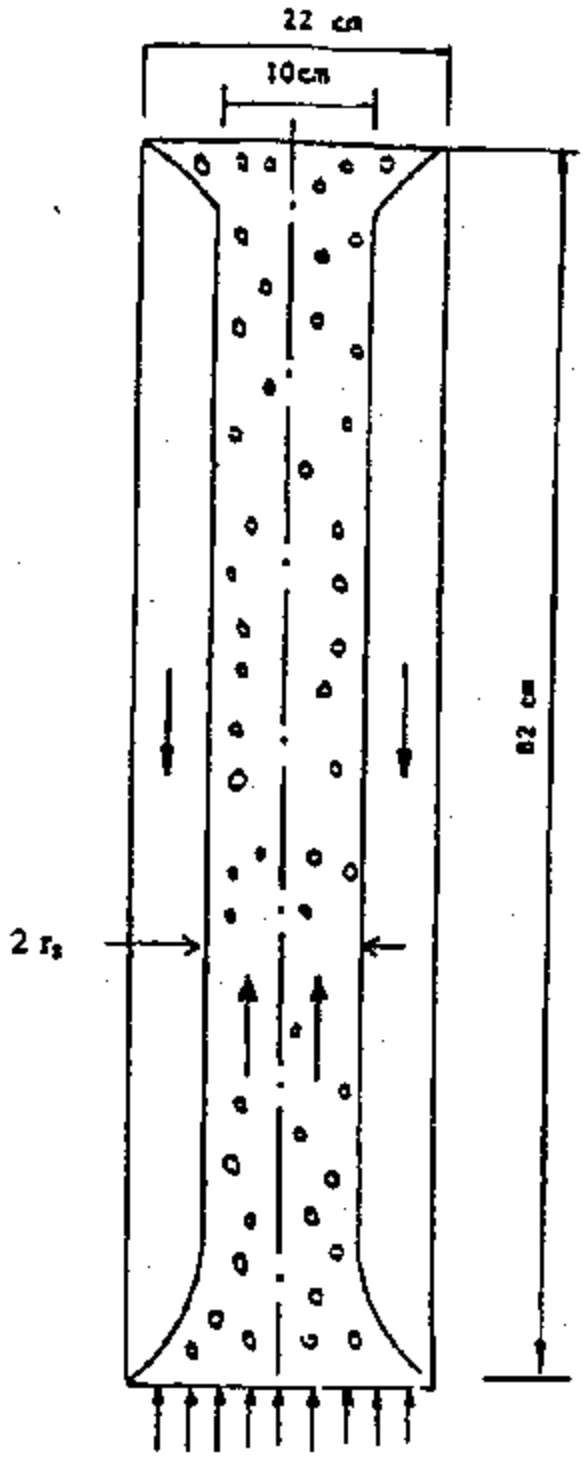
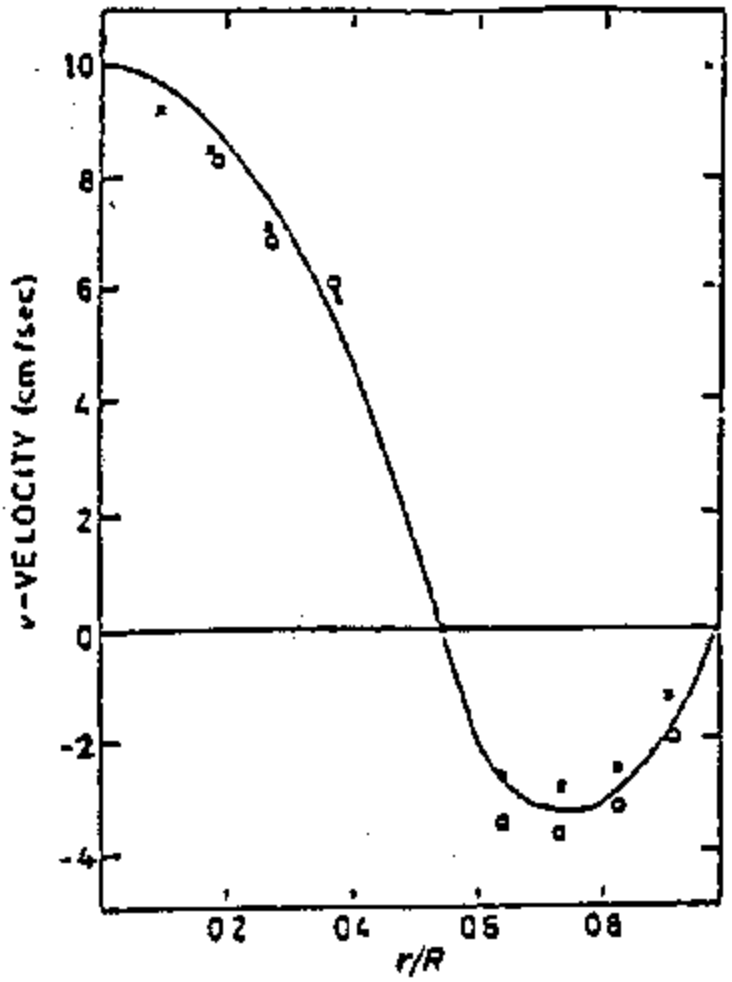


