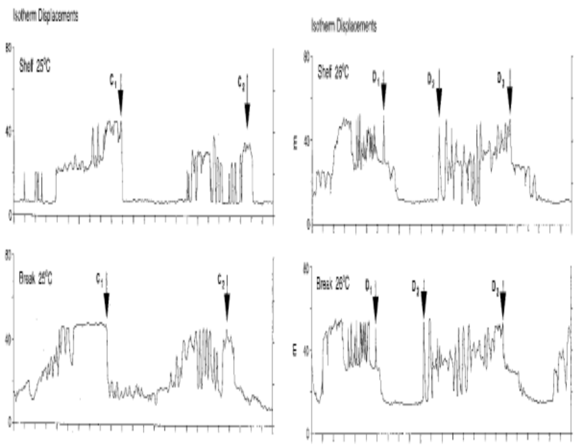
Statistic moments of long internal solitary wave ensemble

Institute of Applied Physics, N. Novgorod, Russia
Higher School of Economics, Moscow, Russia
T. Talipova, E. Didenkulova, E. Pelinovsky



Motivation

IW solitary wave ensembles on the Australian shelf

Basic Gardber Equation

$\tau = x/c - t$, c is linear wave speed. Periodic boundary conditions, time interval τ is 12.4 h

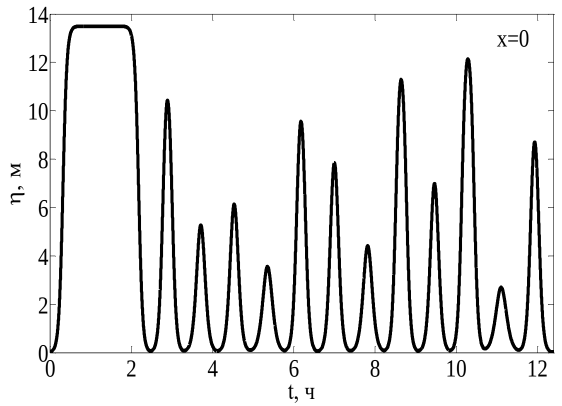
$$\frac{\partial \eta}{\partial x} + \left(\frac{\alpha}{c^2}\eta + \frac{\alpha_1}{c^2}\eta^2 \right)\frac{\partial \eta}{\partial \tau} + \frac{\beta}{c^4}\frac{\partial^3 \eta}{\partial \tau^3} = 0$$

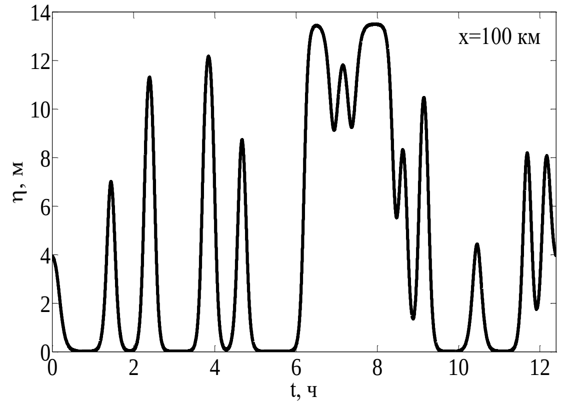
Gardner equation coefficients and ensemble

c = 0.32 м/с, β = 71.5 м^{3}с$^{-1}$, α = 0.00965 с$^{-1}$; α_1 =- 0.000715 м$^{-1}$с$^{-1}$.

$$\eta_0(t) = \sum_{i=1}^{13} \frac{a_i\left(2 - \frac{a_i}{a_{\lim}}\right)}{1 + \left(1 - \frac{a_i}{a_{\lim}}\right)\cosh(\gamma_i V_i t + \varphi_i)} \qquad \gamma_i = \sqrt{\frac{\alpha a_i}{6\beta}\left(2 - \frac{a_i}{a_{\lim}}\right)} \qquad V_i = \frac{\alpha a}{6}\left(2 - \frac{a_i}{a_{\lim}}\right)$$

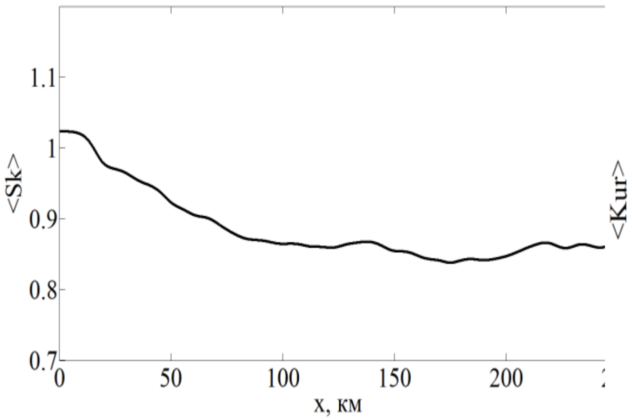
50 soliton ensembles with amplitudes from 2.7 m to 13.5 m and various phases, space domain *x* is 250 km

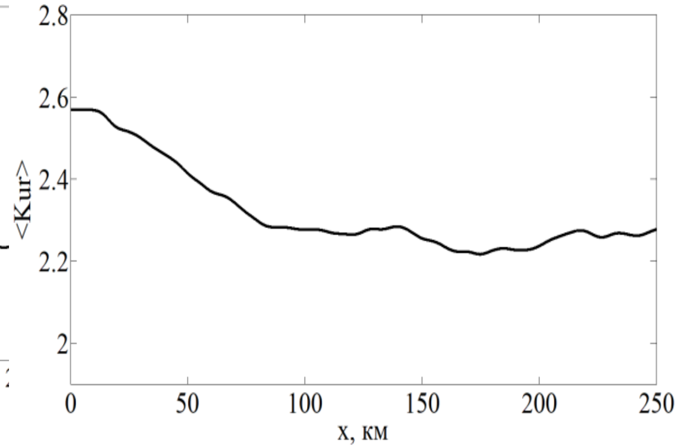




$$Sk(x) = \frac{1}{T\sigma^3}\int_0^T [\eta(x,\tau) \prec \eta(x,\tau) >]^3 d\tau$$ – skewness

$$Kur(x) = \frac{1}{T\sigma^4}\int_0^T [\eta(x,\tau) - < \eta(x,\tau) >]^4 d\tau.$$ - kurtosis





The significant variations in both moments appear after 130 km of ensemble evolutions