



Ordering of small particles in one-dimensional coherent structures by time-periodic flows

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Small particles transported by a fluid medium do not necessarily have to follow the flow. We show that for a wide class of time-periodic incompressible flows inertial particles have a tendency to spontaneously align in one-dimensional dynamic coherent structures. This effect may take place for particles so small that often they would be expected to behave as passive tracers and be used in PIV measurement technique. We link the particle tendency to form one-dimensional structures to the nonlinear phenomenon of phase locking. We propose that this general mechanism is, in particular, responsible for the enigmatic formation of the 'particle accumulation structures' discovered experimentally in thermocapillary flows more than a decade ago and unexplained until now.

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