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Motion of particles in the field of nonlinear wave packets and dark solitons in a fluid beneath an ice cover

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A fluid layer of finite depth described by Euler's equations is considered. The ice cover is modeled by a geometrically non-linear elastic Kirchhoff-Love plate. The trajectories of liquid particles under the ice cover are found in the field of a nonlinear surface traveling waves of small, but finite amplitude, indicating the focusing and defocusing of nonlinear carier wave, namely, a solitary wave packet (a monochromatic wave under the envelope, the speed of which is equal to the speed of the envelope) and the so called dark soliton (the wave being a nonlinear product of a kink and periodic wave). The analysis uses explicit asymptotic expressions for solutions describing wave structures on the water-ice interface such as the solitary wave packet and dark soliton, as well as asymptotic solutions for the velocity field in the liquid column generated by these waves [ISS24].

This is a joint work with Alexander Savin.

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