

Starting with the vorticity vector $\vec{\omega}$ expressed in its three components, show that

$$\vec{\Omega}_H = \hat{k} \times \vec{S} ,$$

where $\vec{\Omega}_H$ is the environmental horizontal vorticity vector, and \vec{S} is the environmental shear vector. Assume that the environmental wind vector is given as

$$\vec{V}(z) = \bar{U}(z)\hat{i} + \bar{V}(z)\hat{j} .$$