Fig. 4.1 Geometry of the bubble column
(Experiments by Rietema and Ottengraf, 1970)



$q_d = 0.3834 \times 10^{-5}$ $\quad \alpha = 0.0118$

$\varphi = 0.4108 \times 10^{-4}$ $\quad \delta = 0.46$

Fig. 4.2 Experimentally determined velocity profile, from Rietema and Ottengraf (1970).

q_d DIMENSIONLESS AIR FLOW-RATE

φ DIMENSIONLESS SLIP VELOCITY

δ DIMENSIONLESS STREET DIAMETER

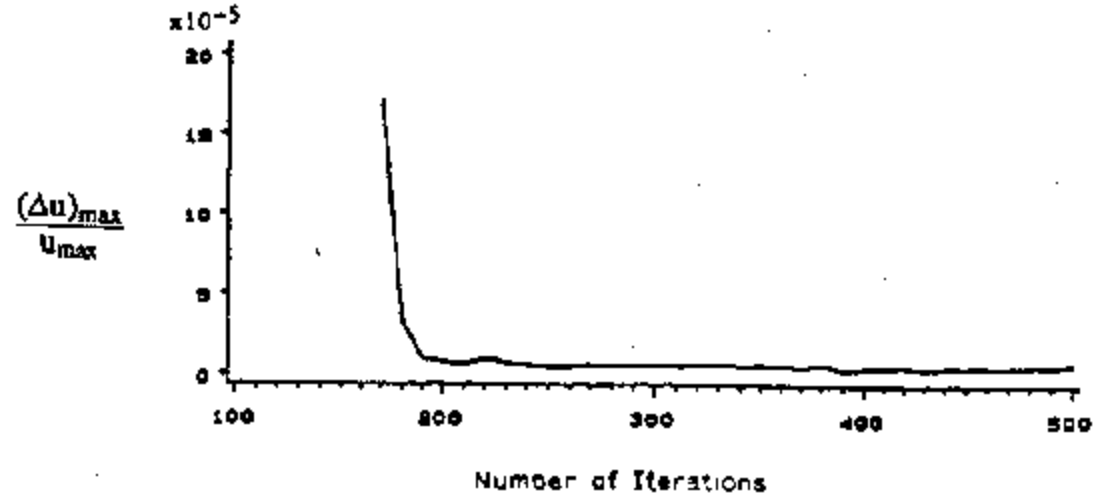


Fig. 4.3 Convergence of numerical solution with respect to the maximum relative changes in axial velocity.

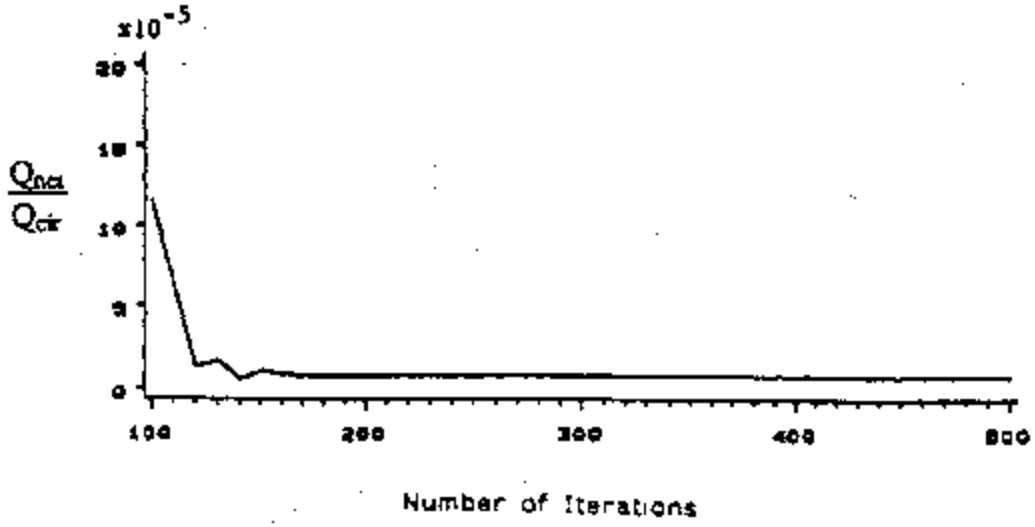


Fig. 4.4 Convergence of numerical solution with respect to the net recirculated liquid mass Q_{net}.

