Tsunami simulation

$$\frac{\partial \vec{v}}{\partial t} + (\vec{v} \cdot \nabla)\, \vec{v} + g \nabla h = 0$$

$$\frac{\partial h}{\partial t} + \nabla \cdot [\vec{v}\,(h - b)] = 0$$

Equation 1 - Equations of the model: h is the height of the wave, v is the velocity and b is the bottom of the sea

$$b(x, y, t) = \begin{cases} -10, & r < R/3 \\ -10 \left(\cos[\frac{3\pi}{4} \frac{r - R/3}{R}] \right)^2, & r < R \end{cases}$$

Equation 2 - Bottom of the sea

Initial conditions:

$$h = e^{-r^2} \qquad \vec{v} = 0$$

$$R = 10$$

Boundary conditions:

- Near the edges the partial derivative of h related to x and y is constant
- For the velocity, the walls surrounding the tsunami are fully reflective

Two objectives:

- Visualize graphically the evolution of the wave
- Highest height
- Calculate the amount of dislocated water by the wave, which is proportional to:

$$H(t) = \int dx\, dy\, h(x, y, t)$$