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Surfing a magnetic wave ELINE DEHANDSCHOEWERCKER, Laboratoire d'Hydrodynamique de l'Ecole Polytechnique (LadHyX), DAVID QUERE, Laboratoire de Physique et Mecanique des Milieux Heterogenes (PMMH), CHRISTOPHE CLANET, Laboratoire d'Hydrodynamique de l'Ecole Polytechnique (LadHyX) — Surfing is a free surface sport in which the athlete rides a wave standing on a board. However, any object plunged into the water or put on its surface is not always captured by an approaching wave, just like the classic example of a fisching float. So, a particle can be captured or not by a wave. Two regimes are defined : surf (captured) and drift (not captured). We focus on the question of the transition between these two regimes. Here we address the question with a magnetic wave. We have developed an experimental setup which allows the control of all relevant physical parameters. Liquid oxygen, which is paramagnetic and undergoes Leidenfrost effect, can be used to ensure magnetic and frictionless particles. A permanent magnet in translatory movement allows us to create a definite magnetic wave. We discuss the motion of oxygen drops deposited on an smooth and horizontal surface above an approaching magnet. First we show the existence of a critical speed below which drops are captured and determine how it depends on the velocity and intensity of the magnetic wave. Then we experimentally investigate the parameters that would affect the movement of drops in each regime. Finally, models have been developed to interpret magnetic drops motion and guarantee an efficient control.

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