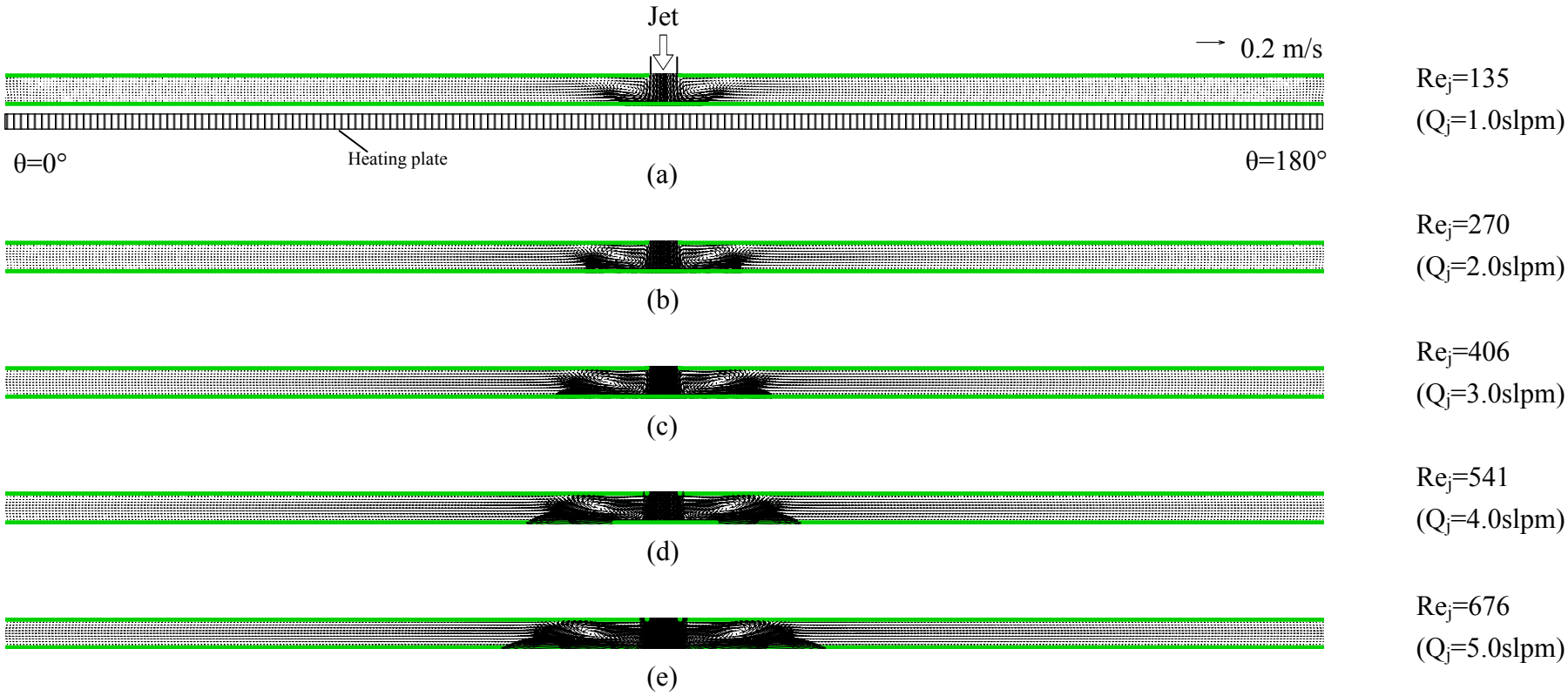


Fig. 4.13 Velocity vectors on the cross plane $\theta = 0^\circ$ & 180° at steady state for $D_j = 10.0$ mm, $H = 10.0$ mm, $Ra = 940$ ($\Delta T = 10^\circ C$) for Re_j = (a) 135 (Q_j=1.0 slpm), (b) 270 (Q_j=2.0 slpm), (c) 406 (Q_j=3.0 slpm), (d) 541 (Q_j=4.0 slpm), and (e) 676 (Q_j=5.0 slpm).

