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Computer-assisted construction of singular waves in quasilinear water wave models

In deep water under the effects of constant vorticity and gravity (but not surface tension), small solitary waves exist which resemble a rescaled Benjamin–Ono soliton. As speeds increase from a critical speed, numerical evidence suggests these waves become more sharply peaked. Studying periodic travelling waves for a paradifferentially-reduced model, we construct a family of cusped waves using a computer-assisted fixed point argument. The structure of the equation requires careful control of nonlocal quasilinear terms which couple terms singular at the origin with the longer-range behavior. The constructed cusped behavior is in contrast to the expected 120 degree angle of a Stokes wave of maximum height, shedding light on what precise structure in the full water wave problem leads to angled crested waves. This is joint work with Jeremy Marzuola. -