ID de Contribution: **32**   Type: **Non spécifié**

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mardi 2 décembre 2025 15:15 (1 heure)

About the speed and amplitude of the leading edge of a dispersive shock wave

In 1850, at the age of 33, Ivan Aivazovsky, a Russian painter of Armenian origin, presented his major work, The Ninth Wave, to the Russian public. The painting depicts the sea after a cruel storm. The shipwrecked sailors, clinging to the mast of their destroyed ship, continue to fight for their lives. But the sea is not yet calm, and a ninth wave is already forming, ready to strike. According to popular sailors'superstition, the ninth wave is the most violent and dan-
gerous of a storm (Figure 1). The objective of my presentation is to qualitatively describe the solitary wave of largest amplitude appearing in the solution of Riemann problems for the Serre-Green-Naghdi equations describing non-linear long dispersive waves. Such a large-amplitude
wave is the leading wave (i.e., it is the first wave, and not the ninth) of the corresponding dispersive shock. Its speed and amplitude are defined analytically through the solitary limit of the corresponding Whitham modulation equations. The numerical results are in accordance
with the analytical prediction.

References

[1] 2025 T. Congy, Gennady El, S. Gavrilyuk, M. Hoefer and K. -M. Shyue, Solitary wave-mean
flow interaction in strongly nonlinear dispersive shallow water waves, J. Nonlinear Waves, v. 1.