1 Møte

1.1 Conservation of entropy

Advective term:

$$(\partial_t s_1)_{adv} = -\left[v_y \partial_y s_1 + v_z \partial_z s_1 + v_z \partial_z s_0\right] \tag{1}$$

Viscous term:

$$(\partial_t s_1)_{vis} = \frac{\mu}{\rho_0 T_0}\left[(\partial_y v_x)^2 + (\partial_z v_y + \partial_y v_z)(\partial_z v_x + \partial_z v_y + \partial_z v_z)\right] \tag{2}$$

1.2 Conservation of momentum

Advective term:

$$\hat{\mathbf{j}} : (\partial_t v_y)_{adv} = -\left[v_y \partial_y v_y + v_z \partial_z v_y\right] \tag{3}$$
$$\hat{\mathbf{k}} : (\partial_t v_z)_{adv} = -\left[v_y \partial_y v_z + v_z \partial_z v_z\right] \tag{4}$$

Pressure term:

$$\hat{\mathbf{j}} : (\partial_t v_y)_p = -\frac{1}{\rho_0}\partial_y p_1 \tag{5}$$
$$\hat{\mathbf{k}} : (\partial_t v_z)_p = -\frac{1}{\rho_0}\partial_z p_1 \tag{6}$$

Gravitational term:

$$\hat{\mathbf{j}} : (\partial_t v_y)_g = 0 \tag{7}$$
$$\hat{\mathbf{k}} : (\partial_t v_z)_g = -\frac{\rho_1}{\rho_0} g \tag{8}$$

Viscous term:

$$\hat{\mathbf{j}} : (\partial_t v_y)_{vis} = \frac{\mu}{\rho_0}\left[\partial_z^2 v_y + \partial_y \partial_z v_z\right] \tag{9}$$
$$\hat{\mathbf{k}} : (\partial_t v_z)_{vis} = \frac{\mu}{\rho_0}\left[\partial_y^2 v_z + \partial_y \partial_z v_y\right] \tag{10}$$

1.3 Elliptic equation

Advective term:

$$\begin{aligned}(\nabla^2 p_1)_{adv} = &-\rho_0[v_y \partial_y^2 v_y + v_z \partial_z^2 v_z + (\partial_y v_y)^2 + (\partial_z v_z)^2 \\ &+ 2\partial_y(v_z)\partial_z(v_y) + v_y \partial_y \partial_z v_z + v_z \partial_y \partial_z v_y] \\ &- \partial_z(\rho_0)\left[v_y \partial_y v_z + v_z \partial_z v_z\right]\end{aligned}$$

Viscous term:

$$(\nabla^2 p_1)_{vis} = 2\mu(\partial_y \partial_z^2 v_y + \partial_y^2 \partial_z v_z) \tag{11}$$