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Are the wake angles of a duck and a ship really the same? MARC RABAUD, FREDERIC MOISY, Laboratoire FAST, Universite Paris-Sud — The wake of a disturbance moving at the water surface, like a ship or a duck, owes its shape to the dispersive property of surface gravity waves. According to Kelvin's theory, it is widely accepted, and sometimes observed, that the wake angle is independent of the disturbance velocity, and given by $\sin^{-1}(1/3) = 19.4$ degrees. However, field observations often show much smaller angles for fast ships, down to 5 - 10 degrees. The angle of these narrow wakes is actually found to decrease as the inverse of the disturbance velocity, similarly to the Mach cone of a supersonic disturbance in a non-dispersive medium. We propose here a simple model for this transition from a Kelvin regime (at low Froude number) to a Mach regime (at large Froude number) — where the Froude number is based on the disturbance length. This model is confirmed by numerical simulations, reproducing the variety of wake patterns observed for disturbances of various size and velocity.

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