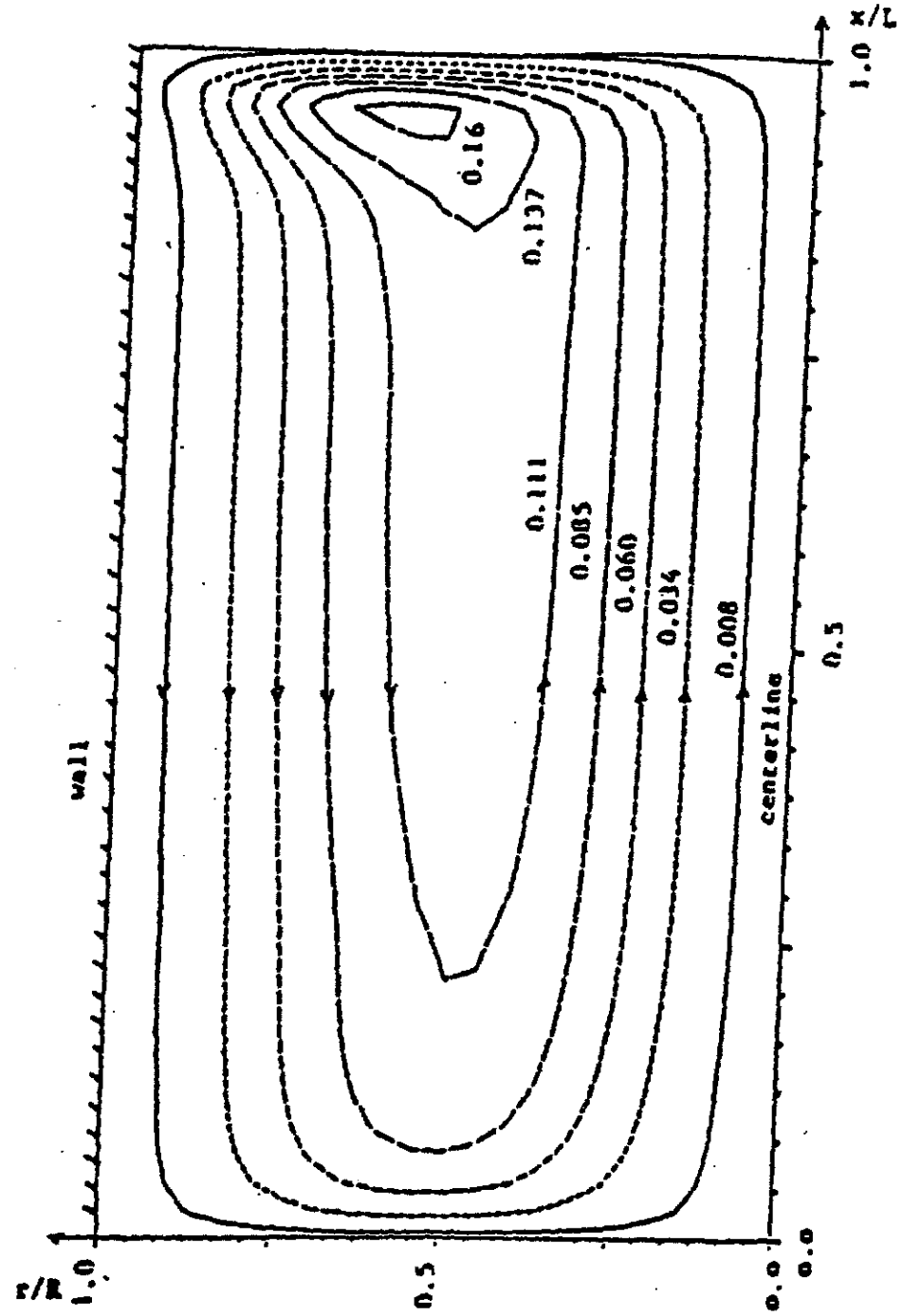


Fig. 4. 5 (a) Calculated circulation pattern
(Result from a cosine α distribution function)

