

$$\nabla_h \cdot (H \nabla_h p_S) = S_{HY}(\lambda, \phi) \quad ; \quad p_{HY}(\lambda, \phi, z) = \int_0^z -g dz'$$

HPE and QH

NH

$$\nabla^2 p_{NH} = \nabla \cdot \tilde{\mathbf{G}}_v - \nabla_h^2 (p_S + p_{HY})$$

$$\frac{\partial \mathbf{v}_h}{\partial t} = \mathbf{G}_{v_h} - \nabla_h (p_S + p_{HY})$$

$$w = - \int_0^z \nabla_h \cdot \mathbf{v}_h dz'$$

$$\frac{\partial \mathbf{v}_h}{\partial t} = \mathbf{G}_{v_h} - \nabla_h (p_S + p_{HY} + p_{NH})$$

$$\frac{\partial w}{\partial t} = \hat{G}_w - \frac{\partial p_{NH}}{\partial z}$$