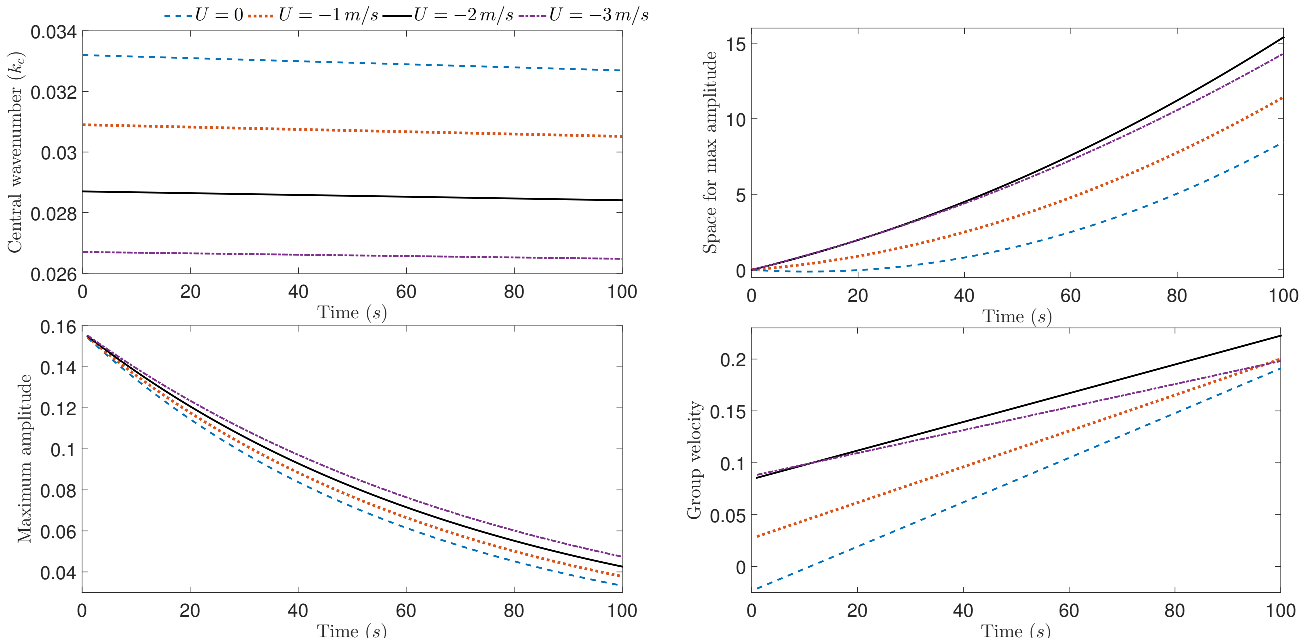

Figure S1: The evolution of the Gaussian wave packet around the primary blocking point is shown by tracking the central wavenumber, location and absolute value of the maximum amplitude, and group velocity over the first 100 s of wave propagation. An apparent decrease in the central wavenumber is observed, and the rate of decrease is higher for a higher magnitude of opposing current. A monotonic increase in the group velocity with higher acceleration (slope of the curves) for the lower magnitude of the opposing current is observed. Due to the initial negative group velocity of the wave packet, the position of maximum amplitude moves backward. But it starts moving in the forward direction as soon as the group velocity becomes positive. The location of perfect blocking can be found from the time at which group velocity crosses zero value. A steady decrease in the amplitude is observed with the highest decay rate associated with a lower magnitude of the opposing current.

