Spirals and dislocations in wave–vortex systems

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The two-dimensional interaction between sound waves and a vortex is studied. When the Mach number defined by the ratio of the typical velocity due to the vortex to the speed of sound is small and the ratio of the size of the vortex to the wavelength is large, a differential equation for the sound waves is derived. Some classes of spiral solutions of the equation are obtained by relating their phase function to the background flow due to the vortex. Using the analogies between the Aharonov–Bohm effect in quantum mechanics, shallow water waves, and sound waves, the scattering problem of an incident dislocated wave is discussed.

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