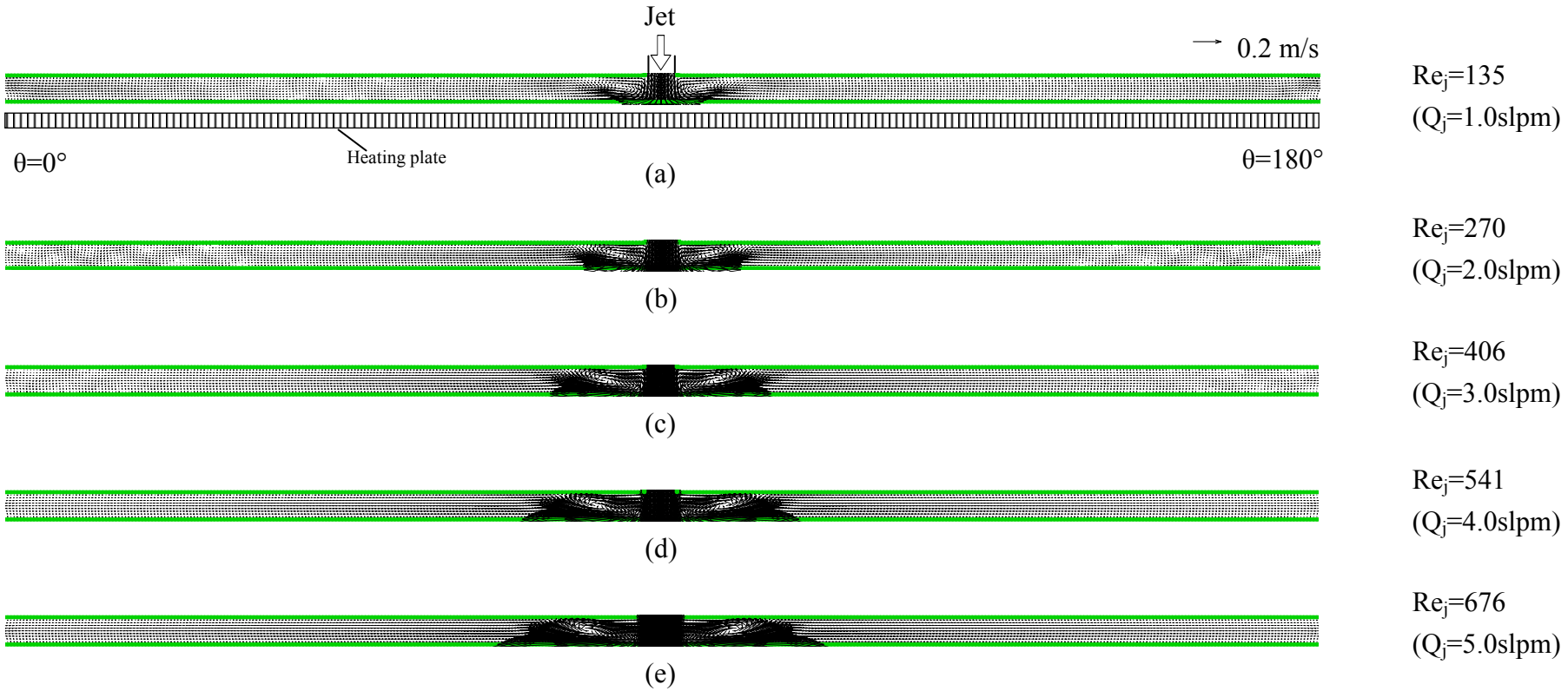


Fig. 4.14 Velocity vectors on the cross plane $\theta = 0^\circ$ & 180° at steady state for D_j = 10.0 mm, H = 10.0 mm, Ra = 1,409 (ΔT = 15.0℃) for Re_j = (a) 135 (Q_j=1.0 slpm), (b) 270 (Q_j=2.0 slpm), (c) 406 (Q_j=3.0 slpm), (d) 541 (Q_j=4.0 slpm), and (e) 676 (Q_j=5.0 slpm).