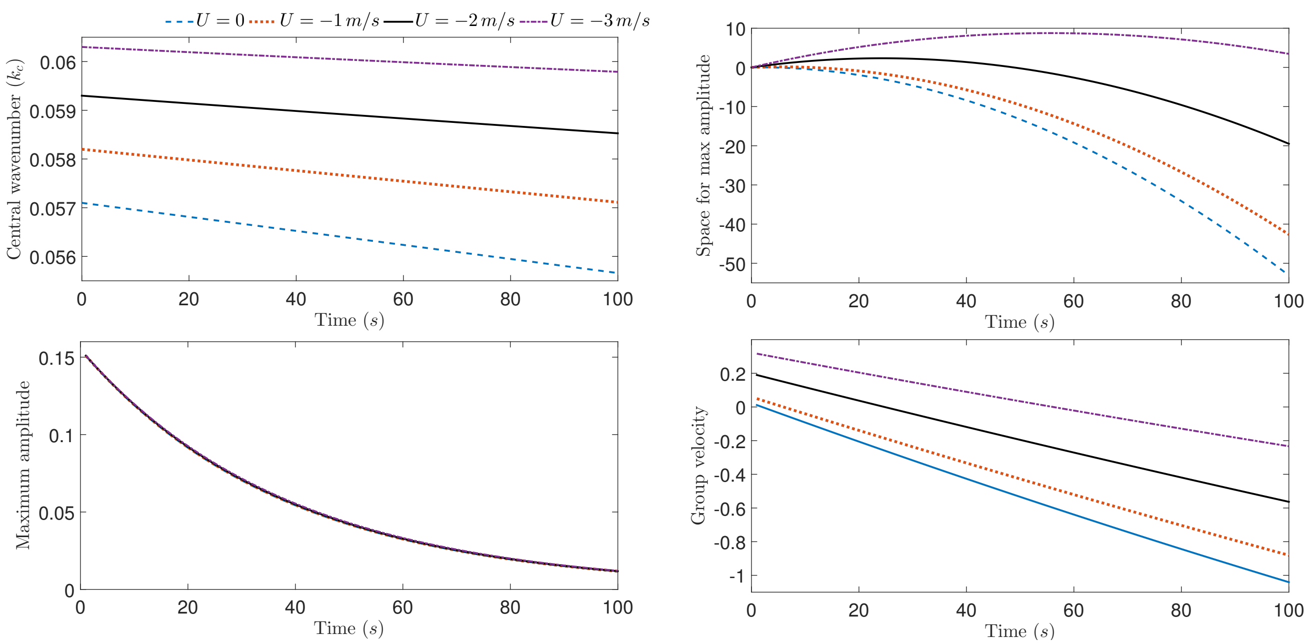

Figure S2: A similar study but around the secondary blocking point. A comparison with the corresponding curves in Fig. S1 reveals that the group velocity continuously decreases over time. Hence, for the cases of initial Gaussian pulse having positive group velocity, the packet initially moves in the forward direction and then starts moving in the backward direction as soon as group velocity reverses its sign. Moreover, the rate of decrease of the maximum amplitude is almost the same in all the cases.

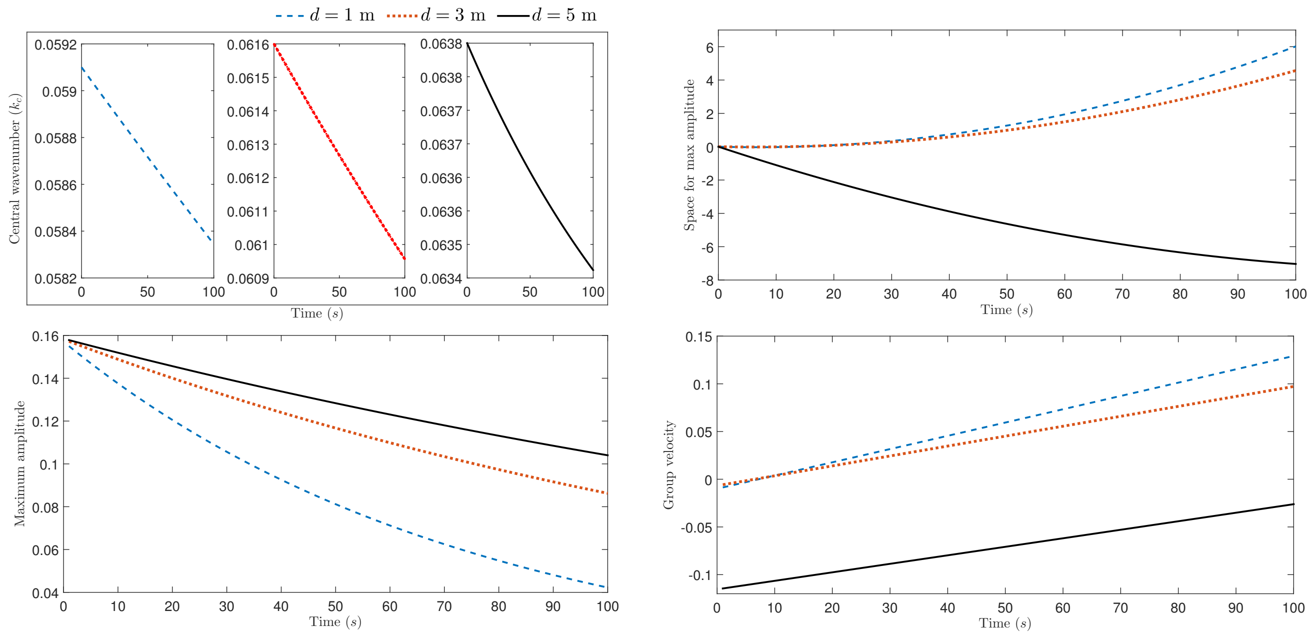

Figure S3: With a fixed opposing current $U = -2$ m/s, we check the impact of ice thickness on the wave packet initially centered around the primary blocking point. The maximum amplitude reduces at a faster rate for thinner ice. An increase in the group velocity is observed, as found earlier. A quicker acceleration of the envelope is found for thinner ice which shows the tendency of thicker ice to keep its shape intact for a longer time. One possible reason for such behavior may be the inertial effect of the ice, which is higher for thicker ice.

