

Vortex Patches Under Free Surface Waves

1 Model Setup

In an inviscid, incompressible fluid, we can generally represent the fluid velocity $\mathbf{u}(x, z, t)$ via the integral equation

$$\mathbf{u}(x, z, t) = \int_{\Omega(t)} \mathbf{K}(x - \tilde{x}, z - \tilde{z}) \omega(\tilde{x}, \tilde{z}, t) d\tilde{x} d\tilde{z} + \nabla \tilde{\phi}, \quad \Delta \tilde{\phi} = 0.$$

where ω is the vorticity, and \mathbf{K} is the standard Biot-Savart law style kernel.

2 Validation

3 Numerical Experiments