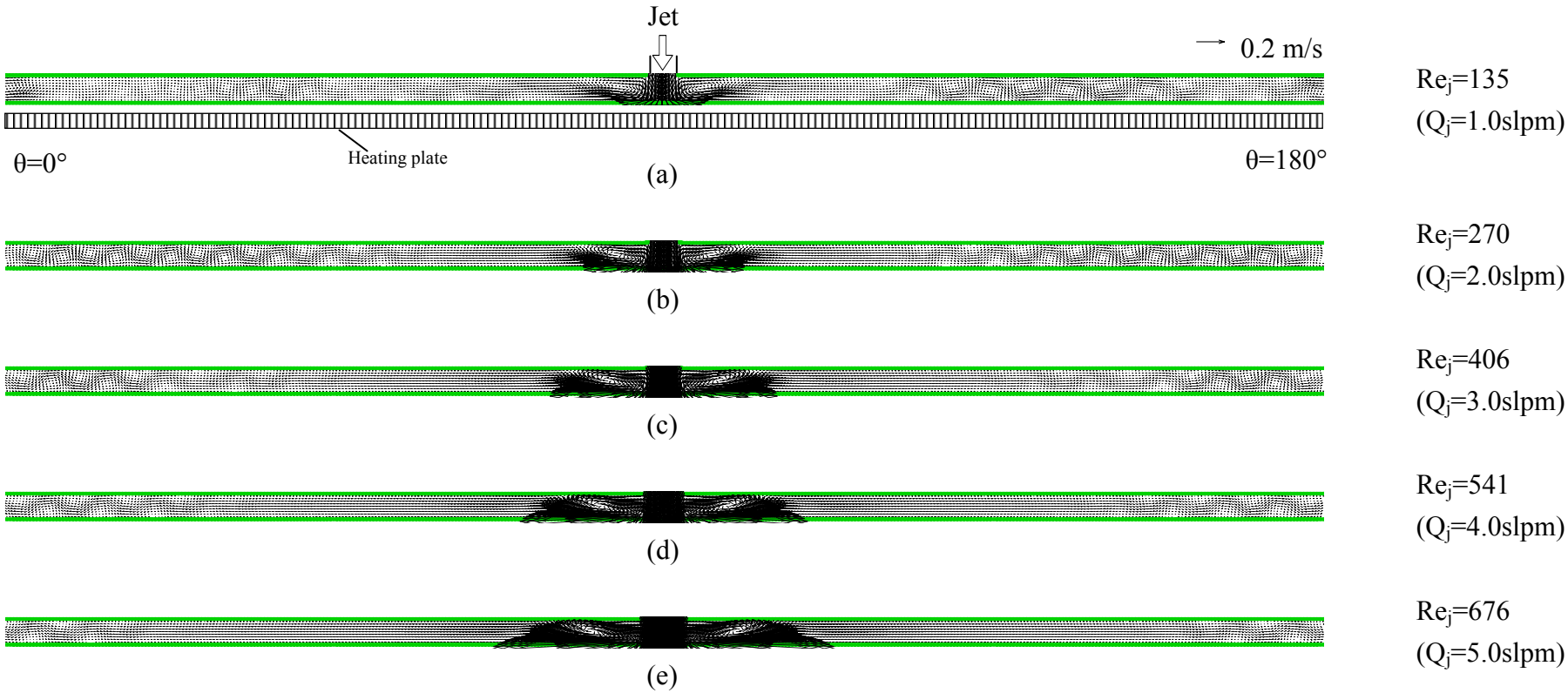


Fig. 4.15 Velocity vectors on the cross plane θ = 0° & 180° at steady state for D_j = 10.0 mm, H = 10.0 mm, Ra = 1,880 (ΔT = 20.0℃) for Re_j = (a) 135 (Q_j=1.0 slpm), (b) 270 (Q_j=2.0 slpm), (c) 406 (Q_j=3.0 slpm), (d) 541 (Q_j=4.0 slpm), and (e) 676 (Q_j=5.0 slpm).

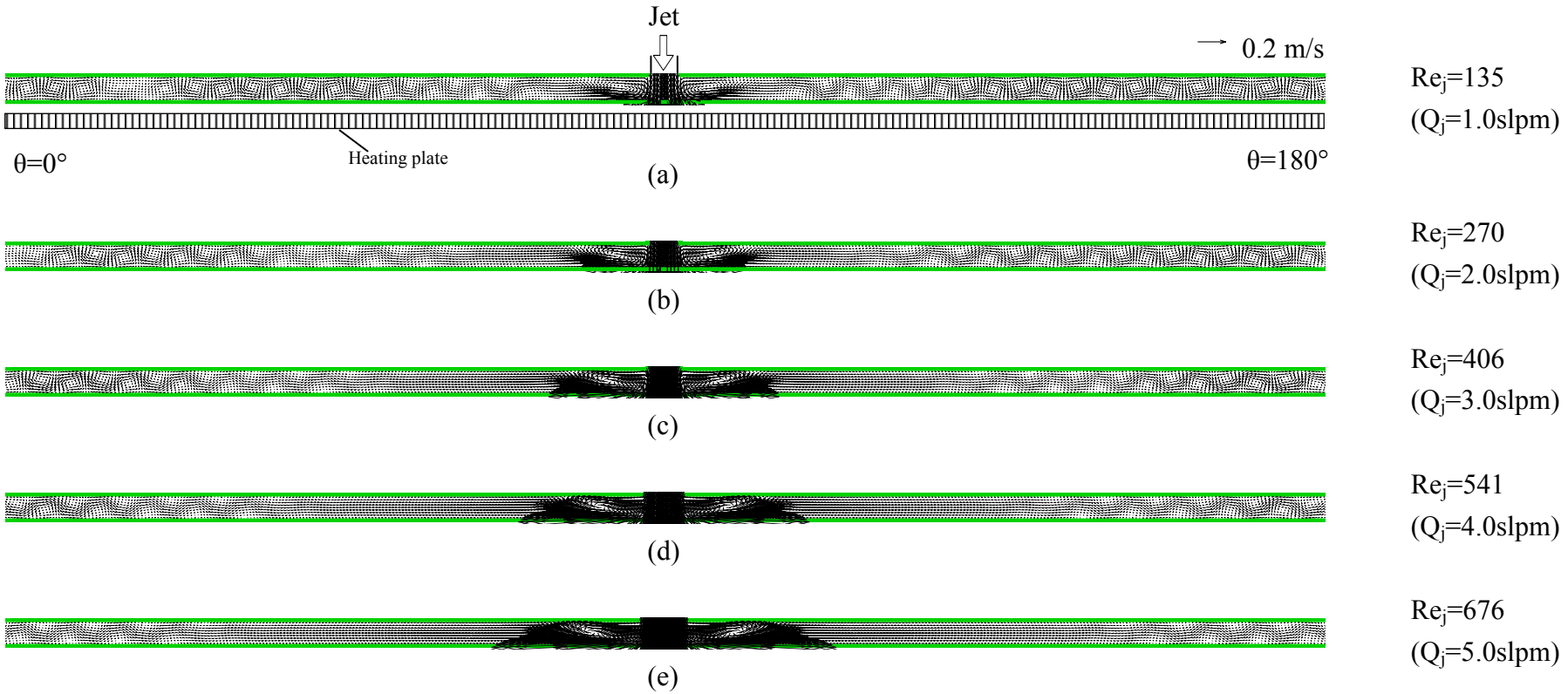
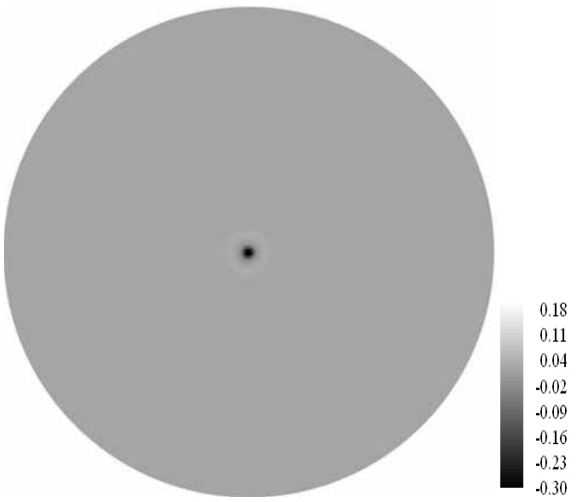
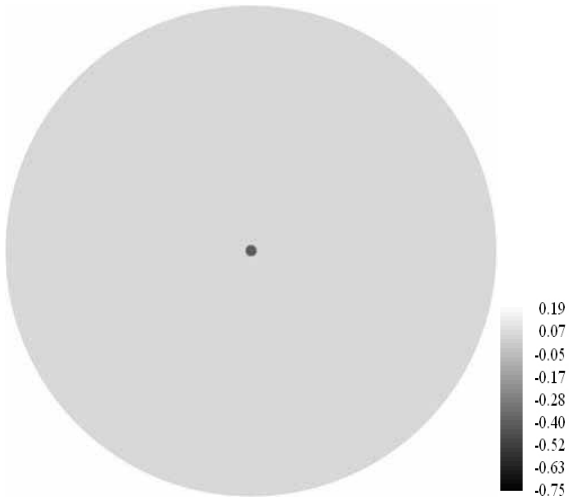


