

Оценка источника цунами 2011 года по мареограммам, полученным на регистрирующих станциях

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ФНБИК, ноябрь 2015

1. The system of linearized shallow water equations describes propagation of tsunami wave. In particular, the free surface elevation $\eta(x, t)$ satisfies the wave equation with variable velocity $c(x) = \sqrt{gD(x)}$, where g - acceleration of gravity, $D(x)$ - depth at point $x = (x, y)$ with coordinates (x, y) .

$$\frac{\partial^2 \eta}{\partial t^2}(x, t) - \frac{\partial}{\partial x} \left(c^2(x) \frac{\partial \eta}{\partial x}(x, t) \right) - \frac{\partial}{\partial y} \left(c^2(x) \frac{\partial \eta}{\partial y}(x, t) \right) = 0. \quad (1)$$

2. The generation of tsunami is described by piston model: vertical disturbance of the ocean bottom at the initial time moment is instantaneously transferred to the ocean surface

$$\eta(x, t)|_{t=0} = \eta_0(x), \quad \frac{\partial \eta}{\partial t}(x, t)|_{t=0} = 0. \quad (2)$$

3. The source $\eta_0(x)$ is localized in a neighbourhood of the epicenter $x_0 = (x_0, y_0)$ and can be modelled approximately by a simple function of the following form

$$\eta_0(x) = \frac{A}{\left(1 + \frac{(x - x_0)^2}{R^2} + \frac{(y - y_0)^2}{R^2}\right)^{3/2}}. \quad (3)$$

Thus source in our model has exactly four parameters: *latitude and longitude of the epicenter* (x_0, y_0) , *maximal elevation* A of the free surface in the epicenter and characteristic *radius* R .