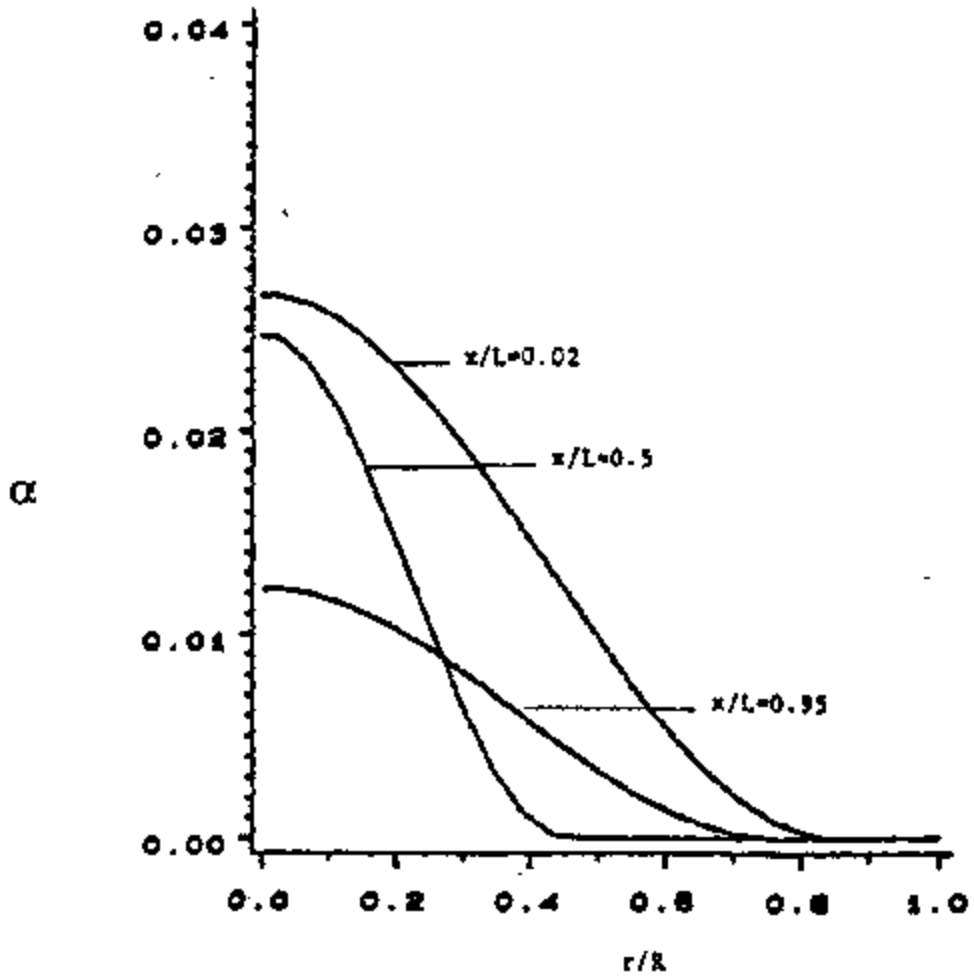


Fig. 4.5 (b) Void ratio distribution as a cosine function.