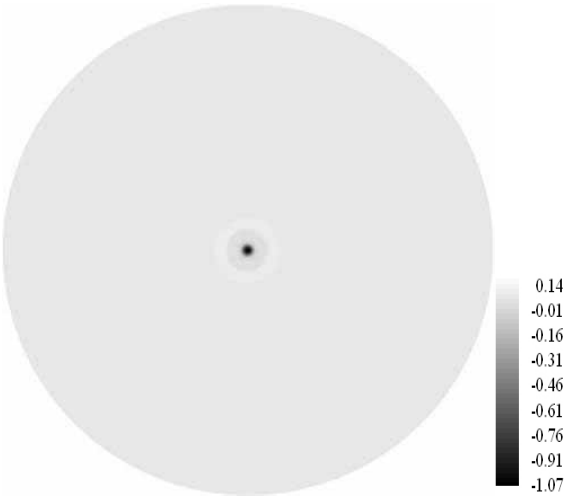
Fig. 4.16 Velocity vectors on the cross plane $\theta = 0^\circ$ & 180° at steady state for D_j = 10.0 mm, H = 10.0 mm, Ra = 2,348 (ΔT = 25.0℃) for Re_j = (a) 135 (Q_j=1.0 slpm), (b) 270 (Q_j=2.0 slpm), (c) 406 (Q_j=3.0 slpm), (d) 541 (Q_j=4.0 slpm), and (e) 676 (Q_j=5.0 slpm).



(a)

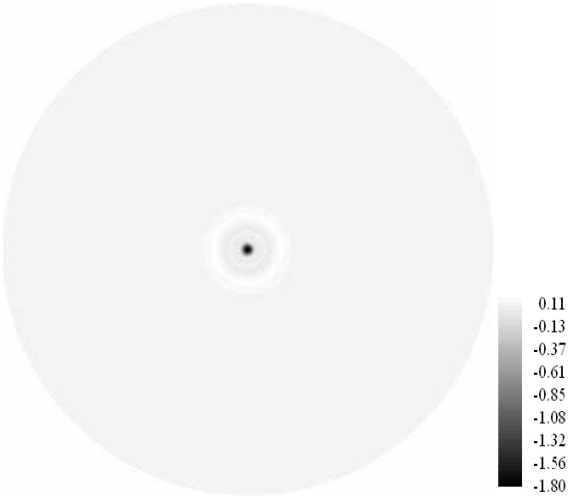


(b)



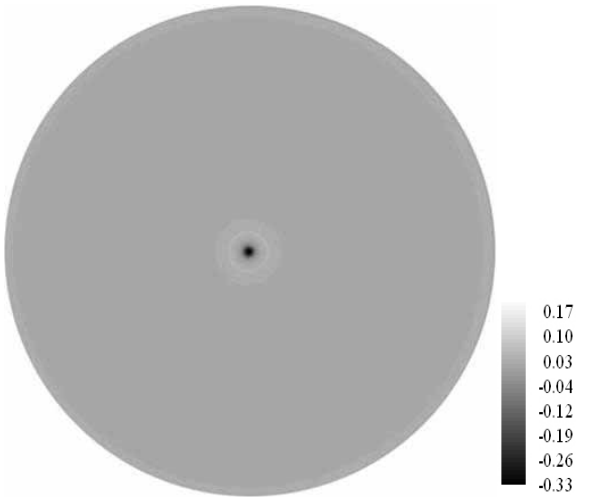
(c)

(d)

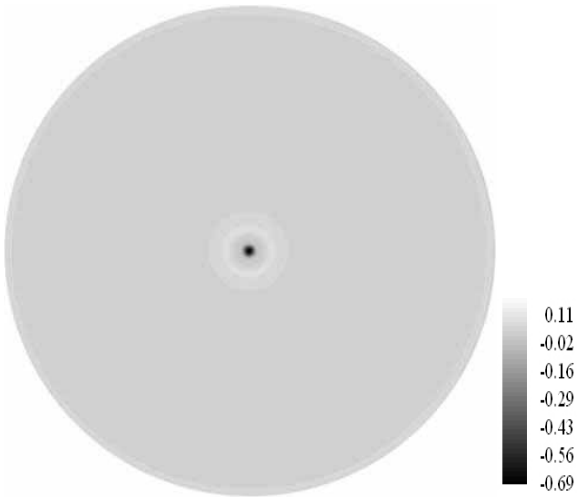


(e)

