さらに両辺の $\tilde{z}$ 微分をとることによって

$$0 = -\tilde{\nabla}^2 \frac{\partial p'}{\partial \tilde{z}} + \frac{Ra}{Pr} \frac{\partial^2 T'}{\partial \tilde{z}^2} \tag{6.99}$$

となるので，(6.95) の $\tilde{z}$ 成分に $\tilde{\nabla}^2$ を演算した

$$\frac{\partial}{\partial \tilde{t}} \tilde{\nabla}^2 w' = -\tilde{\nabla}^2 \frac{\partial p'}{\partial \tilde{z}} + \tilde{\nabla}^2 \tilde{\nabla}^2 w' + \frac{Ra}{Pr} \tilde{\nabla}^2 T' \tag{6.100}$$

に (6.99) を代入して T' と w' だけの式

$$\left(\frac{\partial}{\partial \tilde{t}} - \tilde{\nabla}^2 \right) \tilde{\nabla}^2 w' = \frac{Ra}{Pr} \left(\frac{\partial^2}{\partial \tilde{x}^2} + \frac{\partial^2}{\partial \tilde{y}^2} \right) T' \tag{6.101}$$

を得る．この (6.101) に $\left[\partial / \partial \tilde{t} - (1/Pr) \tilde{\nabla}^2 \right]$ を演算した後に，(6.96) を代入して T' も消去することにより，w' のみの方程式

$$\left(\frac{\partial}{\partial \tilde{t}} - \tilde{\nabla}^2 \right) \left(\frac{\partial}{\partial \tilde{t}} - \frac{1}{Pr} \tilde{\nabla}^2 \right) \tilde{\nabla}^2 w' = \frac{Ra}{Pr} \left(\frac{\partial^2}{\partial \tilde{x}^2} + \frac{\partial^2}{\partial \tilde{y}^2} \right) w' \tag{6.102}$$

を得る．

　次に，境界条件 (6.97) も w' で表しておこう．$\tilde{x}$, $\tilde{y}$ 方向に広がる境界上ではどこでも $\partial u' / \partial \tilde{z} = \partial v' / \partial \tilde{z} = 0$ を満たすので，境界では

$$\frac{\partial^2 u'}{\partial \tilde{z} \partial \tilde{x}} = \frac{\partial^2 v'}{\partial \tilde{z} \partial \tilde{y}} = 0 \tag{6.103}$$

となる．ところが，連続の方程式 (6.94) を $\tilde{z}$ で微分すると

$$\frac{\partial^2 u'}{\partial \tilde{z} \partial \tilde{x}} + \frac{\partial^2 v'}{\partial \tilde{z} \partial \tilde{y}} + \frac{\partial^2 w'}{\partial \tilde{z}^2} = 0$$

となるから，

$$\frac{\partial^2 w'}{\partial \tilde{z}^2} = 0 \tag{6.104}$$

の境界条件を得る．さらに，境界面上ではどこでもいつでも $T' = w' = \partial^2 w' / \partial \tilde{z}^2 = 0$ を満たすから，(6.101) の各項のうち

$$\left(\frac{\partial}{\partial \tilde{t}} - \frac{\partial^2}{\partial \tilde{x}^2} - \frac{\partial^2}{\partial \tilde{y}^2} \right) \left(\frac{\partial^2}{\partial \tilde{x}^2} + \frac{\partial^2}{\partial \tilde{y}^2} \right) w', \quad \left(\frac{\partial^2}{\partial \tilde{x}^2} + \frac{\partial^2}{\partial \tilde{y}^2} \right) \frac{\partial^2 w'}{\partial \tilde{z}^2},$$
$$\left(\frac{\partial}{\partial \tilde{t}} - \frac{\partial^2}{\partial \tilde{x}^2} - \frac{\partial^2}{\partial \tilde{y}^2} \right) \frac{\partial^2 w'}{\partial \tilde{z}^2}, \quad \left(\frac{\partial^2}{\partial \tilde{x}^2} + \frac{\partial^2}{\partial \tilde{y}^2} \right) T'$$