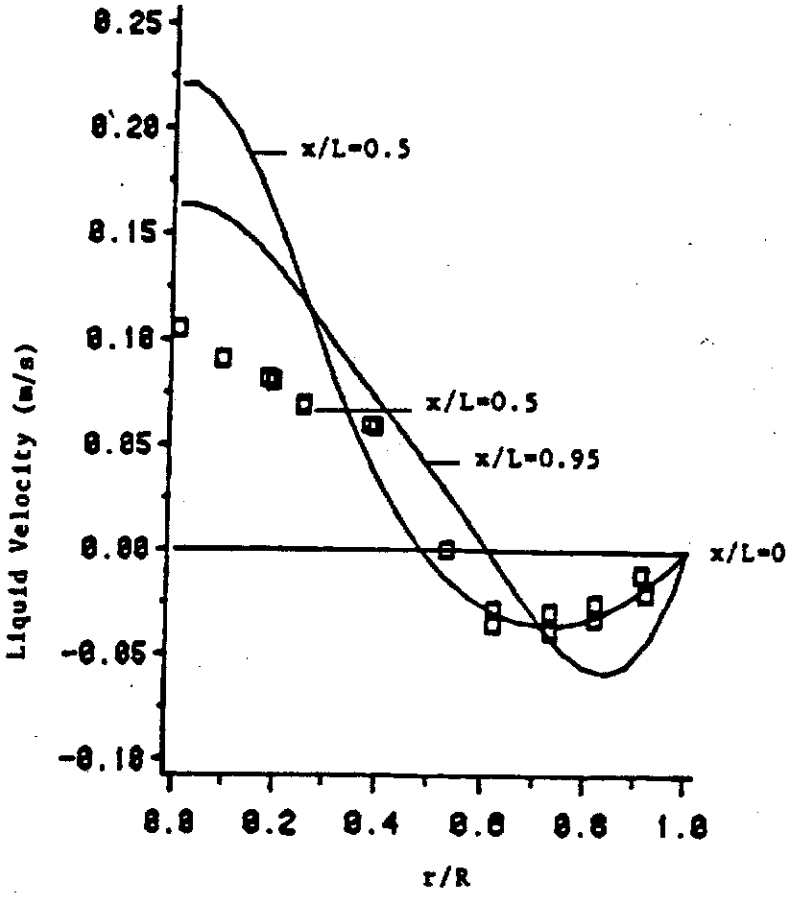


Fig. 4.5 (c) Liquid velocity profiles
□ (experiments by Rietema and Ottengraf, 1970)