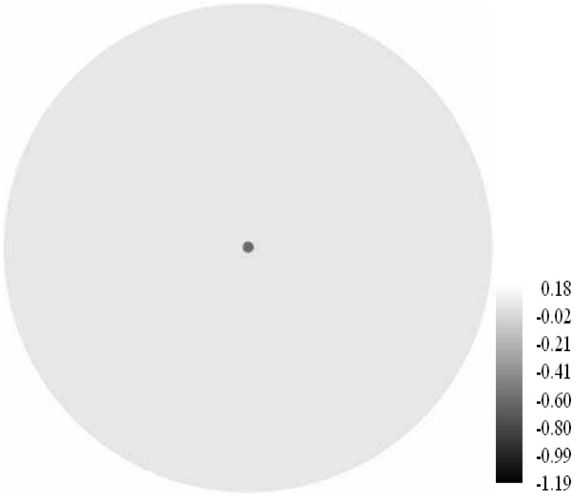
Fig. 4.17 Contours of vertical velocity component w at long time at the horizontal plane z = - 5 mm for Ra = 470 ($\Delta T = 5.0℃$) and D_j = 10.0mm at H = 10.0 mm for Re_j = (a) 135, (b) 270, (c) 406, (d) 541, and (e) 676.



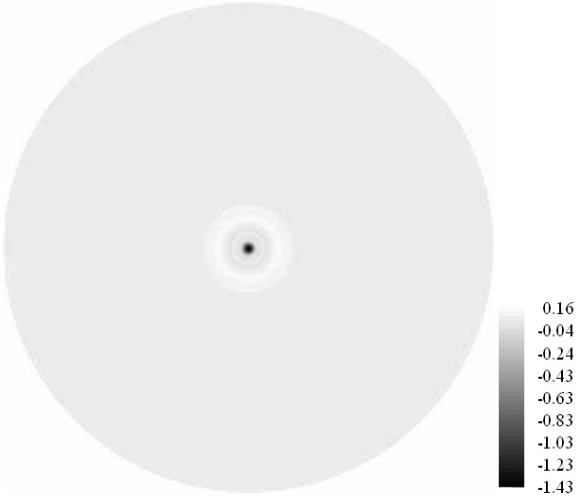
(a)



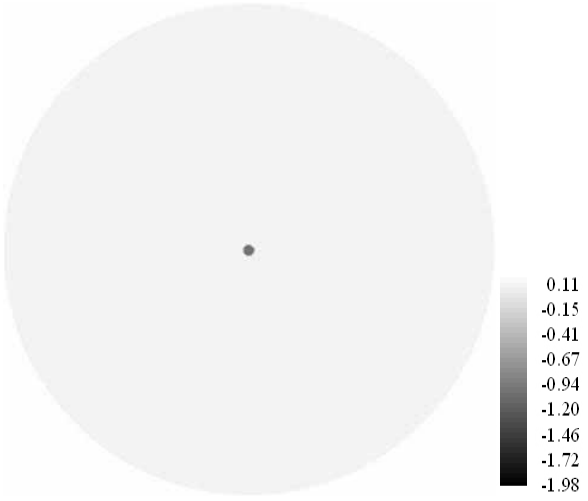
(b)



(c)

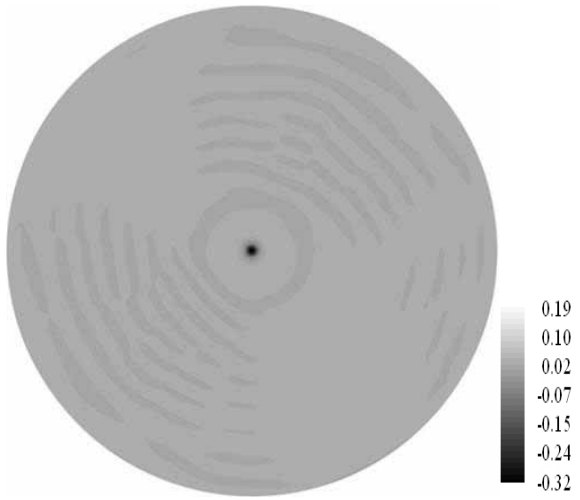


(d)

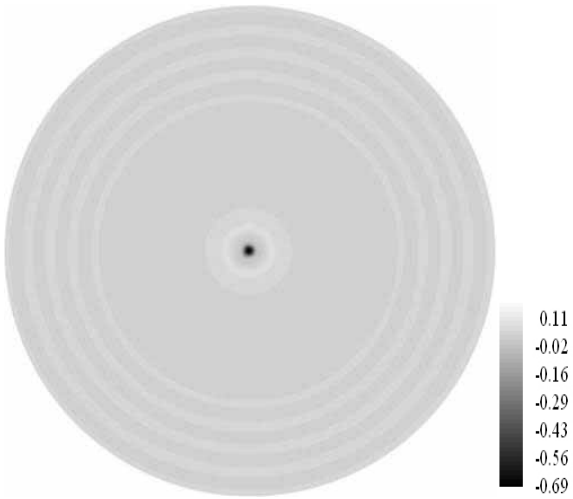


(e)

