Meteotsunami disintegration and soliton forerunners on Atchafalaya shelf, Louisiana

Alex Sheremet (1), Uriah Gravois (1), and Victor Shrira (2)
(1) University of Florida, Gainesville, United States (alex@coastal.ufl.edu), (2) School of Computing and Mathematics, Keele University

Field observations collected on the Atchafalaya 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 forerunners might be more common than expected.