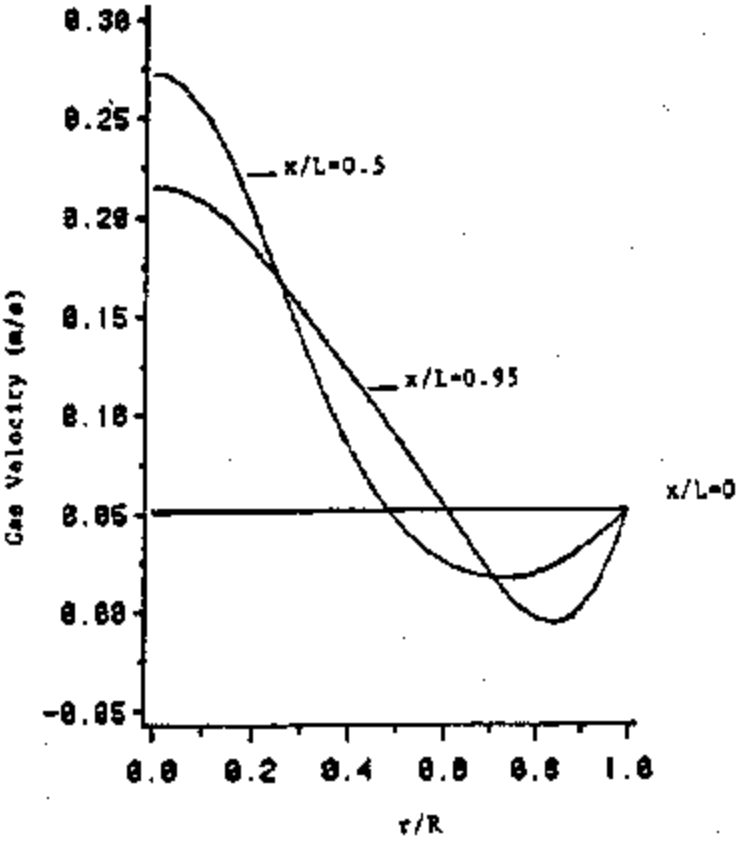
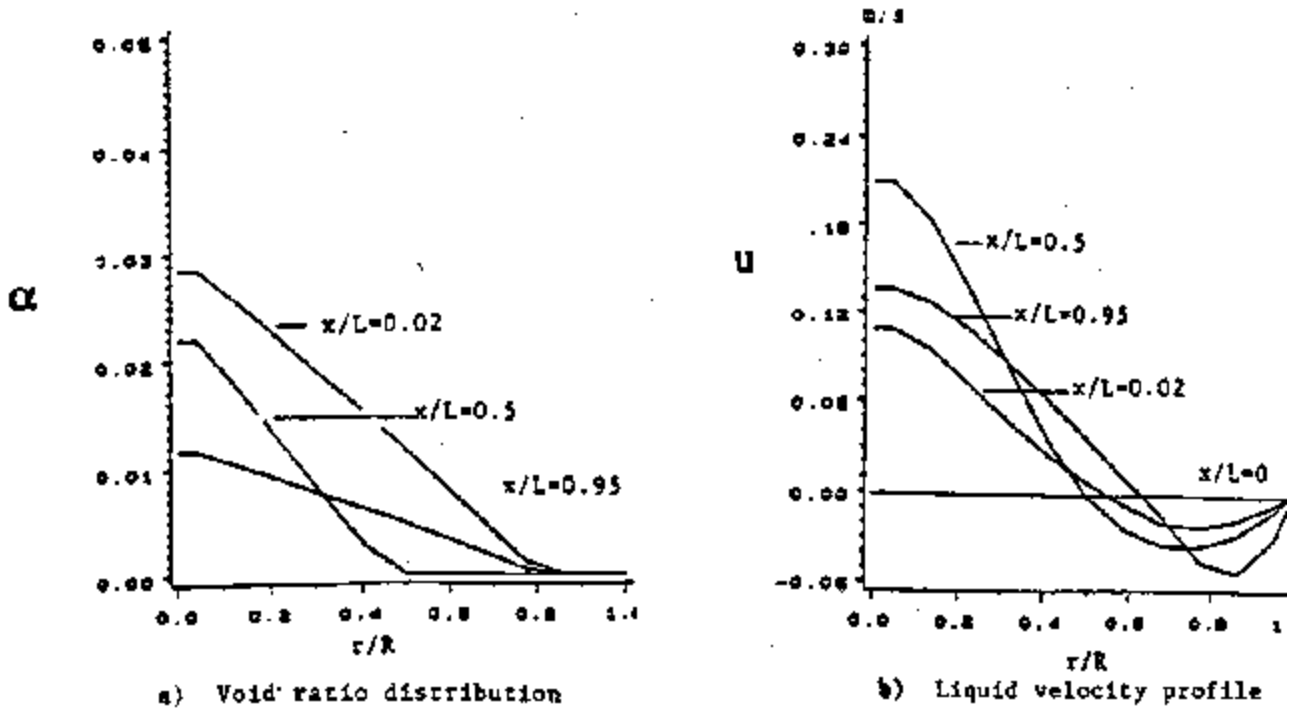
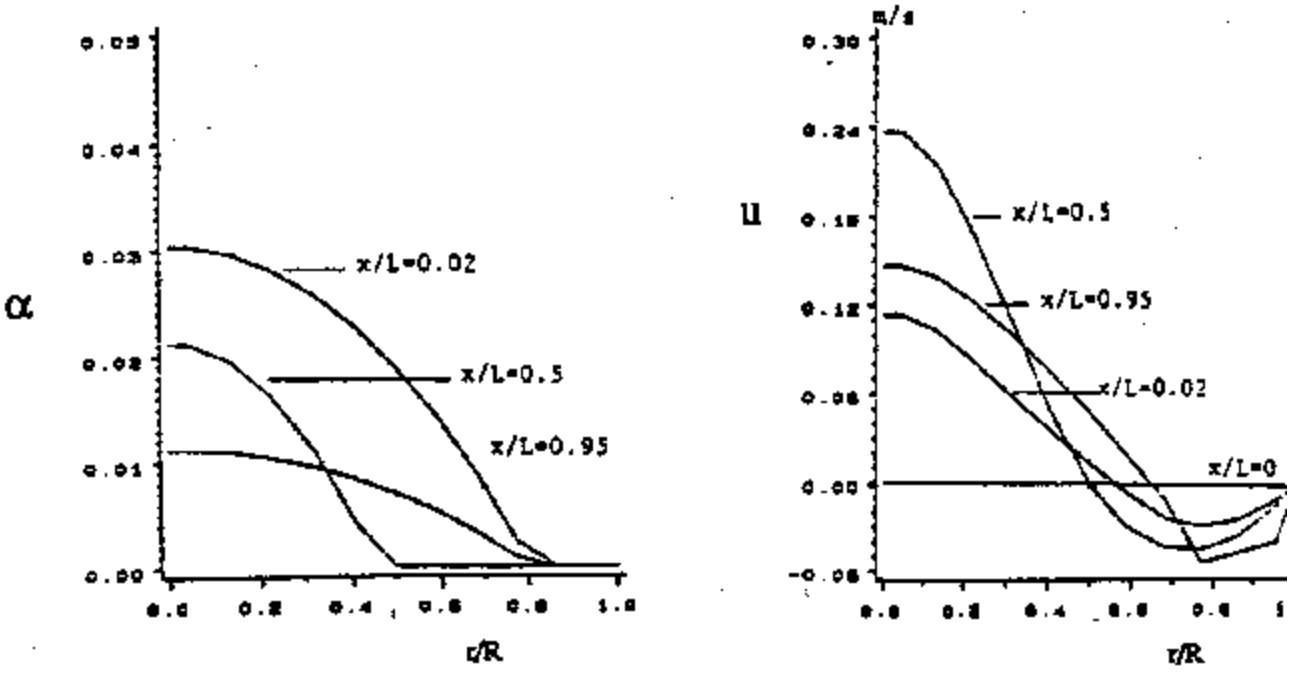


Fig. 4.5 (d) Gas velocity profile



a) Void ratio distribution b) Liquid velocity profile

Fig. 4.6 Results with linear void ratio distribution.



a) Void ratio distribution b) Liquid velocity profile

Fig. 4.7 Results with parapolic void ratio distribution.

