

Impact of different environmental conditions on the swimming strategies of planktonic copepods

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Suspensions of small planktonic copepods represent a special category in the realm of active matter, as their size is relatively small, whereas the wide range of individual variability and motion patterns resembles that of much larger animals. In this talk, after an overview of copepod swimming behaviour, we will discuss the possibility of detecting how the motion of organisms is affected by different external conditions, such as the presence of food and the effect of gravity, drawing on a large number of three-dimensional trajectories of copepods[1]. We will show that this goal can be quickly obtained by focusing on simple average metrics commonly used to characterize colloidal suspensions, such as the mean square displacement and temporal autocorrelation functions. We find that the presence of food leads to the onset of a clear localization that separates a short-time ballistic from a long-time diffusive regime. Such a benchmark reflects the tendency of copepods to remain temporally feeding in a limited space and disappears when food is absent. Localization is clearly evident in the horizontal plane, but is negligible in the vertical direction, due to the effect of gravity. We will also show preliminary results demonstrating that a similar approach can be also used to investigate the impact of crowding [2].

Overall, our results suggest that simple average descriptors may provide concise and useful information on the swimming properties of planktonic copepods, even though single organism behaviour is strongly heterogeneous.

[1] R.Pastore, M. Uttieri, G. Bianco, M. Ribera d'Alcalà and M. G. Mazzocchi, Distinctive diffusive properties of swimming planktonic copepods in different environmental conditions, *European Physical Journal E* 41, 79 (2018).

[2] M. Uttieri, P. Hinow, R. Pastore, G. Bianco, M. Ribera d'Alcalà and M. G. Mazzocchi, Swimming performance of the copepod *Centropages typicus* at increasing populations densities, In preparation.

*JOINT TALK

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