Nonlinear Models of Tsunami Propagation

Efim N. Pelinovsky*

The paper is devoted to one of the branches tsunami wave hydrodynamics. The theory of propagation, transformation and runup of tsunami waves taking into account the nonlinearity and the dispersion is exposed. The available data on real tsunamis are reviewed. The results of laboratory and numerical experiments are reported which point to the necessity of taking into account simultaneously the tsunami wave nonlinearity and dispersion. The theory of nonlinear and dispersion tsunami waves is developed taking into account the wave refraction. The nonlinear ray method is proposed. The part played by the nonlinearity and dispersion in the propagation of tsunami wave transformation near the shoreline and wave runup on a beach is proposed. The theory is used for estimating the tsunami risk and the maximum wave runup in the Pacific coast of Russia. The conclusions of the theory are compared with the available data on real tsunami and the results of laboratory and numerical experiments.

Some of results of nonlinear theory of tsunami propagation and corresponding numerical algorithms were published in books:

1. Pelinovsky E.N. Nonlinear Dynamics of Tsunami Waves. - Gorky: Applied Physics Institute Press, 1982. 226 p.

2. Pelinovsky E.N. (ed) The Climbing of Tsunami Waves on the Beach. - Gorky : Applied Physics Institute Press. 1985. 215 p.

3. Engelbrecht Ju. K., Fridman V.E., Pelinovsky E.N. Nonlinear Evolution Equations (Pitman Research Notes in Mathematics Series, N. 180). London : Longman Science & Technical Groups. 1988. 122 p.

4. Voltsinger N. E., Klevanny K. A., Pelinovsky E.N. Long - Wave Dynamics of the Coastal Zone. - Leningrad : Gidrometeoizdat. 1989. 271 p.

5. Nekrasov A. V., Pelinovsky E. N. (eds). Practical Book on Dynamics of the Ocean. - St. Petersburg : Gidrometeoizdat. 1982. 318 p.

---

* Institute of Applied Physics, Russian Academy of Sciences, 46, Uljanova str., Nizhny Novgorod, 603600, Russia.