

Sharpening and Breaking of Subharmonic Gravity Waves on Deep Water

Vasyl P. Lukomsky⁽¹⁾, Ivan S. Gandzha⁽¹⁾, Yaroslav V. Tsekhmister⁽²⁾

(1) *Institute of Physics, National Academy of Sciences, Kyiv, Ukraine*

(2) *Bogomoletz National Medical University, Kyiv, Ukraine*

The process of sharpening and formation of singular flows in symmetric and non-symmetric subharmonic gravity waves, whose period is multiple to the period of Stokes waves, is investigated in the framework of the canonical model of hydrodynamics. Subharmonic waves, which are excited due to subharmonic instabilities of Stokes waves and have the crests of different height, are traced up to limiting waves. Non-symmetric subharmonic waves appear via symmetry-breaking instabilities of symmetric subharmonic waves. The effect of non-symmetry of subharmonic waves was found to be more essential with wave sharpening. Irregular flows with stagnation point inside the flow domain and discontinuous streamlines near the wave crests beyond limiting subharmonic waves were found to originate in the following way. Streamlines become discontinuous only in the highest sharp crests while the flow in all other crests (that are still rounded and have much lesser amplitude) remains regular.

[View the extended summary](#)