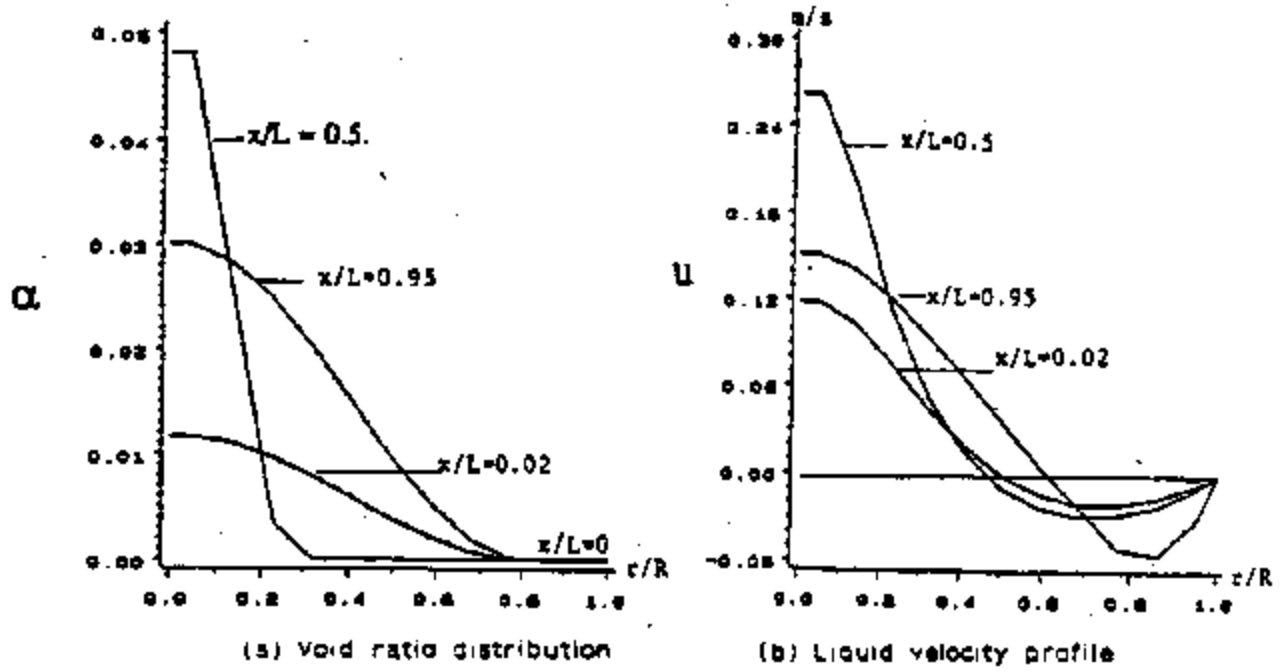


Fig. 4.8 Results with $r_p/R = 0.27$

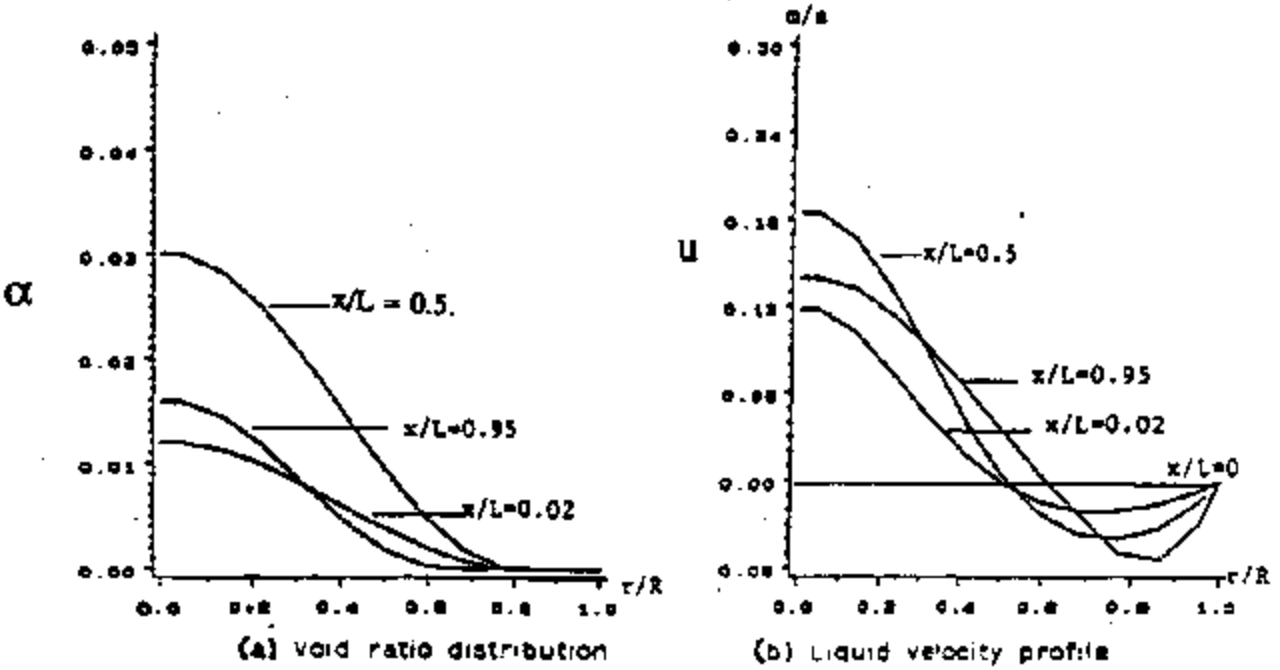


Fig. 4.9 Results with $r_p/R = 0.65$

