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Meteotsunami disintegration and soliton forerunners on Atchafalaya shelf, Lousiana

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Field observations collected on the Atcahfalaya shelf in 2008 captured in high detail the shoaling evolution of a meteotsunami, including its disintegration into a undular bore. One of the intriguing elements of this process is a spectacular 1.5-m solitary-wave (soliton) forerunner, that precedes the arrival of the meteotsunami by approximately 5 min, reaching the observation site propagating through relatively calm waters (a wave field of approximately 20-cm height).

The source of the meteotsunami is identified as a squall line associated with a strong atmospheric perturbation. An inverse ray method used to estimate the meteotsunami path suggests that the meteotsunami propagated as a trapped wave, originating in shallow water and ending in shallow water. The process of the generation of the soliton forerunner is investigated using the variable-coefficient KdV equation first proposed by Ostrovsky and Pelinovsky (1975). Numerical scenarios indicate that the soliton is the product of the collision of a shoaling "multiple-bump" tsunami structure. Given the natural irregularities of the generation mechanism of the meteotsunami, this suggests that such solitary-wave foreunners might be more common than expected.

Ostrovsky L.A., and E.N. Pelinovsky (1975). Refraction of nonlinear ocean waves in a beach zone. Izv Atmos Ocean Phys 11, 37–41.