$$
\begin{aligned}
\int c_p^{(d)} \left(\overline{T} - T_{00}\right) \frac{\partial}{\partial t} \left[\overline{\rho}^{(d)} \overline{\widehat{m}}^{(H_2O)}\right] dz - \overline{F}_{net}^{(H_2O)} c_p^{(d)} \left(\overline{\widetilde{T}}_s - T_{00}\right) &= \Delta \widehat{\mathcal{I}}^{(h)}_{\partial m^{(H_2O)}/\partial t} \\
\int \overline{K} \frac{\partial}{\partial t} \left[\overline{\rho}^{(d)} \overline{\widehat{m}}^{(H_2O)}\right] dz - \overline{F}_{net}^{(H_2O)} \overline{\widetilde{K}}_s &= \Delta \widehat{\mathcal{I}}^{(K)}_{\partial m^{(H_2O)}/\partial t} \\
\int \overline{\Phi}_s \frac{\partial}{\partial t} \left[\overline{\rho}^{(d)} \overline{\widehat{m}}^{(H_2O)}\right] dz - \overline{F}_{net}^{(H_2O)} \overline{\Phi}_s &= \Delta \widehat{\mathcal{I}}^{(\Phi)}_{\partial m^{(H_2O)}/\partial t}
\end{aligned}
$$