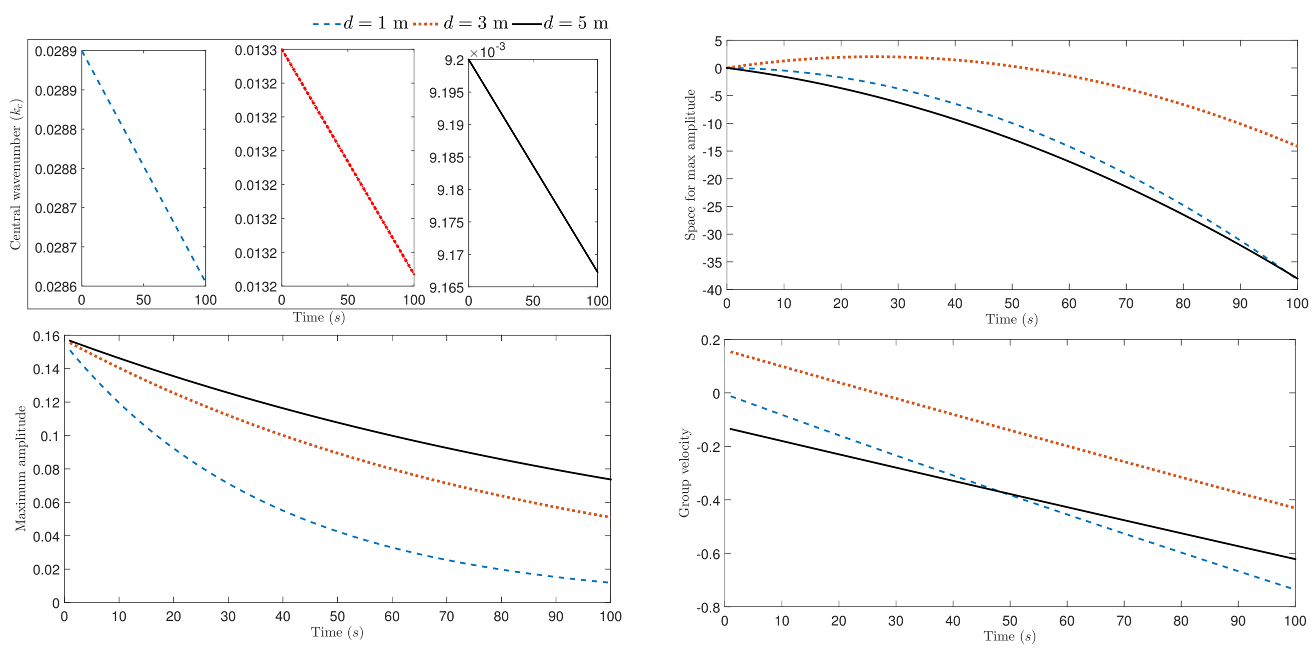

Figure S4: A similar study but around secondary blocking point is depicted. The group velocity decreases in time and results in being negative. A faster acceleration of negative group velocity is observed for thinner ice with more rapid amplitude decay. Because of the generation of negative group velocity, the wave packet moves in the negative direction.