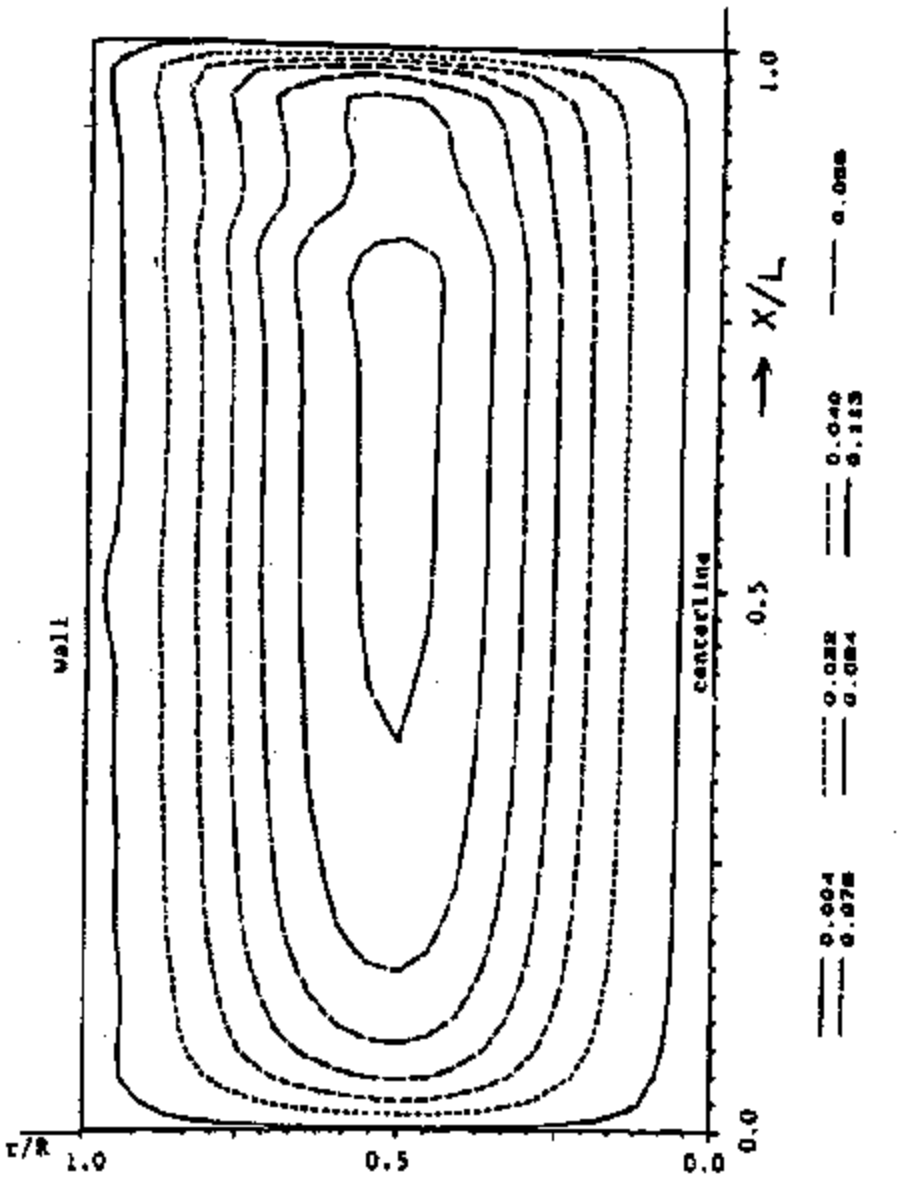


Fig. 4.10 (a) Calculated circulation pattern
(α is calculated from transport equation (4.28) with $r_p/R = 0.45$).