Optimal transport of active particles induced by substrate concentration oscillations

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We show the existence of a stochastic resonant regime in the transport of active colloidal particles under confinement. The periodic addition of substrate to the system causes the spectral amplification to exhibit a maximum for an optimal noise level value. The consequence of this is that particles can travel longer distances with lower fuel consumption. The stochastic resonance phenomenon allows the identification of optimal scenarios for the transport of active particles, enabling them to reach regions that are otherwise difficult to access, and may therefore find applications in transport in cell membranes and tissues for medical treatments and soil remediation.

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