

GLOBAL BIFURCATION FOR SOLITARY STRATIFIED WATER WAVES

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ABSTRACT

The study of water waves has a long history starting from Euler in 1752, and continues to be a very active area to the present day. Mathematically, the water wave equations describe the motion of water bounded above by a free surface. This free surface is subject to a constant (atmospheric) pressure, while gravity acts as an external force.

We consider 2D steady water waves with heterogeneous density. The presence of stratification allows for a wide variety of traveling waves, including fronts, so-called generalized solitary waves with ripples in the far field, and even fronts with ripples! Among these many possible wave patterns, we prove that for any smooth choice of upstream velocity and monotone streamline density function, there always exists a continuous curve of solitary waves with large amplitude, which are even and decreasing monotonically on either side of a central crest. As one moves along this curve, the horizontal fluid velocity comes arbitrarily close to the wave speed. We will also discuss a number of results characterizing the qualitative features of solitary stratified waves.