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# Physics of surfing

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## Abstract

Surfing is a cheap and efficient means of transport used by mammals.

But delicate to master.

Catching the wave, finding the equilibrium state and remaining stable are the three main challenges. We address sequentially these problems and focus on the different physical phenomena involved. Identifying the respective role of the slope and of the current is probably the main point of the discussion on catching the wave. For the slope, we will focus on the shoaling effect and show that an analogy with a pendulum provides a way to classify the different types of waves. For the equilibrium we follow Hayes' model for wave riding. Finally, stability is discussed by comparing the stabilizing role of both buoyancy and flow.

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