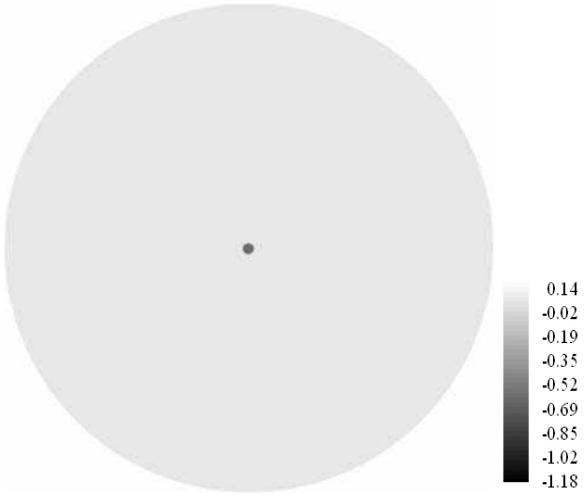
Fig. 4.18 Contours of vertical velocity component w at long time at the horizontal plane z = - 5 mm for Ra = 940 ($\Delta T = 10.0℃$) and D_j = 10.0mm at H = 10.0 mm for Re_j = (a) 135, (b) 270, (c) 406, (d) 541, and (e) 676.



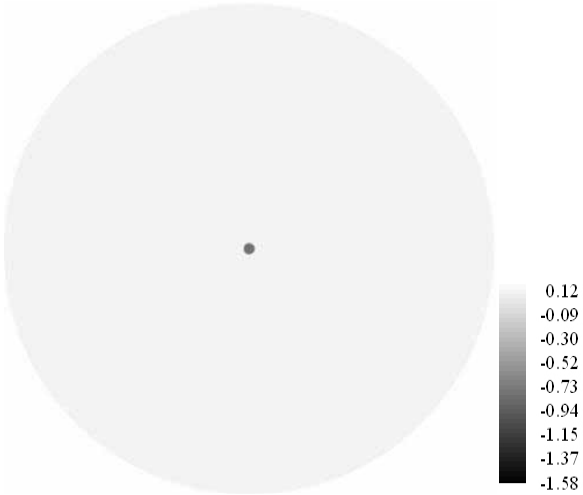
(a)



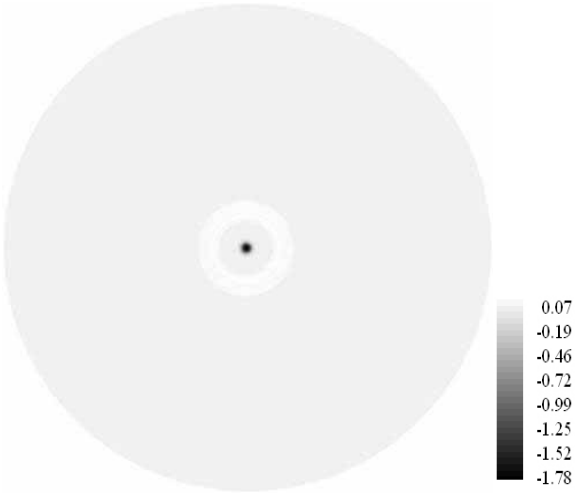
(b)



(c)



(d)



(e)

Fig. 4.19 Contours of vertical velocity component w at long time at the horizontal plane at z = - 5 mm for Ra = 1,409 (ΔT = 15.0℃) and D_j = 10.0mm at H = 10.0 mm for Re_j = (a) 135, (b) 270, (c) 406, (d) 541, and (e) 676.