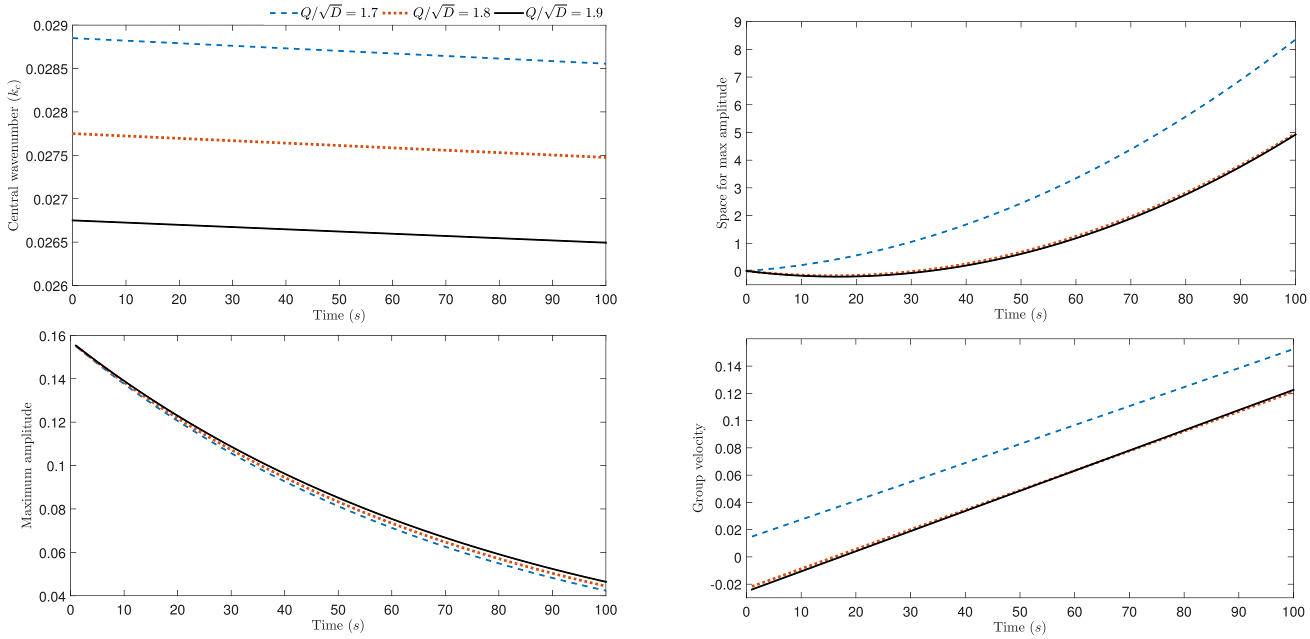

Figure S5: The evolution of the wave packet around the primary blocking point is shown. At a very high compression values, the wave envelopes have almost identical maximum amplitude, group velocity, and location of maximum amplitude in time, except for the central wavenumber. The group velocity increases with time with a continuous decay in the value of central wavenumber.

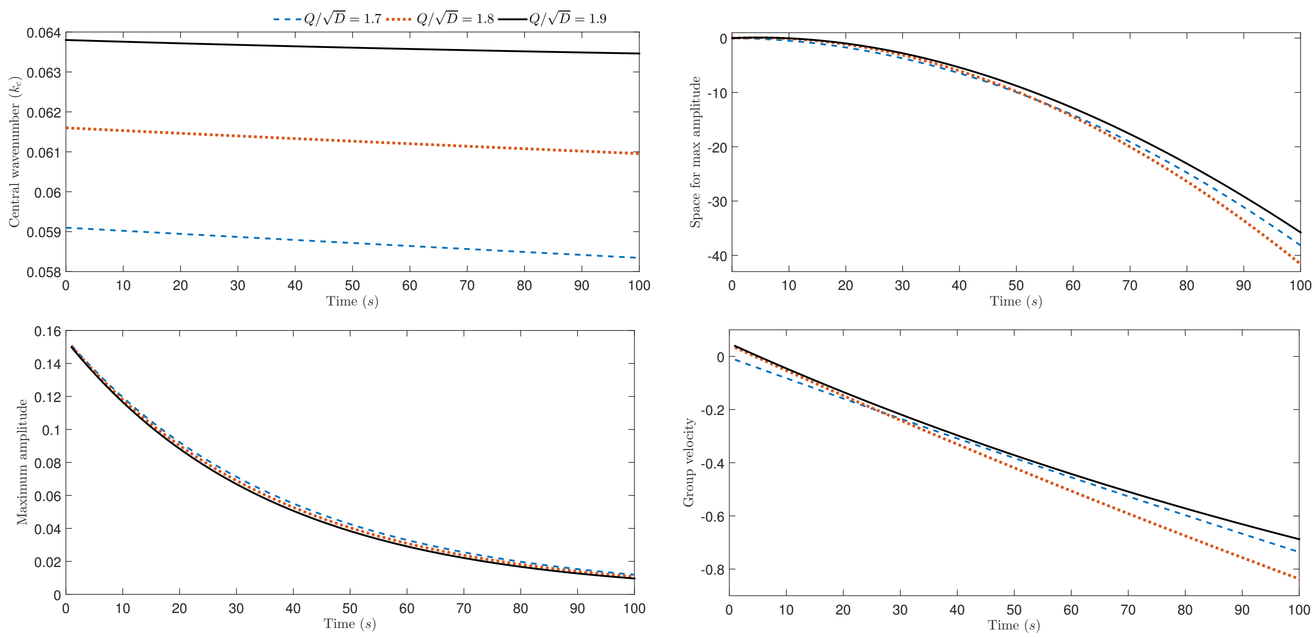

Figure S6: A similar study around the secondary blocking points is shown. In comparison to Fig. S5, the group velocity decreases at a faster rate for $Q/\sqrt{D} = 1.8$. This observation suggests the existence of an optimum value of compression for which the wave packet travels a longer distance. Since the group velocity becomes negative, it ultimately results in a faster increase in the magnitude of negative group velocity, and the wave packet travels in the negative direction.