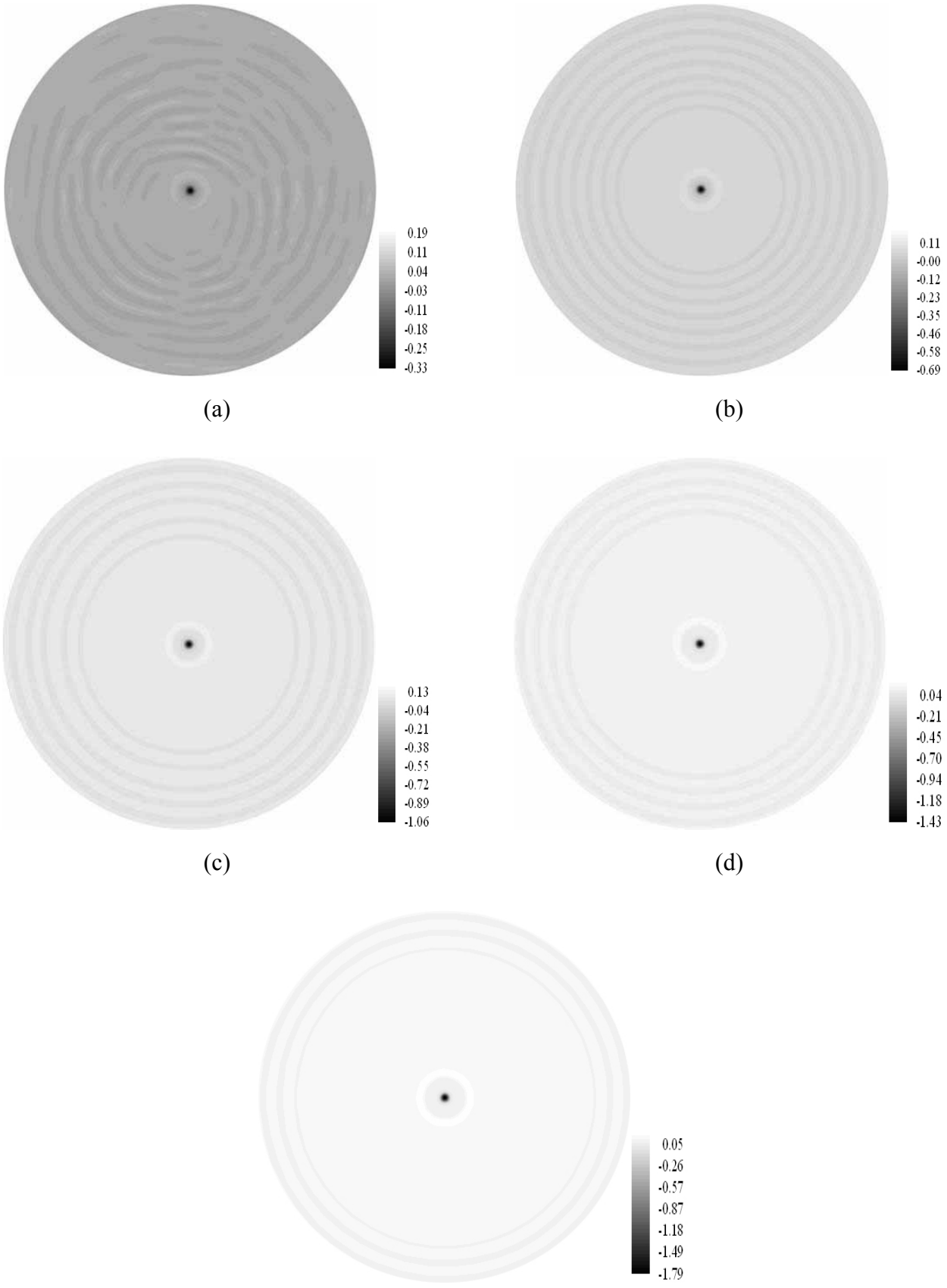
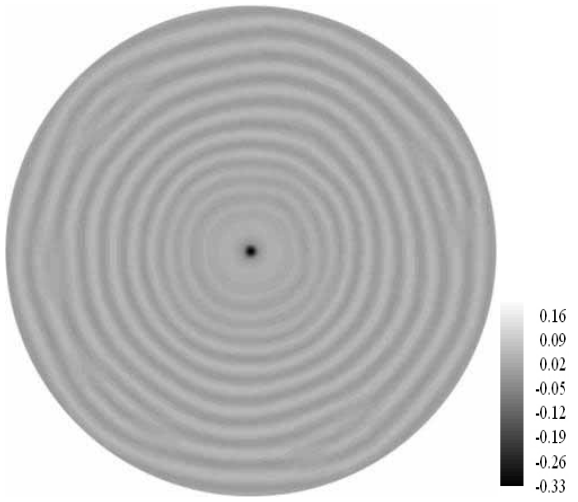
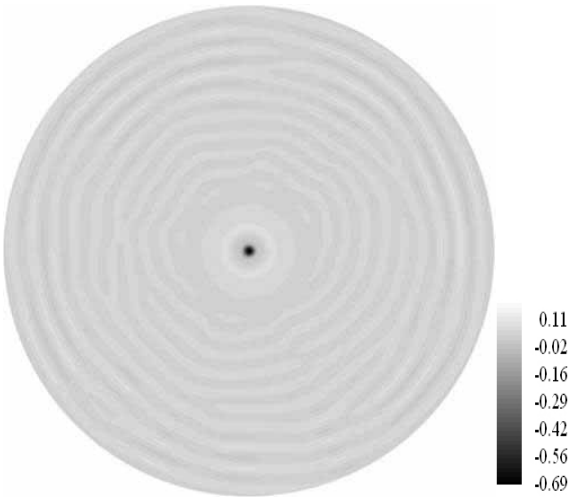


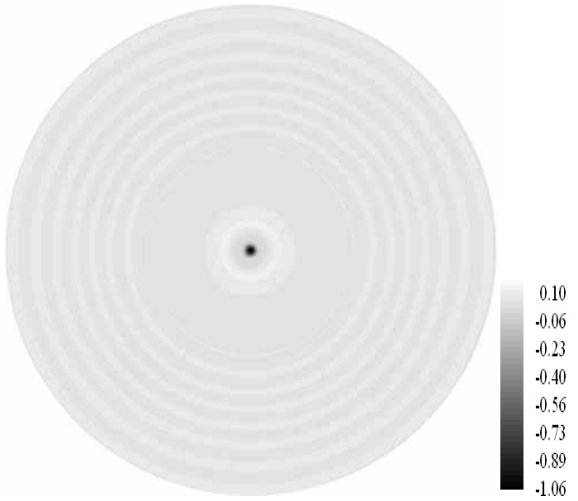
Fig. 4.20 Contours of vertical velocity component w at long time at the horizontal plane at z = - 5 mm for Ra = 1,880 (ΔT = 20.0℃) and D_j = 10.0mm at H = 10.0 mm for Re_j = (a) 135, (b) 270, (c) 406, (d) 541, and (e) 676.



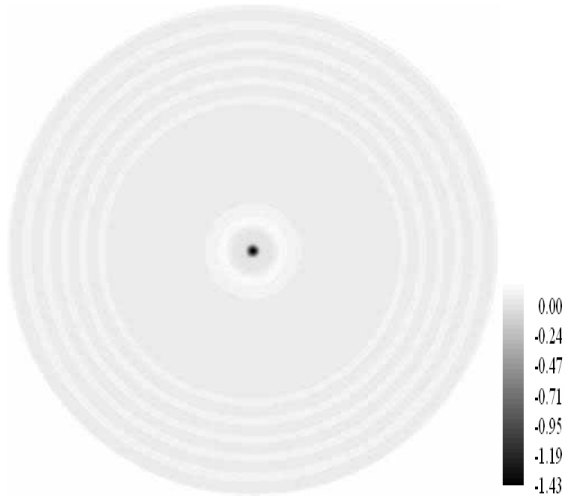
(a)



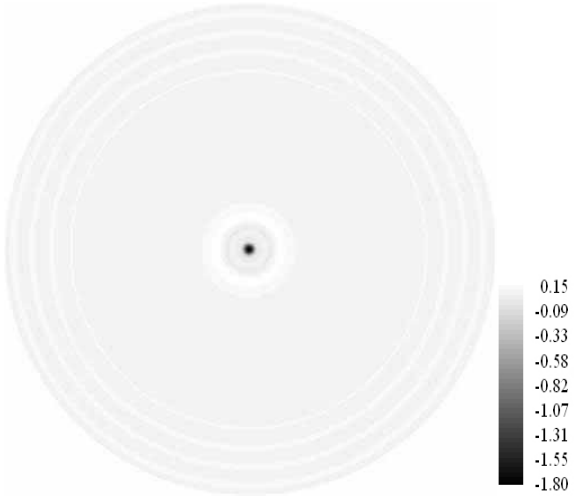
(b)



(c)



(d)



(e)

Fig. 4.21 Contours of vertical velocity component w at long time at the horizontal plane at z = - 5 mm for Ra = 2,348 ($\Delta T = 25.0℃$) and D_j = 10.0mm at H = 10.0 mm for Re_j = (a) 135, (b) 270, (c) 406, (d) 541, and (e) 676.

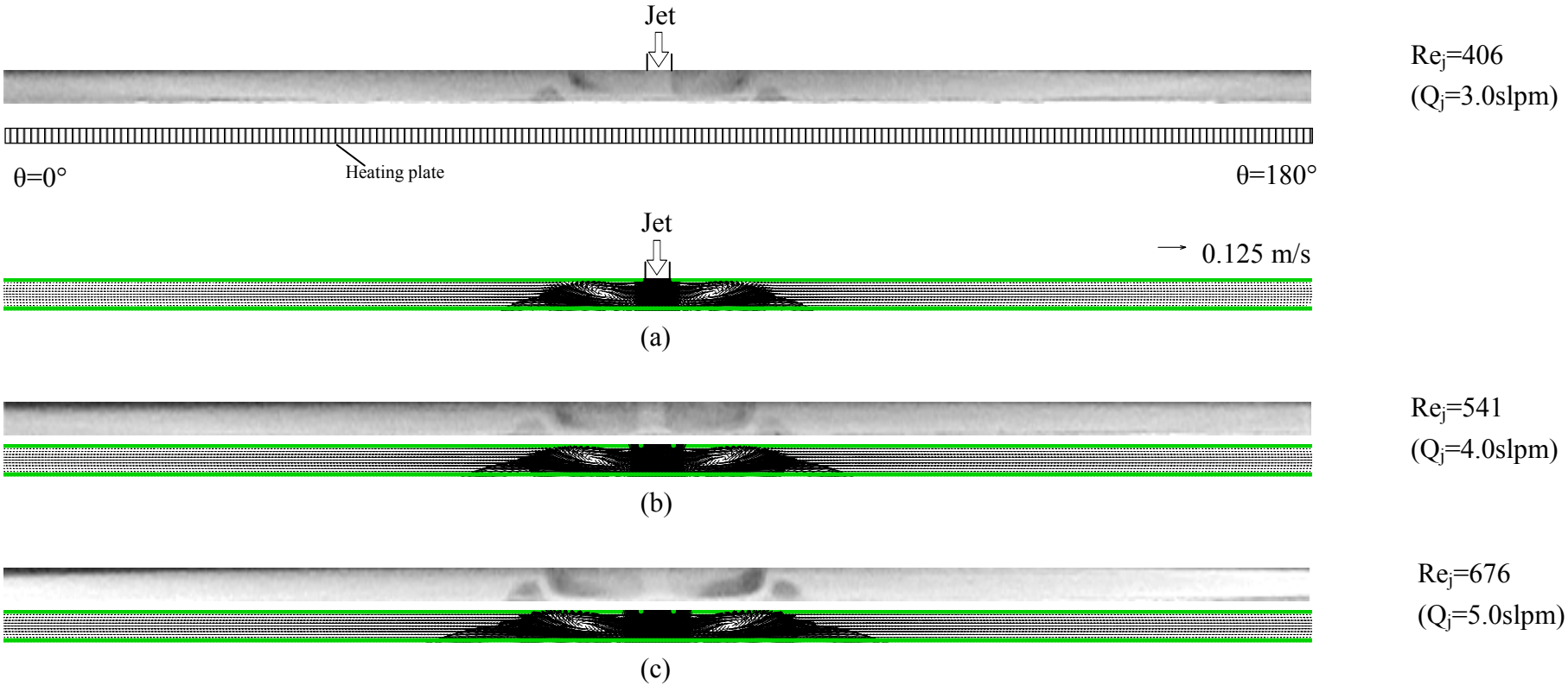


Fig. 4.22 Steady side view flow photo on the cross plane θ = 0° & 180° from Hsieh and Lin [36] and predicted velocity vectors from the present study on the same plane for D_j = 10.0 mm, H = 10.0 mm, Ra = 470 (ΔT = 5℃) for Re_j = (a) 406 (Q_j=3.0 slpm), (b) 541 (Q_j=4.0 slpm), and (c) 676 (Q_j=5.0 slpm).